

**ADF**  
**Aalto**  
**Design Factory**

# ADF

## Aalto Design Factory

Annual Publication 2019/2020





# Hi, Visitor!

## Welcome to ADF, Aalto Design Factory!

Annual Publication 2019/2020

Just past the decade mark, the Aalto Design Factory is a magical co-creation space, the first of 30 design factories around the world, where a growing family of hard workers from various disciplines combine their skills to create, teach, learn, conduct research and solve problems.

In this publication, we provide an overview of our experiences from 2019-2020 and share our activities and highlights in love, design, business and engineering.

**Enjoy!**  
**Visual Communications Team and Staff**





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## Face-To-Face Greetings From The Janitor

During the spring of 2020, the Aalto Design Factory (ADF) was more silent than ever in its history. University buildings were closed down and online studying and working became the standard. Most of the courses were quickly reshaped and realized without classrooms, seminars, studying together in teams or having access to laboratories. When I spoke to students, they were surprised at how smoothly the change actually went. The official message from the political and university leadership is quite similar: a huge thanks to teachers and students for successfully adapting to an unexpected situation. It seems very likely that online studying and working will continue after the summer.

The Aalto Design Factory was built for interaction, joint learning, prototyping, testing, using facilities without a plan and providing a space for 'planned coincidences'. How do I feel about transferring all this to the online mode?

Without hesitation, I can say, for instance, that the Product Development Project (PdP) course students and sponsors have been truly flexible and understanding about the restrictions. On the other hand, the lockdown has caused numerous problems and delays and the final gala event is still to be held in September. When sitting

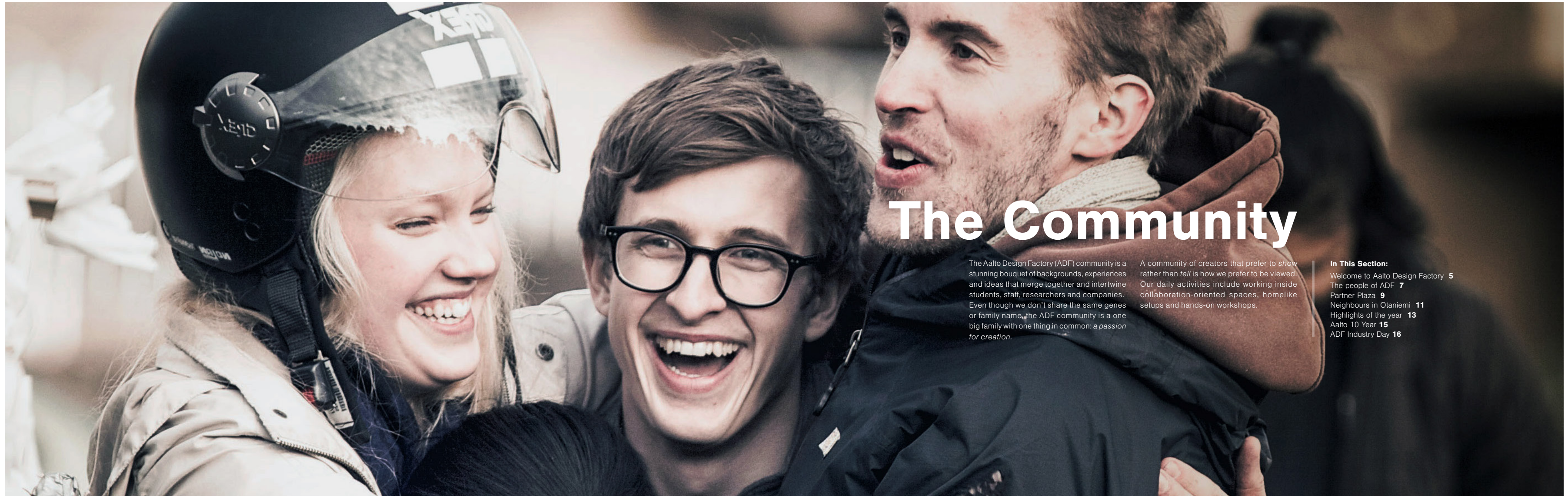
in an empty building of 3000 square meters, I wished there was a way to better help students than just let them borrow some tools or arrange components for their needs. Informal 'coffee corner' online sessions didn't attract much of an audience. The mental distance between the students and teaching staff only grew greater, while the number of informal discussions decreased dramatically. The threshold for contacting staff and asking for help has always been high, but informal meetings have always counteracted that. They inform us about problems or issues without a formal request for help.

Interesting discussions have taken place on supporting online prototyping and testing. I'm not against such approaches, they certainly deserve further exploration. However, in addition to the straightforward adaptation to the lockdown, I would suggest that we also focus on finding creative ways to use the ADF for its fundamental purpose without endangering the safety of users and letting diseases like COVID-19 spread. The ADF is not exactly the same as most other campus learning facilities; it's built to be different and, consequently, doesn't 'do' online very well.

Having said all that, everyone knows that, at the ADF, safety and students come first.

**Kalevi "Eetu" Ekman**





# The Community

The Aalto Design Factory (ADF) community is a stunning bouquet of backgrounds, experiences and ideas that merge together and intertwine students, staff, researchers and companies. Even though we don't share the same genes or family name, the ADF community is a one big family with one thing in common: *a passion for creation.*

A community of creators that prefer to *show* rather than *tell* is how we prefer to be viewed. Our daily activities include working inside collaboration-oriented spaces, homelike setups and hands-on workshops.

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designfactory.aalto.fi

# Welcome to Aalto Design Factory

12000	4000	25	11	143*
Cups of Coffee Consumed	Bottles collected and returned from ADF	Community breakfasts organized	Community breakfasts cancelled due to COVID-19	Requested tours of the premises

## What you will find in ADF:

The ADF structure is a combination of workshops, lecture halls, office and research wings, and social gathering areas where we used to hug all the time. Although the better part of this year has been away from the physical space for most habitats, the walls are waiting on standby for life to go back to normal.

### Touring the facilities

Every year, local and international visitors come to see the facilities and learn more about the design factory structure. The data for all planned tours are recorded and categorized according to the user segments. Additionally, a number of impromptu tours take place on the premises year-round.

### Workshops

Discover and develop any project by joining a course or becoming a partner company.

PrintShop, ElectroShop, MachineShop, ProtoBunker, WoodShop, PaintShop, KnittingShop, ModelShop, The Cage, AC/DC

### Office wings:

Where you can find staff.

Staff Wing, Research Wing, Barn (Teaching Wing)

### Lecture spaces:

Where you can host a lecture or event through the online booking system.

The Stage, Studio, Puuhama, Engine Room

### Meeting spaces:

Where you can hold team meetings by booking through the online booking system.

Brainstorm, Birch, Audition, IdeaSquare, Salli, +15 additional smaller meeting spaces

### Social areas:

Where you can share the space with other members of the community to mingle, learn and eat.

Lobby, The Library, Kafis





## The people of ADF

At the Aalto Design Factory, a staff packed with awesome and authentic individuals who work together to run the factory, welcome visitors, teach students and learn from each other.

### Enablers



**Kalevi "Eetu" Ekman**  
ADF Director  
PDP Professor



**Martti Jerkku**  
Project Manager of ADF



**Vesa "Vesku" Saarijärvi**  
Omniscient Caretaker



**Serpil Oğuz**  
Media & Communication



**Pullea Mentula**  
Soft Skills Expert



**Marthe Dehli**  
DFGN Coordinator



**Klaus E. Castrén**  
Engagement Economist  
Project Member



**Päivi Oinonen**  
DFGN Manager



**Shreyasi Kar**  
Design & Electronics



**Aimane Blej**  
Project Coordinator



**Eeva-Mari Virtanen**  
Project Controller  
Mother Figure

### Workshops



**George Atanassov**  
Content Producer



**Erwin Laiho**  
Model Maker



**Joel Meneses**  
El Visual Maestro



**Jani Kalasniemi**  
MachineShop Maestro



**Simon Andsten**  
MachineShop Assistant



**Teemu Ronkka**  
Electronics Specialist



**James Evans**  
BioGarage Manager

### Teaching



**Katja Hölttä-Otto**  
Professor



**Jaana Suviniitty**  
Pedagogical Developer



**Tua Björklund**  
Professor of Practice



**Maria Clavert**  
Professor of Practice



**Tuomas Paloposki**  
Aaltonaut Teacher



**Maurice Forget**  
Aaltonaut Teacher



**Elina Kähkönen**  
Teacher in Charge- Aaltonaut



**Meri Kuikka**  
Aaltonaut Teacher



**Teppo Vienamo**  
Aaltonaut Teacher



**Markku Koskela**  
ME310 Teacher



**Andre Santos**  
PDP Course Assistant



**Joel Tolonen**  
PDP Course Assistant

### Research



**Katrina "Kati" Nordström**  
Professor



**Senni Kirjavainen**  
Project Researcher



**Maria Mikkonen**  
Researcher / Ph.D. Candidate



**Teo Keipi**  
Postdoc Researcher



**David Leal Martinez**  
PhD Candidate / Electroshop



**Anna Kuukka**  
Research-driven designer



**Erika Perttunen**  
Researcher & Communicator



**Paul Savage**  
Postdoc Researcher



**Johanna Kaila**  
Planning Officer for UNITE!  
Doctoral Candidate



**Marcela Acosta**  
Project Manager of UoF



**Sine Çelik**  
Postdoc Researcher



**Esko Hakanen**  
Postdoc Researcher



**Satu Rekonen**  
Postdoc Researcher



**Floris van der Marel**  
Ph.D. Surf Schooler



**Hanna Aarnio**  
Researcher / Doctoral Candidate



**Antti Surma-aho**  
Ph.D. Candidate



**Alvaro Chang**  
Researcher  
Doctoral Candidate



**Jie Li**  
Researcher  
Doctoral Candidate



**Saurabh Deo**  
Researcher  
Doctoral Candidate





designfactory.aalto.fi/companies

# Partner Plaza

5	8	4	17	€8.45M
Community partners	Prototyping partners	In-house partners	Total start-up partners	Revenue*

## Industry Collaboration

Industry collaboration is so strongly at the core of the experimentation and educational activities at ADF that having in-house start-ups goes without saying! We have invited them to stay with us and they have even been given their own space, the Partner Plaza. Depending on their needs, some require desk space, some need access to prototyping facilities, while others simply enjoy being part of the community.

They serve as role models for students by making an entrepreneurial career path less intimidating and therefore building the students' confidence in their own ability to become entrepreneurs.

They recruit students to work for them both during and after their studies, providing a safe first encounter with entrepreneurship.

Finally, by supporting community start-ups, we remove barriers and make it easier for students and community members to launch their entrepreneurial ventures.

The ADF is built around the benefits of collaborating with distinct and diverse communities. Having start-ups within our walls allows us to bring another perspective from the non-academic world into the community and to support our ambitious community members in gaining the confidence and support they need to take their first steps into entrepreneurship!

They sponsor thesis workers, Product Development in 6 Hours (PD6) workshops and project courses.

They participate in and host regular community activities, such as the Tuesday breakfasts, and participate in other events, such as the ADF booth at the Aalto 10th year anniversary.

They bring their specialized equipment and knowhow to the community and share it with both students and staff.

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### Partner Corner

**Aurora Propulsion Technologies**

Manufacturing motors and plasma breaks for satellites weighing up to 150 kg.

Founded in 2018  
ADF partner since autumn 2019  
24 employees

**Start-up stage: validating solution and business, starting to scale up**


**Riot Innovations**

Creating smart modular outlet systems to optimize the use of electricity and reduce the environmental footprint.

Founded in 2018  
ADF partner since autumn 2019  
3 full-time employees and 1 Master's Degree intern from Aalto University

**Start-up stage: early stages of validation**

“The ADF has a great atmosphere, provides access to great machinery and has a lot of old friends! We did a PdP project with the students and the best way to collaborate with them was to be present in the same space.



**Roope Takala**  
CEO of Aurora Propulsion Technologies

“The ADF provides us with the essential spaces, equipment and staff expertise for our product development process of building and testing physical products. Thanks to our partnership in the ADF, we can do almost everything in-house, which shortens development time, makes testing and piloting easier and results in cost savings.



**Miska Karvinen**  
Founder and CEO of Riot Innovations

”

### COVID-19 and Partner Plaza

Start-ups are by nature highly fragile in their early stages and the COVID pandemic raised serious concerns among the start-ups within our community. As the university gradually shut down almost all physical access to the ADF, we decided that the only right thing we could do was to exempt all of our start-ups from the fees for the second half of the academic year.

Furthermore, as a few start-ups ran into prototyping issues critical to their future, we worked to enable them to safely use the prototyping spaces following the public health regulations and university-level regulations. We remain hopeful that none of the start-ups within our community will be lost due to the pandemic and we will keep on supporting them in every way we can!

### Start-ups at the Design Factory - 2019/2020

Kaon Oy	Riot Innovations Oy	Surgify Medical Oy	Nose Academy Oy
Onnivation Oy	Caidio Oy	Protorhino Oy	Consair Oy
Teraloop Oy	StrateCo, Global Oy	EHE Oy	Aurora Propulsion Technologies Oy
Trick Technologies Oy	mResell Oy	Nordic Crafters Oy	
Trenox Oy	Yield Systems Oy		

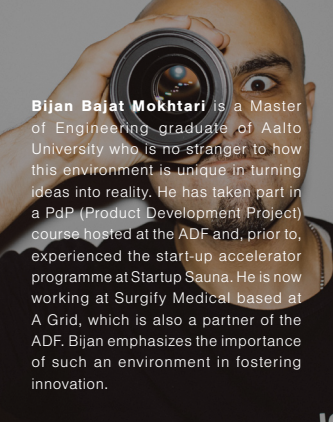




# Neighbours in Otaniemi

## Neighbours in Otaniemi

Hosting Otaniemi, Espoo is the second-largest and fastest-growing district of Finland, rapidly shaping into a unique, innovative and collaborative ecosystem, with a vibrant and rapidly evolving community of game-changers. Its evolution will continue in the decades to come. The Aalto Design Factory has been part of the Otaniemi neighbourhood for more than 10 years as a critical player that shortens the gap between education and industry by fostering a multidisciplinary approach to work.



**Bijan Bajat Mokhtari** is a Master of Engineering graduate of Aalto University who is no stranger to how this environment is unique in turning ideas into reality. He has taken part in a PdP (Product Development Project) course hosted at the ADF and, prior to, experienced the start-up accelerator programme at Startup Sauna. He is now working at Surgify Medical based at A Grid, which is also a partner of the ADF. Bijan emphasizes the importance of such an environment in fostering innovation.

“ This ecosystem takes the worries out of innovation and leaves room for problem-solving. ”

**Bijan Bajat Mokhtari**  
Surgify Medical



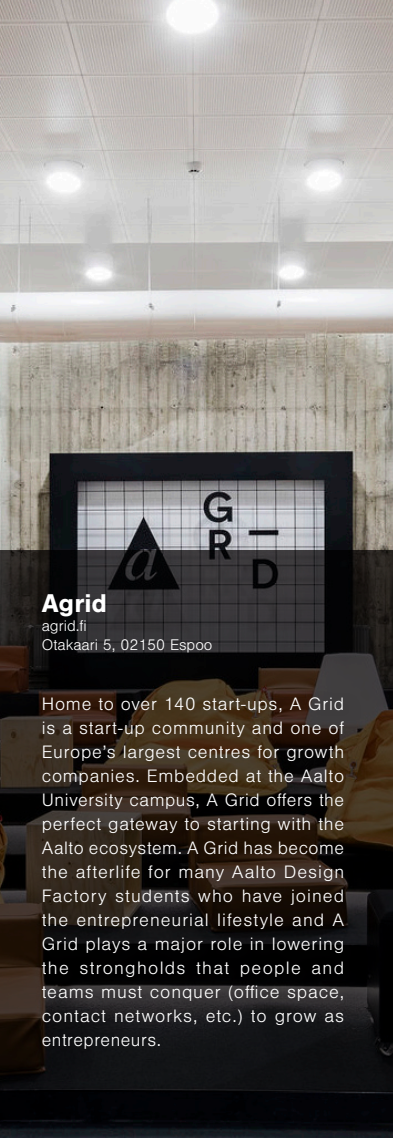
**Väre**  
aalto.fi/en/locations/vare  
Otaniementie 14, 02150 Espoo

Väre is a home for the school of Business and the School of Arts, Design and Architecture, housing shared facilities for both fields.



**Urban Mill**  
urbanmill.org  
Betonimiehenkuja 3 E, 02150 Espoo

Part of the Espoo Innovation Garden, Urban Mill opened its doors back in 2013. Urban Mill is and works as a global focal point for urban innovation and co-creation. This space and community are located directly adjacent to the ADF premises (20-second walk). Hosting events and offering prototyping space and flexibility when accessing the facilities provides a great helping hand to those ready to jump into the adventure.



**Agrid**  
agrid.fi  
Otakaari 5, 02150 Espoo

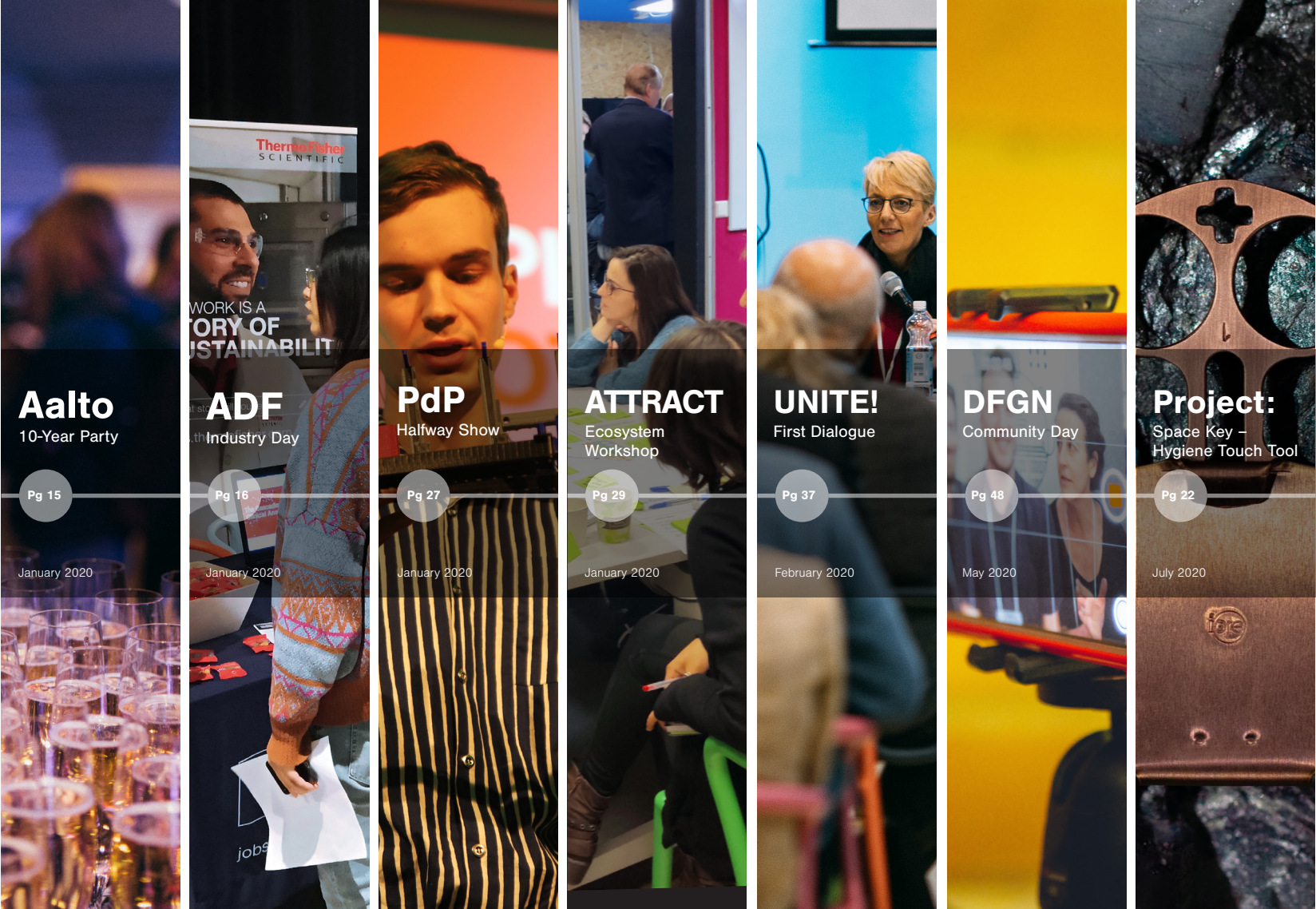
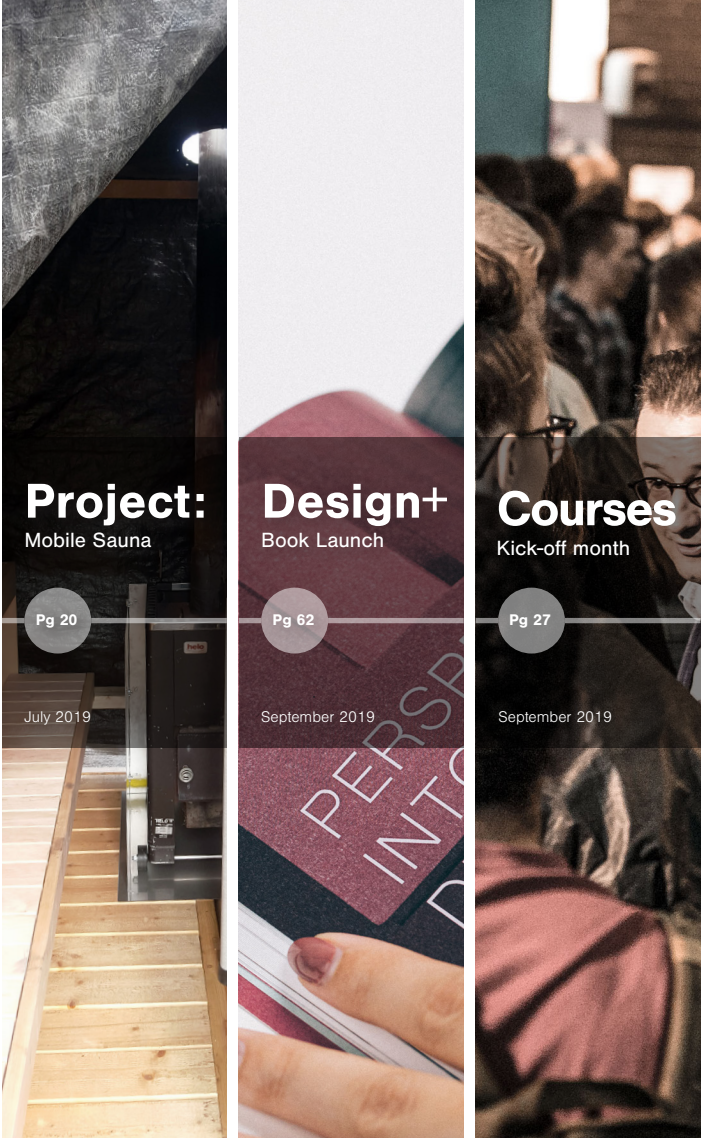
Home to over 140 start-ups, A Grid is a start-up community and one of Europe's largest centres for growth companies. Embedded at the Aalto University campus, A Grid offers the perfect gateway to starting with the Aalto ecosystem. A Grid has become the afterlife for many Aalto Design Factory students who have joined the entrepreneurial lifestyle and A Grid plays a major role in lowering the strongholds that people and teams must conquer (office space, contact networks, etc.) to grow as entrepreneurs.



**Startup Sauna**  
startupsauna.com  
Betonimiehenkuja 3D, 02150, Espoo

Located directly adjacent to the ADF, Startup Sauna is Finland's central hub for the student-run entrepreneurial movement. Equipped with friendly co-working spaces and a 1500 square meter industry hall open for all those interested in or who desire access.









## Aalto 10-Year Party

Aalto University has brought together science, art, technology, and business at the Otaniemi campus and is now one of the world's leading universities in these key areas. In January 2020, Aalto celebrated its 10th anniversary. Since Aalto Design Factory is the first physical manifestation of Aalto and the forerunner of interdisciplinary education, our community had a strong presence at Dipoli where the festivities were organized.

ADF showroom was established on the 2nd floor of Dipoli where projects and prototypes from past years were showcased. Students and staff together promoted ADF's interdisciplinary activities and described how we cherish the innovation culture. The highlight of the day was the moment when KU Leuven signed the membership agreement with ADF and became the 30th member for Design Factory Global Network. This ceremony was accompanied by Retuperän WPK orchestra, followed by raising a toast for the new member of the network.

The party was as warm, diverse, and extraordinary as the Aalto community is at its best.



## ADF Industry Day

The Industry Day at the ADF was organized for students, researchers, and teachers to meet industry representatives from multiple sectors. The goals were to explore the possibilities of research and academic collaboration to solve multidisciplinary real-life problems, and for students to learn about available opportunities such as thesis work, summer jobs, internships, and more!

For many international students, this was an exceptional opportunity to make closer connections with Finnish companies in a casual environment, and we hope for this to be the first of many such events in the future.





# Hands-on Work

To turn ideas into usable innovations, the ADF has an array of people and machines that make prototypes. After an idea is expressed, the team discusses what is needed and designs a manufacturing process to achieve the final form of each project. To put it bluntly, students and staff are supported by learning about their vision and translating it into objects. Iteration is the key to successful solutions, so students are encouraged to make alternative prototypes (aka dark horse prototypes) by varying the scale, materials and use scenarios.

Some of these tangible objects are highlighted in this section, as well as the processes that led to the end result through the makers who enabled them to be made in the first place, be it a staff member or one of the dear machines in the factory. Some of the ADF machines are given individual names to help these sometimes intimidatingly complex technologies be more approachable and to simplify communication. This is also a reminder of the importance of creating things that are perceived as more than the sum of their parts.

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# Workshop Portfolio

In ADF, the workshop facilities for makers offer a wide range of tools and materials to work with. All workshops prioritize the work of students and the start-up partners when offering services and staff assistance.

Regardless of the complexity of the product envisioned, the arc of development often follow this order:

- 1 Sketch on paper
- 2 Crude handmade prototype using a light & easy-to-shape material like paper, foam and cardboard modeling of digital version with computer-aided design software (CAD)
- 3 Mockup made with accessible materials like wood and readily available objects (read: trash & other stuff that is lying around)
- 4 Revise the digital version so that the CAD is manufacturable
- 5 Prototype using CAM (computer-aided manufacturing) technology like 3D-printing, laser-cutting or CNC-milling
- 6 Combine the prototype with additional components like nuts & bolts and electronics to produce a functional prototype
- 7 Repeat steps 5-7 until design satisfies all design drivers (needs & wishes)

8 A high-fidelity prototype is outsourced to a company with more ideal machines for the job

9 Document the prototype with high-quality photos and videos, because "pics or didn't happen!"

## ADF Workshops

**Protobunker**  
Protobunker houses power tools, basic machines for wood and sheet metal work, an inventory of recycled materials, and a mini electronics workshop equipped with the essentials.

**PrintShop**  
PrintShop houses 3D printers named NUNU and COCO, a large-format roll-to-roll printing machine named BARBARA, a vinyl cutter named BUBU, and a laser cutter named LALA 2.

**ElectroShop**  
ElectroShop houses a PCB etching tank, a UV development machine, soldering and de-soldering stations suitable for even surface mount soldering, oscilloscopes, multimeters, signal analyzers, variable power supplies, and basic electronic components.

**PaintShop**  
PaintShop houses ventilated painting stations and basic tools for painting.

**MachineShop**  
PaintShop houses a 4x Axis CNC Machine, a 3x Axis CNC Machine with carousel tool changer, manual Lathe, a CNC Lathe, a Metal Saw, a Bench Drill, and a Pillar Drilling Machine.



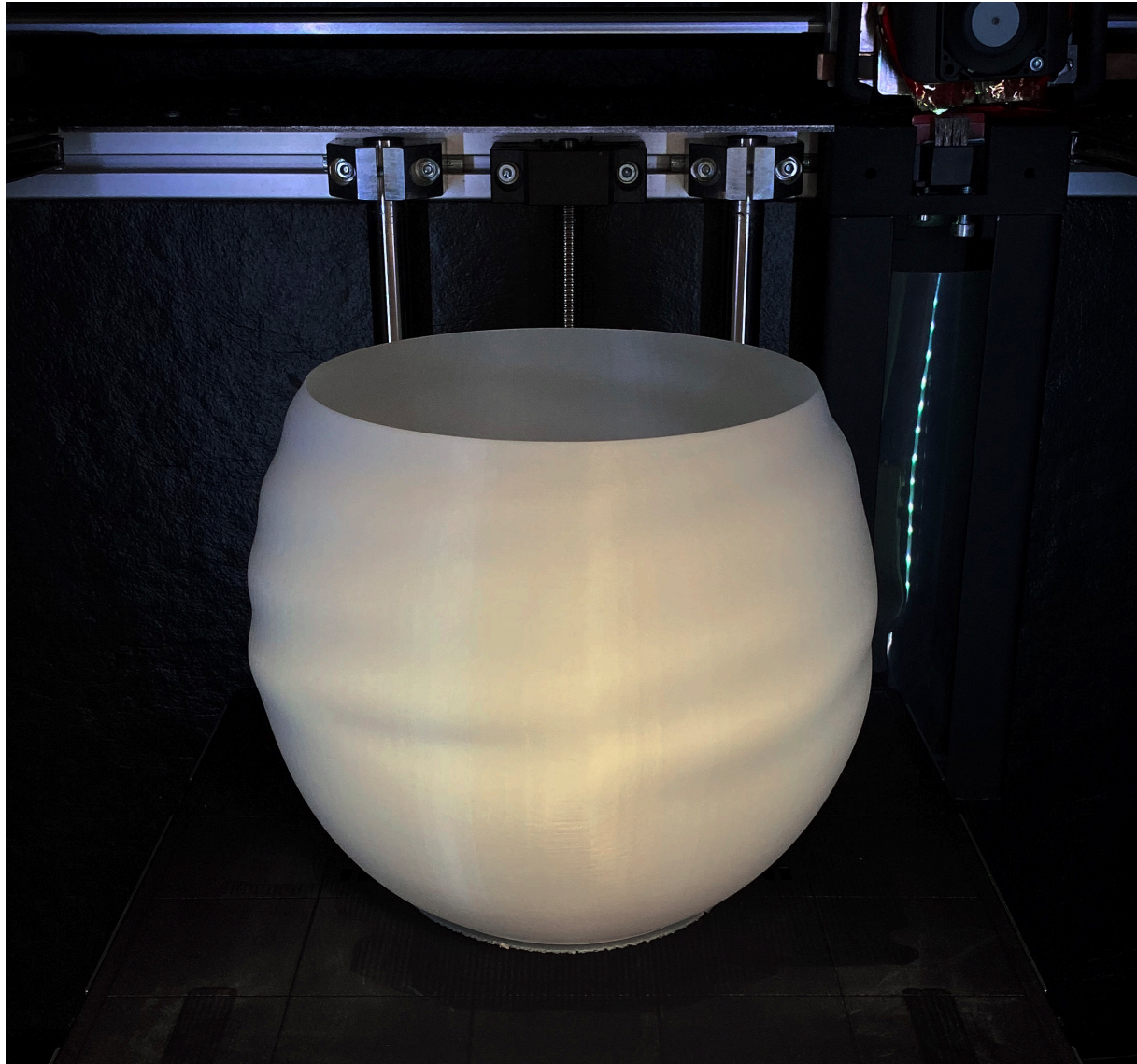
## Project by Pauli Haimilahti Mobile Sauna

In Finland, it is not uncommon for saunas to be built in the most remote and unlikely places, but this sauna's idea was that it could be set up wherever, whenever. It entails trailers with saunas built into them. However, they are still limited by scenarios in which a person has to drive a car with a trailer.

The sauna is flat-packed and can be assembled on site without any tools. The frame is made of 2x4 fir with simple joinery and a measure-made tarp fits over it to create an enclosed space. Lastly, the stove is a readily available wood-fired model, so no electricity or 'grid' is needed.

One might call this a 'field sauna', but having tested it in the backyard of the ADF a couple of times, it delivers a more pleasurable 'löyly' (heat/steam/the most essential sensation of sauna) than many proper indoor saunas.





Project by **Ville Turunen**

## Mathematically Optimized Lampshades

My research deals with symmetries of signals in space and time, with Fourier and abstract harmonic analysis of groups. The formal vocabularies resulting from the spatial manifestations of these ideas are used in these lampshades to create the optimal secondary light without wasting material. Though reminiscent of modernist designer lamps and patterns in nature, this is purely incidental. In the chosen parameters, factorizations of natural numbers result in the aesthetics of harmonic proportions.

Poul Henningsen (1894-1967) designed his lamps to provide pleasant indirect light and our work takes this idea to the extreme. Picture a transparent round light bulb as the unit sphere, with the light source in the core. Assume single reflections of a constant angle by the lampshade, which clicks onto the sphere, so there is no need for any other supporting structure. Exploiting Euclidean symmetries, exponential functions and spherical harmonics appear in the formulas. In the sketches of all the resulting forms, I have hidden spheres, cylinders and cubes, as well as the regular polygons: triangles, squares and hexagons. The factorizations of the number 12 play a special role, like the hours on the clock face.



Project by **Erwin Laiho**

## Space Key – Hygiene Touch Tool

At the beginning of the Coronavirus outbreak, there was a DIY hack from Wuhan called the 'Wuhan Hook', which was an incredibly inventive and completely improvised chemical weapon against the Coronavirus in the ground zero of the viral outbreak. It was a lighter with an Allen key taped to its side. After touching a potentially contaminated public surface, you turn the lighter on. This disinfects the tool head and you can be sure that you did not and will not get any virus, bacteria, fungi or other microorganisms from a contaminated surface.

This ingenious idea inspired a systematic inquiry into possibilities to create a product. The result is 'Space Key,' an antimicrobial copper aid to avoid diseases on 'high-touch surfaces' and 'fomites'. Its design is inspired by keys, upper limb prosthetics, hand tools and jewellery.

Made of 99.95% copper for hygiene reasons, it is very soft in addition to having a smooth form, so it does minimal harm to materials like wood and plastic and no damage to steel or glass. It works on a variety of handles, locks, toilet fixtures, switches, buttons, drawers, tabs & other keys and, with its copper case, you never touch (even indirectly) the tool end or the germs that may be on it momentarily before the copper eliminates them.





# Learning & Education

The combination of love, design, business and engineering is the eternal spirit of the ADF, as students from various backgrounds are guided through the multidisciplinary courses run in ADF.

Teaching continues despite the unusual circumstances during the COVID-19 pandemic. This section will look into some of the courses run in ADF in the past year and the pedagogical approach of the teaching staff.

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# Our pedagogical approach

## Enabling multidisciplinary education & co-teaching at the ADF

Ten years after its establishment, Aalto has brought art and science together with business and technology? While the disciplines are situated on the same campus, do the performance indicators encourage students or teachers to cross the disciplinary borders? In 2019–2020, the pedagogical activities at ADF focused primarily on building connections across the disciplines for Aalto students and teachers. While most of the development work was done within the ADF premises, the results were also disseminated to wider audiences. The main dissemination activities were related to multidisciplinary education and co-teaching as well as continuing education.

## Multidisciplinary education and co-teaching

This academic year, the ADF has continued to promote multidisciplinary teaching and learning in the degree structures, study paths and schedules across the Aalto schools. The importance of developing key performance indicators supporting multidisciplinary education was shared through various channels, including Aalto

strategy workshops and education steering groups. The dissemination work resulted in a concrete proposal on establishing 1) introductory hands-on courses open to all students across Aalto and 2) capstone courses that build connections between own discipline-specific competence and other Aalto fields.

Meanwhile, the ADF has continued to develop the current Bachelor's degree courses towards multidisciplinary co-teaching. The development efforts have initiated a continuously growing Aalto-wide teacher network. The majority of the collaborative planning and teaching activities have focused on the mandatory parts of students' study paths. For example, Aaltonaut teachers applied their co-teaching and product development-related expertise in collaborative planning, implementation and the evaluation of selected Aalto courses. Moreover, Aaltonaut worked with the Aalto Ventures Program and the Department of Industrial Engineering to pilot a merger of two courses from different fields into a new multidisciplinary one. The lessons learned from the various multidisciplinary co-teaching experiments were shared at scientific conferences (SEFI 2019, Climate University seminar in Aalto 2020).

## Courses at the Design Factory - 2019/2020

Product Development Project	Pack-Age	Design for learning environments
ME310	IDBM Challenge	Yrittäjyys Aalossa
IDBM Industry Project	Opportunity Prototyping	BEST autumn course
AVP Summer Course	Design Theory and Methodology	Designing an Electric Device for Business and Production
Creating Multidimensional Experiences	Product sustainability	Service Design/Palvelumuotoilu valmennusohjelma
EIT Climate Summer School	Methods in Early Product Development	Design & Innovation in Context
ME department master's thesis seminar	Games Now!	Product life cycle
Wood in healthy and sustainable construction	Research Project	Mechanical Engineering in Society
Optics in Engineering	Explorative Information Visualization	CoID Designing Interactions
Introduction to MA Design Studies	SCI Project Course	Korkeakoulupiskelijän ABC
Entrepreneurial Networking	Venture Ideation	Product Analysis
AI in Materials Science	Venture Formation	Startup experience
Urban Space Gaming Workshop series	Professional Development	3D Bear spatial prototyping
	ADD Basics	Universities of the Future
	Creative Sustainability Capstone	Cell and Tissue Engineering

## Continuing Education

This academic year, the professors of Technology Education at Aalto University and the University of Helsinki joined forces to pilot a continuing education programme called **OpiTI** that builds on the best collaborative practices of technology education developed at the ADF. The first pilot was formed with 19 in-service teachers from primary schools, lower and upper secondary schools in the Helsinki-Espoo area, along with a group of teacher-students and partner organizations, such as the Aalto Junior and Innokas network. In 2020, the 15 ECTS programme received additional funding for the second pilot round from The Technology Industries of Finland Centennial Foundation and The Swedish Cultural Foundation in Finland.

Check out OpiTI here:  
[opit.tech](#)

In addition, members of the Design Factory Global Network, namely the ADF and its partner design factories at the Warsaw University of Technology and Polytechnic of Porto, piloted three short courses for industry professionals and doctoral students at Aalto University. The topics covered sustainable, ethical, and user-centred approaches to product development. These courses were organized in collaboration with local technology companies as part of the Erasmus+ Knowledge Alliances project **'Universities of the Future'**. The three courses preview the upcoming joint continuing education pilot 'Industry 4.0 – Digital Innovation and Transformation' starting in autumn 2020.

Check out Universitoies of the Future here:  
[universitiesofthefuture.eu](#)







# PdP - The Product Development Project

The PDP is the largest product design course organized at the Aalto Design Factory (ADF) and one of the most significant project-based courses at Aalto University. Each year, students from around the world form interdisciplinary teams to work in close collaboration with the industry to learn the creative problem-solving of real-life challenges. It's a once-in-a-lifetime experience with great emphasis on Passion-Based Learning (PBL) methodology.

During the 2019-2020 academic year edition, the course had a variety of projects targeting innovative solutions from healthcare technology to fire prevention, space technology, safety and energy use, co-creation spaces and much more.

Due to the pandemic that affected the teaching experience, the PDP staff was forced to change the Final Gala plans. The strong commitment on the part of all teams showed us that we couldn't end the PDP course without a proper finale. Thus, the iconic Product Design Gala that takes place in May every year was postponed until 4 September of this year.

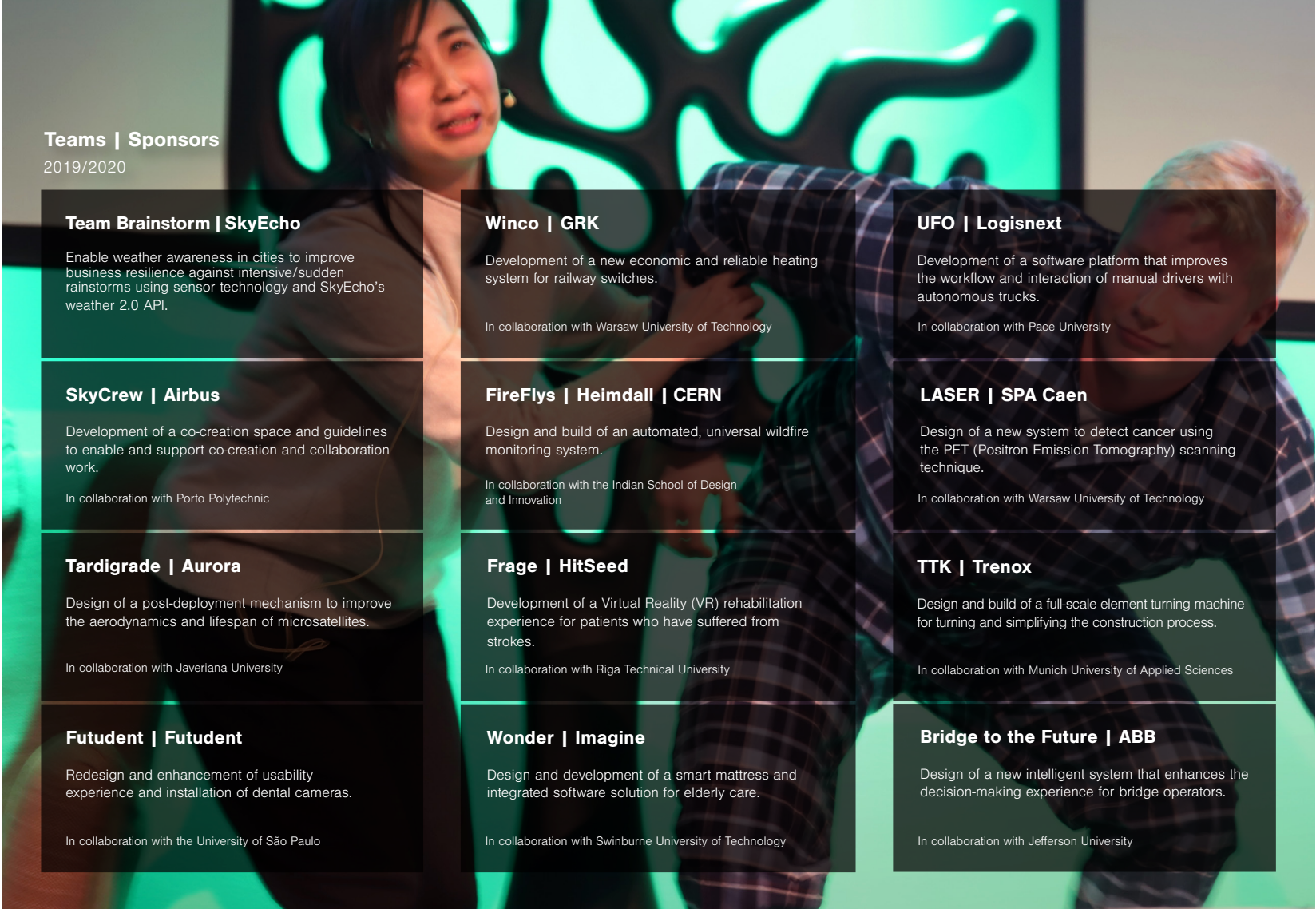
During the Product Design Gala, we hope to bring together hundreds of curious visitors, technology and innovation enthusiasts from all over Finland and (we hope) the world. The teams' outstanding results could not have been achieved without the students' dedication, close coaching of the PDP teaching team and the help and support of the ADF staff.

“What I learned from my teammates was that sometimes it is more useful to be bold enough to just push forward than to hesitate, even if some things might be fuzzy.”

**Eero Suhonen**  
Masters in Mechanical Engineering  
Aalto University

“Working with people from other disciplines and getting to know their perspectives was very valuable to me because it inspired me to be more creative and not be afraid to experiment, something that philosophers have a hard time doing.”

**Isabella Duarte**  
Bachelor of Philosophy  
Javeriana University



## Teams | Sponsors

2019/2020

### Team Brainstorm | SkyEcho

Enable weather awareness in cities to improve business resilience against intensive/sudden rainstorms using sensor technology and SkyEcho's weather 2.0 API.

### SkyCrew | Airbus

Development of a co-creation space and guidelines to enable and support co-creation and collaboration work.

In collaboration with Porto Polytechnic

### Tardigrade | Aurora

Design of a post-deployment mechanism to improve the aerodynamics and lifespan of microsatellites.

In collaboration with Javeriana University

### Futudent | Futudent

Redesign and enhancement of usability experience and installation of dental cameras.

In collaboration with the University of São Paulo

### Winco | GRK

Development of a new economic and reliable heating system for railway switches.

In collaboration with Warsaw University of Technology

### FireFlys | Heimdall | CERN

Design and build of an automated, universal wildfire monitoring system.

In collaboration with the Indian School of Design and Innovation

### Frage | HitSeed

Development of a Virtual Reality (VR) rehabilitation experience for patients who have suffered from strokes.

In collaboration with Riga Technical University

### Wonder | Imagine

Design and development of a smart mattress and integrated software solution for elderly care.

In collaboration with Swinburne University of Technology

### UFO | Logisnext

Development of a software platform that improves the workflow and interaction of manual drivers with autonomous trucks.

In collaboration with Pace University

### LASER | SPA Caen

Design of a new system to detect cancer using the PET (Positron Emission Tomography) scanning technique.

In collaboration with Warsaw University of Technology

### TTK | Trenox

Design and build of a full-scale element turning machine for turning and simplifying the construction process.

In collaboration with Munich University of Applied Sciences

### Bridge to the Future | ABB

Design of a new intelligent system that enhances the decision-making experience for bridge operators.

In collaboration with Jefferson University





# ATTRACT

ATTRACT is a pioneering initiative funded by the European Union's Horizon 2020 research and innovation programme. The goal is to bring together Europe's fundamental research and industrial communities to lead the next generation of detection and imaging technologies. In addition to Aalto University, the initiative is co-led by the following leading European research institutions: CERN, EIRMA, EMBL, ESADE, ESO, ESR, European XFEL and ILL.

During the first phase, 170 research projects involving sensing and imaging technology to enable breakthrough innovation have been given seed funding of €100,000 to bring their ideas to life. The project aims to help revamp Europe's economy and improve people's lives by creating products, services, companies and jobs.

The Aalto University Design Factory has been leading the Master students' product development projects within the ATTRACT initiative. The goal has been to put researchers and student teams together to create products and services with societal

impact following a user-centred approach. During the 2019-2020 academic year, a number of student projects have been running at Aalto University and the Esade Business School to solve the challenges of the project.

To enable the further development of breakthrough detection and imaging technologies, a proposal for ATTRACT Phase 2 has been made. Phase 2 will see a significant scale-up of activities from Phase 1. In January 2020, the ADF hosted a two-day workshop that brought together the ATTRACT Programme Consortium, DFGN members and several international universities that either participated in the ATTRACT Phase 1 Pilot or have indicated an interest in participating in future Design Factory-type activities and were happy to share experiences and ideas. In a series of workshops, we together came up with possible structures for running the student projects during phase 2 and also discussed how other current courses on Design Thinking could be aligned to maximize impact for the students.

“ This project was extremely intense and full of learning. We have had the opportunity to leverage each member's background and expertise like electrical engineering, software development, business models and UX design. ”

Eero Prittinen  
Electrical Engineering Master's student

Ryo Matsuzaki  
Design Master's student

## Projects hosted at Fusion Point

At Fusion Point, interdisciplinary student teams worked out innovation concepts for societal challenges by utilizing ATTRACT project members' technologies.

### Sponsors

Spring 2020

#### CERN - European Organization for the Nuclear Research

Technology: An advanced hybrid single-photon sensor to expand scientific knowledge.

#### IBEC [1] - Institute for Bioengineering of Catalonia

Technology: A drone with olfactory capabilities to provide odor measurements and improve plant management.

#### CSIC - Spanish National Research Council

Technology: An autonomous temperature-triggered alarm system to help industries detect emergency events.

#### IBEC [2] - Institute for Bioengineering of Catalonia

Technology: A new imaging method to improve fertility outcomes for in vitro fertilization embryos.

#### CVC - Computer Vision Centre

Technology: A patient monitoring technology to improve remote rehabilitation processes.

## Projects hosted at Aalto Univeristy

At Aalto University, the ATTRACT projects were done in collaboration with PDP, the Product Development Project & Creative Sustainability Capstone.

### Teams | Sponsors

2019/2020

#### Team Laser | CAEN Spa

**Brief:** Develop a wearable PET system where detectors are placed all around the body in a 'jacket' worn by a patient during the radiotracer's 24 hours of activity.

**Outcome:** A wearable PET-scanning vest to detect cancer and improve patient diagnosis.

#### Team Brainstorm | SkyEcho

**Brief:** Enable weather awareness in cities to improve business resilience against intensive/sudden rainstorms using sensor technology and SkyEcho's weather 2.0 API.

**Outcome:** An app to help cities become more weather resilient and sustainable.

#### Frage | Hitseed

**Brief:** The project's objective is to develop new haptic interfaces that provide an intuitive and personalized AR/VR experience and explore further market potential.

**Outcome:** A virtual reality device to improve patient rehabilitation and monitoring.

#### Team FireFlies | Heimdall | CERN

**Brief:** Develop an MVP designed for firefighters that integrates the sensor technologies from CERN on a UAV. In addition, a go-to-market plan must be prepared.

**Outcome:** A drone solution to speed up detection and monitoring of wildfires.

#### Project Swap | CERN

**Brief:** Aims to develop revolutionary components for the next generation of cooling systems, directly embedding sensors in a hydraulic circuit element by combining Additive Manufacturing (AM) technologies.

**Outcome:** Applications for 3D printed pipe with sensors to improve thermal energy and fight climate change.





# ME310

The ME310 Aalto Global Innovation Program is a product & service development course that is part of the SUGAR network, the world's largest innovation network. In SUGAR, universities across the globe collaborate and teach human-centred design through real-life corporate projects. ME310 Aalto & the SUGAR Network share a pedagogy originating from Stanford University.

This year, ME310 Aalto partnered for the first time with Trinity College Dublin, the world's oldest continuously operating university, and a long-time member of the SUGAR Network. The collaboration project between Trinity and ME310 Aalto was philanthropically funded and supported

by Enable Ireland. In addition, ME310 Aalto also collaborated with Porto Design Factory on two projects. Sponsoring companies were Konecranes from Finland and Lipor from Portugal.

## ME310 online global reviews:

The lockdown hit the ME310 course in the middle of the prototyping and user testing stages of the course. The weekly student progress review meetings of the course faced a transformation the same as everything and everybody during the pandemic. ME310 has global participants and normally, each participating university holds weekly/biweekly meetings with their own teaching teams.

“ Now that everyone moved online, we joined for global reviews instead. The teaching team really LOVED this! It had many benefits; the whole team received the same message, we learned from each other as a multidisciplinary and multicultural teaching team. We need to think if we can keep it also during normal times. ”

**ME310**  
Teaching Staff

## Sugar Projects in Aalto University

2019/2020

**Enable Ireland**

Empowering disabled individuals in wheelchairs with toileting needs.

In collaboration with Trinity College Dublin

**Konecranes**

Reimagining the future of overhead crane control.

In collaboration with Porto Polytechnic

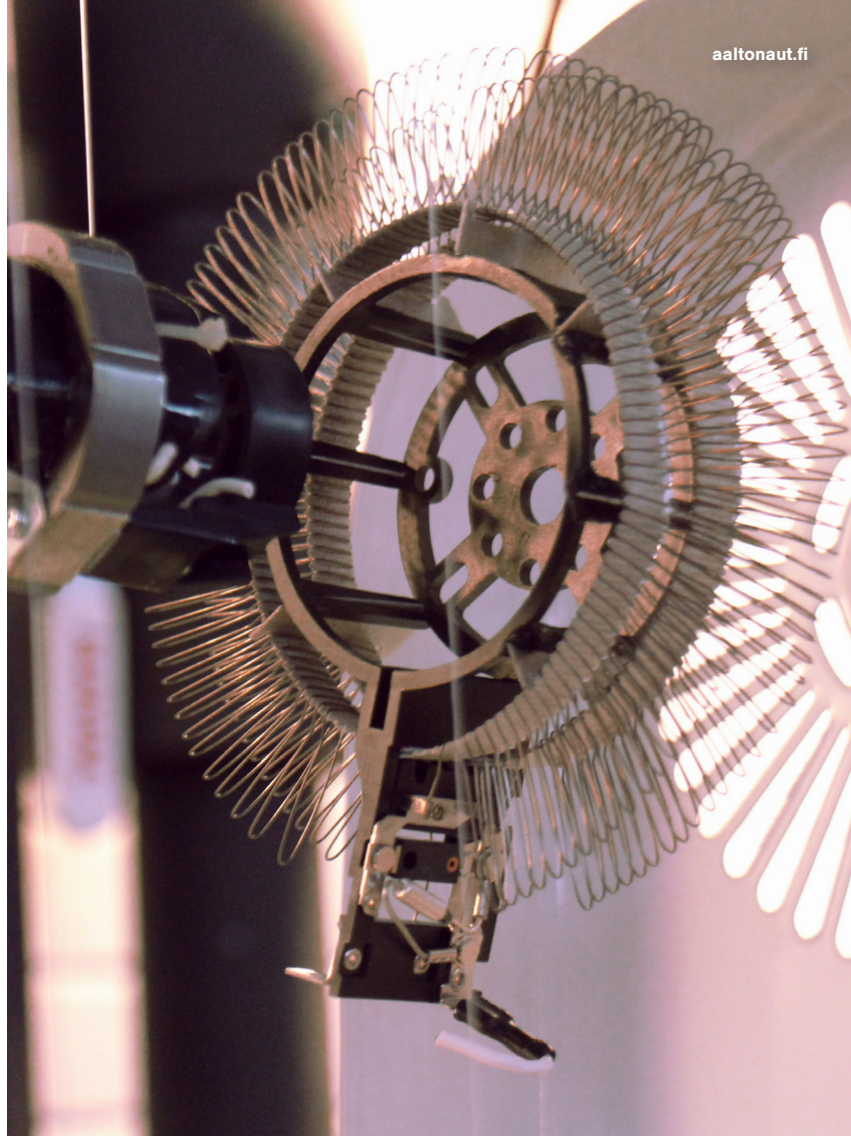
**Lipor**

Enabling the Porto region transformation to implement bio-waste recycling.

In collaboration with Porto Polytechnic







## Aaltonaut

Aaltonaut courses underwent quite a few changes in 2018/2019. The Aaltonaut Research Project course, which serves as a platform for completing the Bachelor's thesis in English, was integrated into the English Bachelor's programme in SCI. Thanks to the efforts of Tuomas Paloposki and Maurice Forget, it is now possible to complete a Bachelor's thesis in English at all Aalto schools. The course ran for the last time during spring 2020. The Product Sustainability course was included in the EIT-AMIS M. programme of optional courses, resulting in the number of participants exceeding 50 for the first time. Product Sustainability, Device Design and ADD Basics were included as alternative ways to complete the SCI project course. Similarly, ADD Basics was offered as

an alternative way to complete the ENG project course. From now on, the integrated Aaltonaut Communications course will be a parallel course to the Aaltonaut courses during the fall semester. In the Professional Development course lead by Professor Tua Björklund and Senni Kirjavainen during the spring semester, Aaltonaut students redesigned Aalto learning experiences using service development tools. Moving forward, the course is being changed to Service Design Tools for Creating Change, encouraging and equipping students to drive change at Aalto University. Aaltonaut summer courses were not offered in 2020 due to reduced demand and the restrictions on on-campus learning caused by the pandemic.



## A course within Aaltonaut:

### Better Learning Experiences Using Aaltonaut service design tools for redesigning Aalto learning experiences

Learning experiences are at the heart of Aalto University and Aalto Design Factory (ADF). That is why the teaching staff has decided to redesign the Bachelor's level course, focusing on using service design methods and design thinking to support the professional development of students through mapping and redesigning better learning experiences at Aalto University. The course is a part of the Aaltonaut product development minor programme, welcoming non-Aaltonaut students as well.

This year, the students began by mapping the skills required in their future careers, i.e. those skills that are important to

them individually and how those skills can be acquired. They then progressed to collecting user knowledge on existing and ideal learning experiences. Through interviews, observations, prototyping and the creation of service paths and blueprints, the students generated a variety of ideas that could improve experiences at Aalto University.

One concept under the teaching staff microscope was aimed at graduating design students, who have an opportunity to showcase their skills to possible employers at the end of their degree programme, while another concept focused on substituting classical exams with collaboration in real-life problem-solving tasks. The teaching staff received encouraging feedback for the concepts with recommendations for the further development of the course.





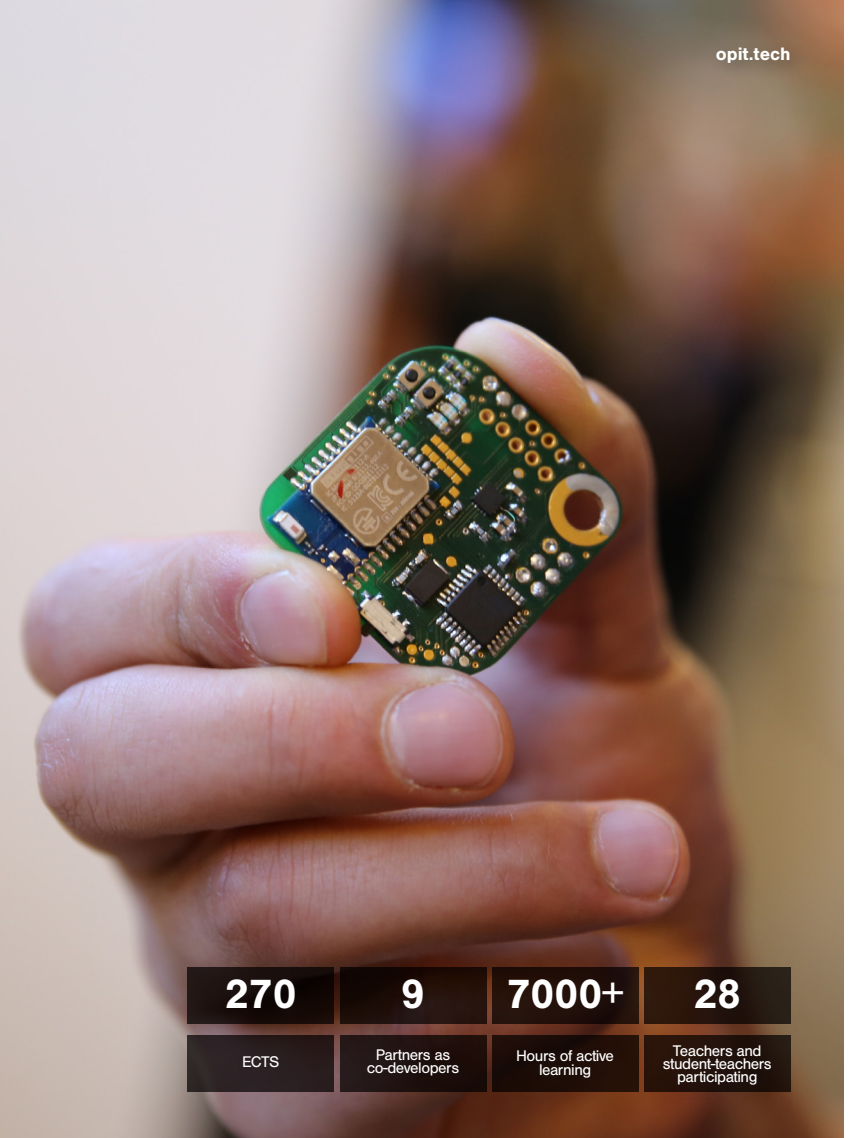
# UoF - Universities of the Future

The Universities of the Future project aims to create educational opportunities to upskill and reskill professionals for Industry 4.0. For this purpose, the project leveraged the ADF platform to organize three co-creation events and pilot three lectures and three courses for continuing education. The co-creation events targeted academia, industry and students, and aimed to accelerate collaboration between them within the context of Education 4.0.

The first lecture on Data Analytics and Artificial Intelligence was organized for 20 students from the Board of European Students of Technology. The second and third lectures were produced in our own ADF PrintShop, covering the topics of Prototyping and Additive Manufacturing. All classes will be available online in the upcoming Virtual Factory platform.

## Education

In the spring of 2020, the Universities of the Future project piloted three short courses for industry professionals and doctoral students in Aalto. For many, it was their first visit to the design factory and their first time experiencing the hands-on ways of working. The topics covered included sustainable, ethical, and user-centred approaches to product development, and were organized in collaboration with technology companies Consair, ProtoRhino, and Start North. These three courses preview the upcoming Joint Post Graduation course 'Industry 4.0 – Digital Innovation and Transformation', organized in collaboration with our partner design factories at the Warsaw University of Technology and Polytechnic of Porto. The course will take place online from September 2020 to February 2021.



# OpiT! - Technology Education Programme

OpiT! is an interdisciplinary technology education programme coordinated between Aalto University and the University of Helsinki and funded by the Technology Industries of Finland Centennial Foundation and Swedish Cultural Foundation in Finland. The programme combines the disciplines of science, mathematics, arts, design, crafts and the humanities in creative problem-solving.

The target group consists of in-service teachers and teacher students on all levels of the educational system. After the programme, the participants can inspire their students to learn about technology and its application. They are also able to act as change agents of technology education in their schools. OpiT! was successfully piloted in 2019/2020 and will be continued the next academic year.

270	9	7000+	28
ECTS	Partners as co-developers	Hours of active learning	Teachers and student-teachers participating





# UNITE!

The European University Alliance UNITE! (University Network of Innovation, Technology and Engineering) was launched in November 2019 and is currently one of 17 alliances in Europe funded by the EU Commission (DGEAC). The coordinator for UNITE! is TU Darmstadt in Germany and Aalto University is one of the seven partners, together with KTH, Sweden; INP Grenoble, France; Polito, Italy; ULisboa, Portugal and UPC Barcelona, Spain. Our alliance focuses on developing educational tools such as online learning materials and virtual campuses, as well as designing student and staff mobility programmes, flexible study paths and joint degree programmes, also at the PhD level. Together with our partners, we aim to extend our impact to both international and regional levels.

The Aalto UNITE! Team is based at the Aalto Design Factory under the coordination of Katrina Nordström and Johanna Kaila. The project is led by VP Education Petri Suomala. There are also 30 other people from different Aalto schools active in UNITE!

In February 2020, we brought all European partners together by hosting the 1st UNITE! dialogue at the Aalto University Design Factory. A total of 160 participants took part in this successful event. They loved the ADF atmosphere and the supportive and co-operative working culture. The innovativeness of the Aalto Design Factory (ADF) and Design Factory Global Network (DFGN) attracted considerable interest, especially the way how teaching, learning, research and innovation come together.

During the spring of 2020, UNITE! has been very active, offering webinars and actively contributing to discussions with the DG EAC, as well as launching the H2020 proposal with a focus on open science and innovation, led by Ruden Vicente-Saez. In June 2020, the Aalto UNITE! team also hosted an online boot camp for online teaching and learning, good pedagogical practices, flexible study paths and joint programmes. We also welcomed two new team members on board to create UNITE! from the student perspective this summer.

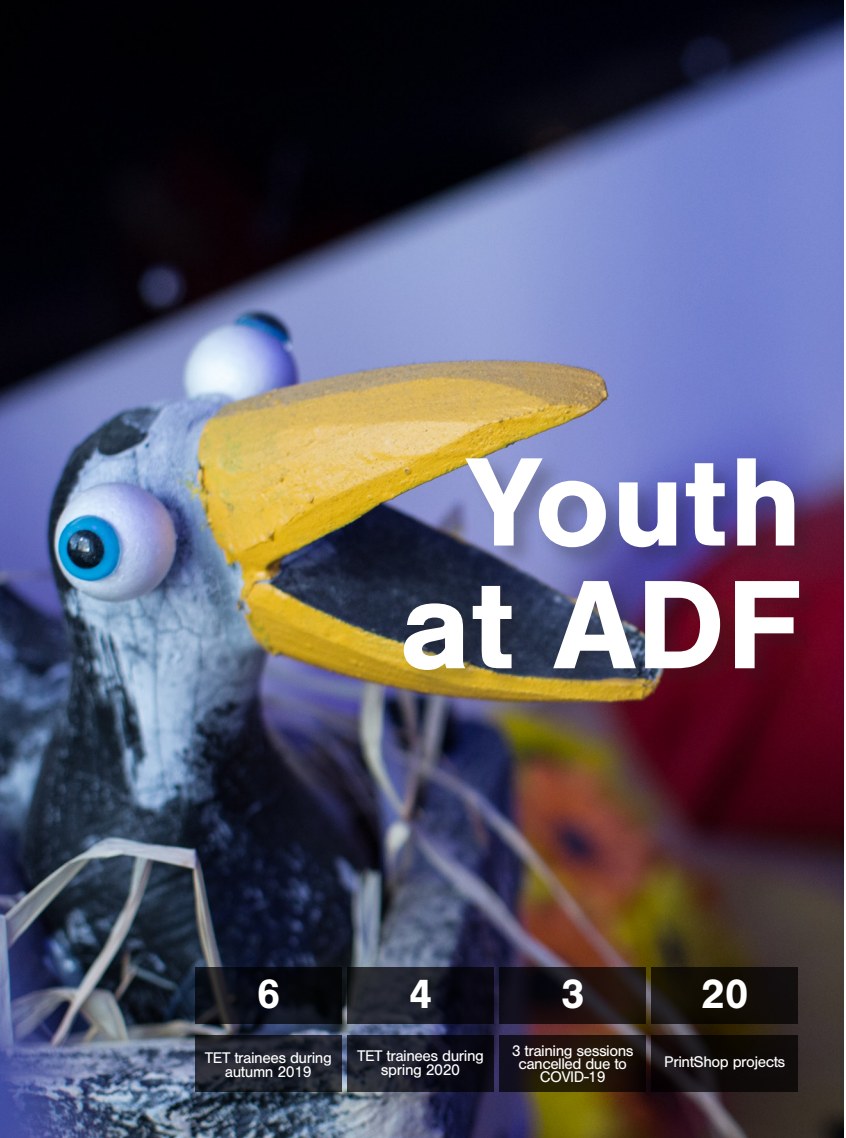
“Great, great job! The meeting was very well organized and the location (Aalto Design Factory and other meeting spaces) was perfect for the work. Thanks a lot!

Dialogue Participant

“The opportunity is outstanding. We need to have this clearly in mind. We can do it!

Dialogue Participant

7	160	95	70
Partners/ universities	Participants in the dialogue, 5 days	Webinar participants	Boot camp participants



# TET trainees

Encountering a secondary school student at ADF is neither a coincidence nor the aftermath of ‘take your kids to work day’. In Finland, secondary school students take part in the TET programme, hosted by institutions or companies to train in the work environment.

TET trainees arrive in pairs or alone and are greeted by a buddy from the staff, who offers lots of tips and tricks. Trainees then choose to join a project or wing within ADF. The Print Shop has turned out to be the greatest attraction over the years.

Its features include 3D printing, laser cutting, vinyl printing and a friendly team of enthusiasts.

The goal is to teach the trainees how to direct an experimental development process and offer the opportunity to practice a discipline, gain a sense of responsibility and bond in the workplace. The students also participate in community activities, become part of the ADF family, walk through the same corridors, share the same coffee machine and join everyone for breakfast.

## ADF Gym

Pipsa & Alma took on the challenge of enhancing the well-being of ADFers over the last few weeks of September in 2019. As a result of their observational study, they came up with an exercise platform for

all days of the week to enhance the work ergonomics in a fresh and fun way. Try it out for yourself! Pull up your socks and take a well-deserved break from the daily grind. Exercise with Alma & Pipsa.

[adf.fi/gym/](https://adf.fi/gym/)

6	4	3	20
TET trainees during autumn 2019	TET trainees during spring 2020	3 training sessions cancelled due to COVID-19	PrintShop projects





## Adapting to COVID19

This year, every agenda changed to best fit the conditions of Covid-19. Teaching at the Aalto Design Factory (ADF), working on projects at the workshops and, most importantly, hugging became impossible for a while. Typically, ADF courses host weekly student progress reviews, along with meetings among the students themselves. The changes were made to minimize contact between people and slow down the spread of the virus. However, according to feedback and course staff reports, the changes ended up being the very thing that brought people together in unexpected combinations.

Adapting to pandemic circumstances brought on positive changes, such as

increasing efficiency in communication, learning from each other as a team of multidisciplinary and multicultural teaching staff, and the motivation to keep things this way during normal times.

### Prototyping at Home

With the hands-on courses comes a great need for prototyping ground and materials. The pandemic hit the students in this same crucial stage of the product development process. Students who needed facilities and materials were enabled by staff to list their required materials to pick them up from the factory.

“

We miss the energy and feedback from a live audience, but we also learned a lot from trying different forms of remote teaching and different platforms to do it with.

”

**Tua Björklund**  
Professor of Practice







# Design Factory Global Network

The Aalto Design Factory is only one node in a network of design factories spanning the globe. The following pages provide an introduction to the Design Factory Global Network and its activities across the world. The passion,

ideas and values behind the Aalto Design Factory have spread and become 29 more design factories on five different continents. Together, we are changing the concepts known as education and learning.

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## What is DFGN?

The Design Factory Global Network (DFGN) consists of innovation hubs at different universities and research institutions, spanning from North America to Oceania. Shared values and practices enable us to collaborate across time zones and cultures despite differences in governance and setup. Design factories are experimentation platforms and it is through experimentation that our network progresses towards its shared goal: to create change in the world of education and learning.

### Highlights

In the past year, some of the highlights of the DFGN include the Technovation Hub becoming the 30th design factory, three more design factories joining the network: Shenkar Design Factory of Tel Aviv, Israel; Technovation Hub of Leuven, Belgium; Design Factory London of London, UK; openings of HAMK DF along with Sandbox and organization of the first virtual DFGN Community Day.



September 2019: Ghent, Belgium

## Design Factory bootcamp, Belgium edition

One of the ways that the DFGN team supports new and existing design factories is through dedicated bootcamps. Spanning from one day to one week, the bootcamps are opportunities for DF staff and friends to immerse themselves in the what, why and how of their design factory.

In September, members of the DFGN team were invited to customize and facilitate a series of workshops for the Ghent Design Factory (GDF), aimed at mapping out their next steps and future. Two days were set aside for a strategy workshop with representatives from GDF, Ghent University and other stakeholders in the greater community. In addition, Ghent's Ministry of Makers hosted two open lectures held by the DFGN team: 'Design thinking in education' and 'Industry collaboration'.





5	22	48	18	7
Days	Design factories (out of 27 at the time)	Participants	Collaboration projects	Best practice demos

October 2019: Philadelphia, U.S.

## International Design Factory Week

Every year, representatives from each design factory get together for the International Design Factory Week (IDFW). The idea is for the network members to learn from each other's best practices and failures, plan for future collaboration and make the overall strategic decisions for the DFGN.

Each year, IDFW is hosted by a different design factory and the 2019 edition was organized by the Nexus Design Factory at Thomas Jefferson University in Philadelphia, U.S.

“ Networks, in the end, aren't about universities and places – they are about people. The leadership at Thomas Jefferson University was convinced of the value of participation in the network by meeting the DF representatives and it was really valuable to make connections between other DFs and the people here at Jefferson building programmes and doing valuable research. ”

**Tod Corlett**  
Director of Industrial Design Programs  
Thomas Jefferson University



3	2	21	22	8	18	7
Design factories	Days	Students from 4 universities	Experts (industry and research)	Teams	Briefs from industry partners	Coaches

November 2019: Stuttgart, Germany

## Arena 2036

ARENA2036 stands for Active Research Environment for the Next Generation of Automobiles and is a research platform for future mobility and production. It is funded by the German Initiative Research Campus – Public-Private Partnerships for Innovations. DFGN's involvement originates in a research collaboration with Swinburne University's Factory of the Future.

Staff from Design Factory Melbourne, Aalto Design Factory and IdeaSquare@CERN teamed up to co-host a 48-hour hackathon together with the University of Stuttgart and Let US start!, a start-up programme for students. The goal was to kick-start the student engagement in ARENA2036, laying the foundation for student-industry collaboration by allowing both parties to experience it first-hand.

Students, experts and industry partners were mixed up and put in separate teams to solve eight different challenges provided by the ARENA2036 partners, including names like Daimler and DXC Technology. The teams presented briefs with topics ranging from creating a platooning service for vehicles and conceptualizing an intelligent intersection to updating the roof box of cars, which has remained the same for years.





**November 2019:** Ankara, Turkey

## Workshop with the Turkish Education Association

TED University was founded in 2012 by the Turkish Education Association (TED). In early November, they hosted creative experts from England, Finland, Israel and Turkey for the three-day-long 'Modelling for a creative hub workshop'. The university wants to develop a creative hub for innovation and collaboration and the DFGN was asked to facilitate a session on governance and decision-making practices. Other topics included programme development and service design, business model development and financial sustainability and networking and community building.



**January 2020:** Leuven, Belgium

## 30th Design Factory

The year started with a double celebration for the DFGN team at Aalto University – the home institution of the first design factory – celebrated its 10th anniversary. During the festivities, the Technovation Hub from KU Leuven signed a contract, making them the 30th design factory in the Design Factory Global Network!

Back in 2010, the day after its opening festivities, Aalto University signed its first strategic partnership agreement with Tongji University of Shanghai, China. Part of this collaboration was the idea to establish the Aalto-Tongji Design Factory in Shanghai, the first design factory abroad. Unbeknownst to those involved at the time, this sparked the expansion abroad and, ultimately, a few years later, to the Design Factory Global Network.





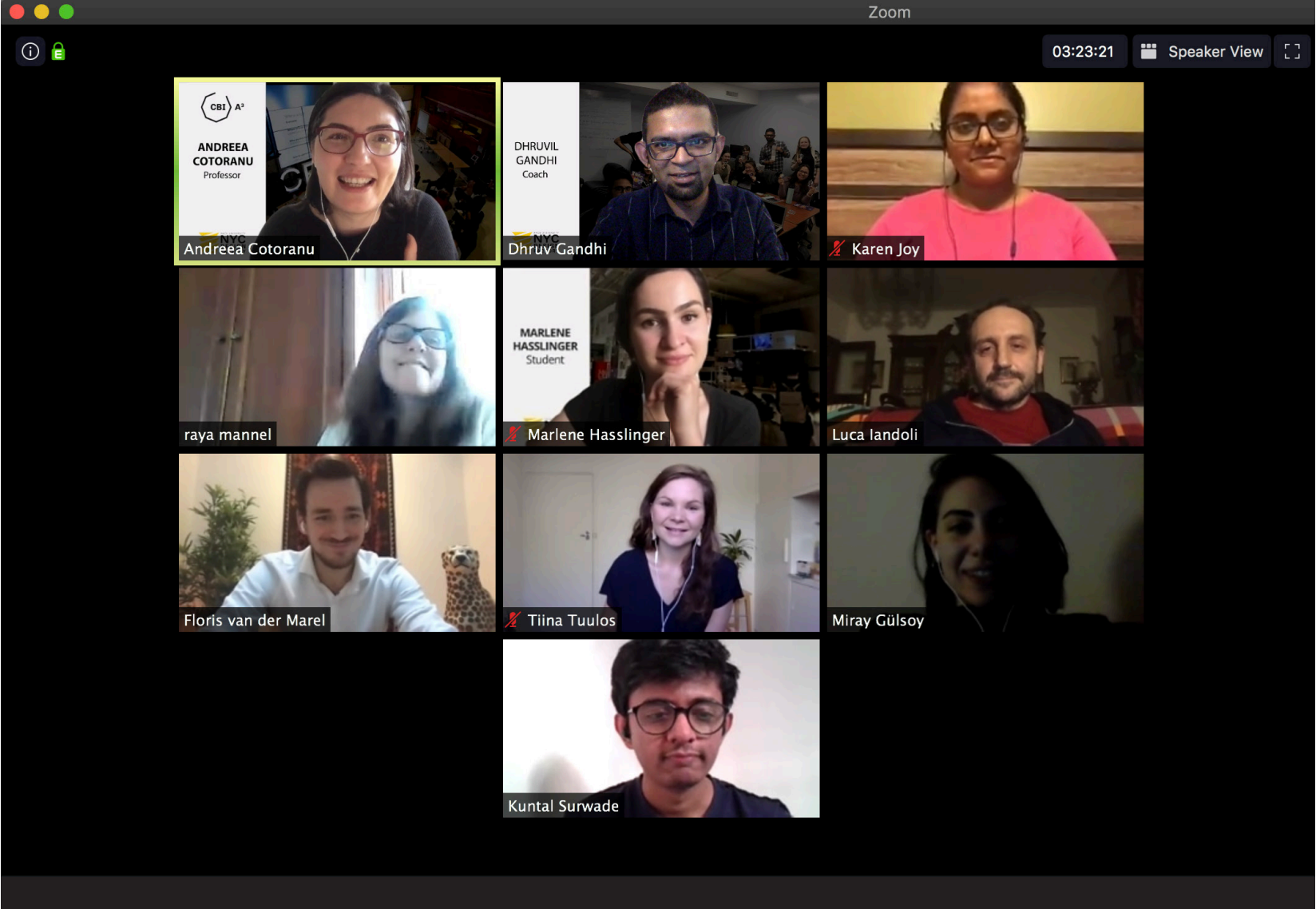
May 2020: Online

# Virtual DFGN Community Day

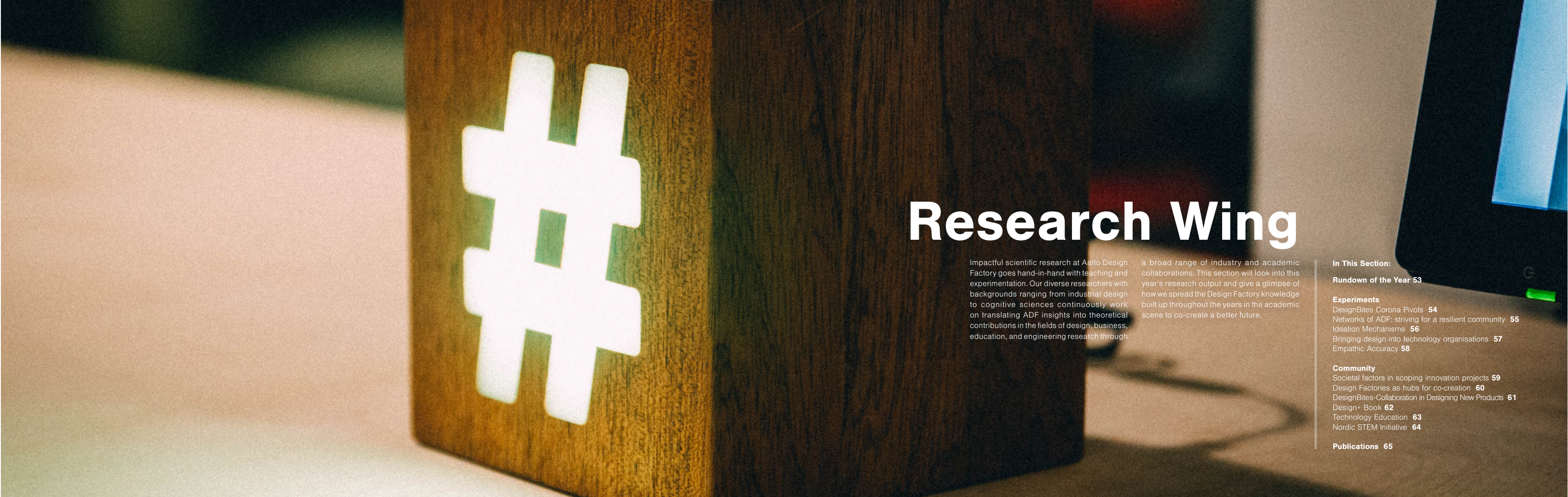
One of the projects that emerged from the IDFW 2019 was the idea of a DF Day to be organized at all design factories on the same day worldwide. Due to mobility restrictions and most universities moving their lessons online, the DFGN team decided to pivot the idea and organize a fully digital event called the virtual DFGN Community Day. The programme offered something for everyone, ranging from a virtual pub quiz with the DF New Zealand (GMT+12) to a co-creation workshop organized by the New York City DF (GMT-4).

The DFGN team itself organized a ‘chit chat’ session, where people could drop by and talk about things more or less related to the design factory way of thinking and working – a mini-experiment that has now turned into weekly hangout sessions on Zoom.

13	15	7	300+	5
Sessions	Programme hours	DFs + DFGN team	Participants	Continents







# Research Wing

Impactful scientific research at Aalto Design Factory goes hand-in-hand with teaching and experimentation. Our diverse researchers with backgrounds ranging from industrial design to cognitive sciences continuously work on translating ADF insights into theoretical contributions in the fields of design, business, education, and engineering research through

a broad range of industry and academic collaborations. This section will look into this year's research output and give a glimpse of how we spread the Design Factory knowledge built up throughout the years in the academic scene to co-create a better future.

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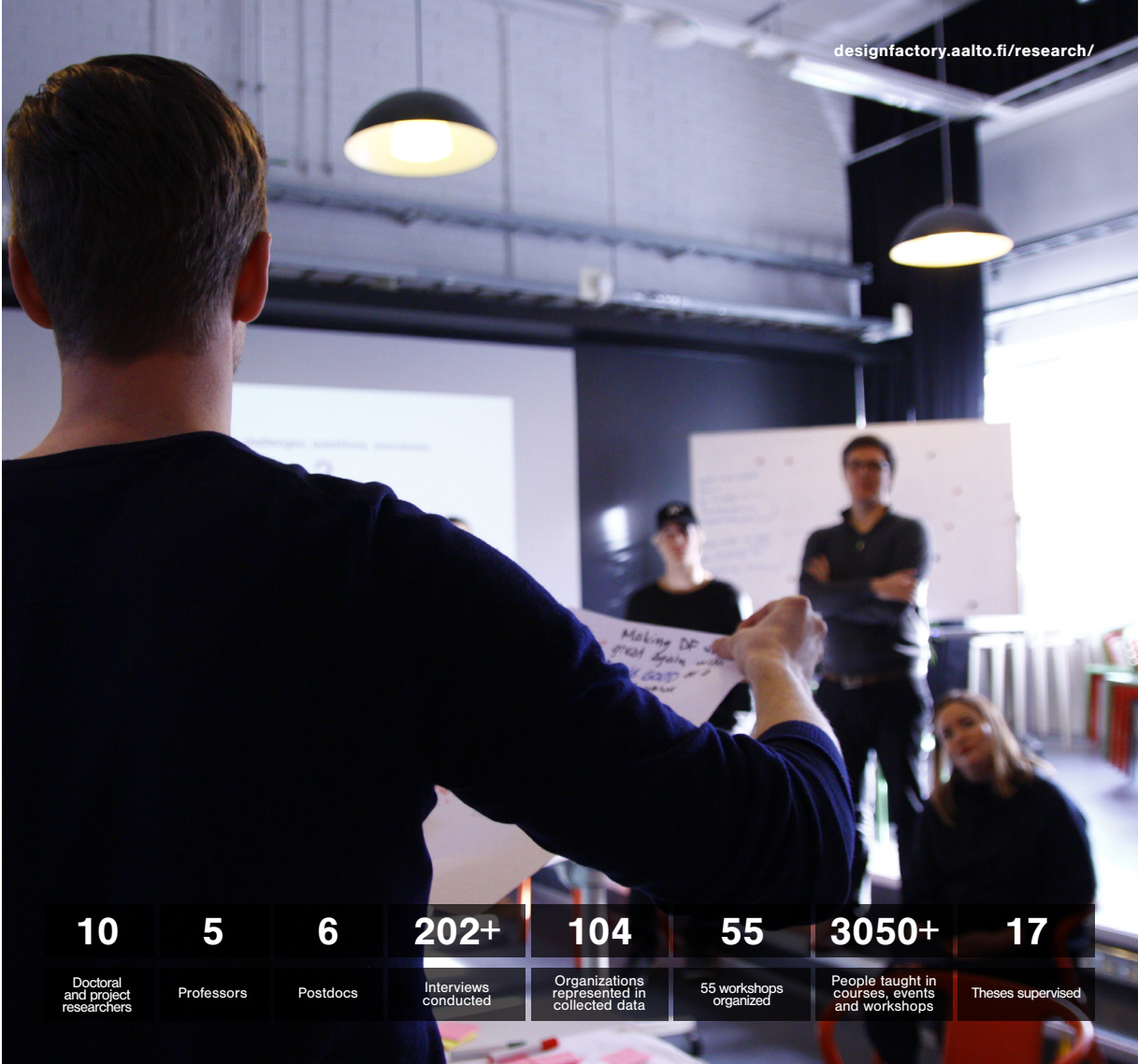
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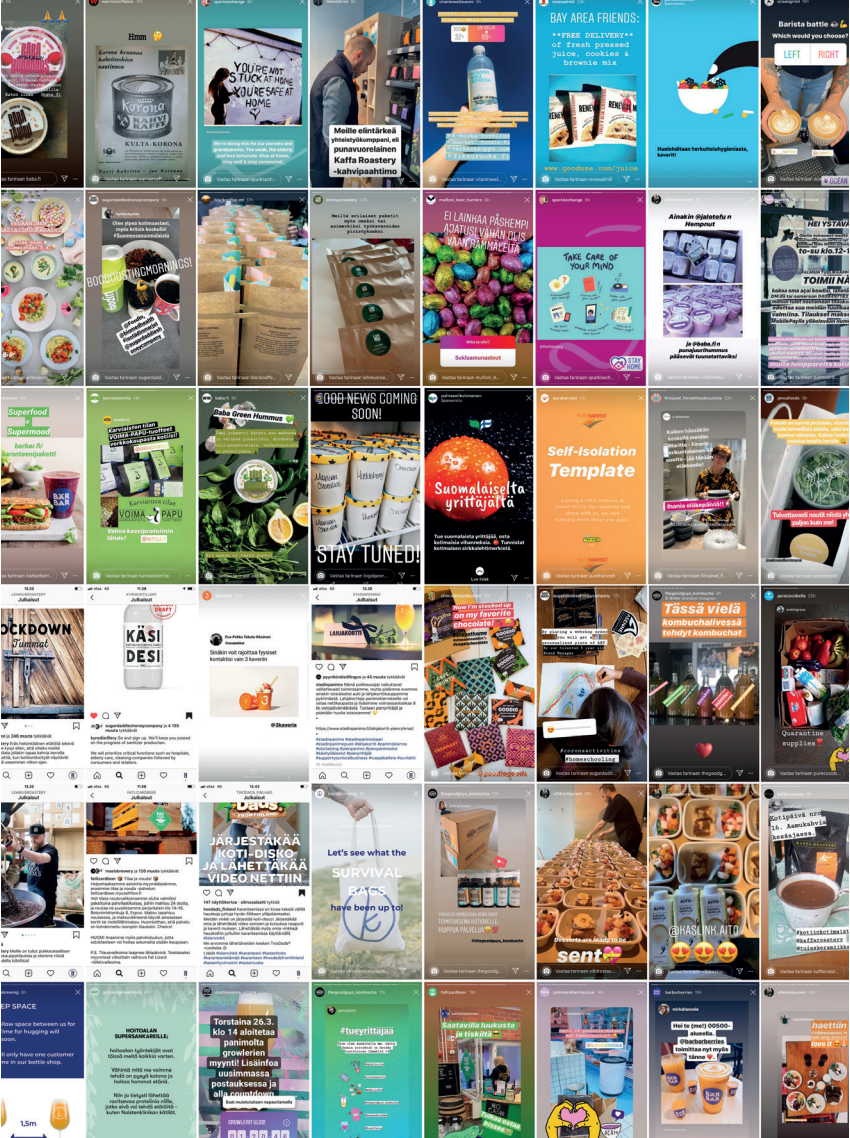


10	5	6	202+	104	55	3050+	17
Doctoral and project researchers	Professors	Postdocs	Interviews conducted	Organizations represented in collected data	55 workshops organized	People taught in courses, events and workshops	Theses supervised

## Rundown of the year

This year our research community kept exploring design, development, and innovation-related issues with local and industrial partners with an additional challenge: the pandemic! While the Covid-19 pandemic limited our physical encounters with colleagues, students, and fellow researchers, it also enabled us to find new ways of collaboration with our international partners, encouraged us to think outside of the box in our data collection and experimentation.

It has been a fruitful year in terms of research at ADF, where over 200 interviews with designers, design researchers, and business owners were conducted, more than 100 different organizations became our collaborators, and 42 papers and reports were published in leading journals and conferences. We are happy to share our output with you and looking forward to a new academic year full of co-creation, design, and research.



## Agile corona pivots in the food industry

When the pandemic and lockdown measures hit Finland in March, entrepreneurs did not stand idle. The DesignBites research project changed plans and documented over 100 new products, services and sales solutions created by packaged food and beverage entrepreneurs in response to the crisis during the spring. Distilleries switched to hand sanitizer to help dwindling supplies

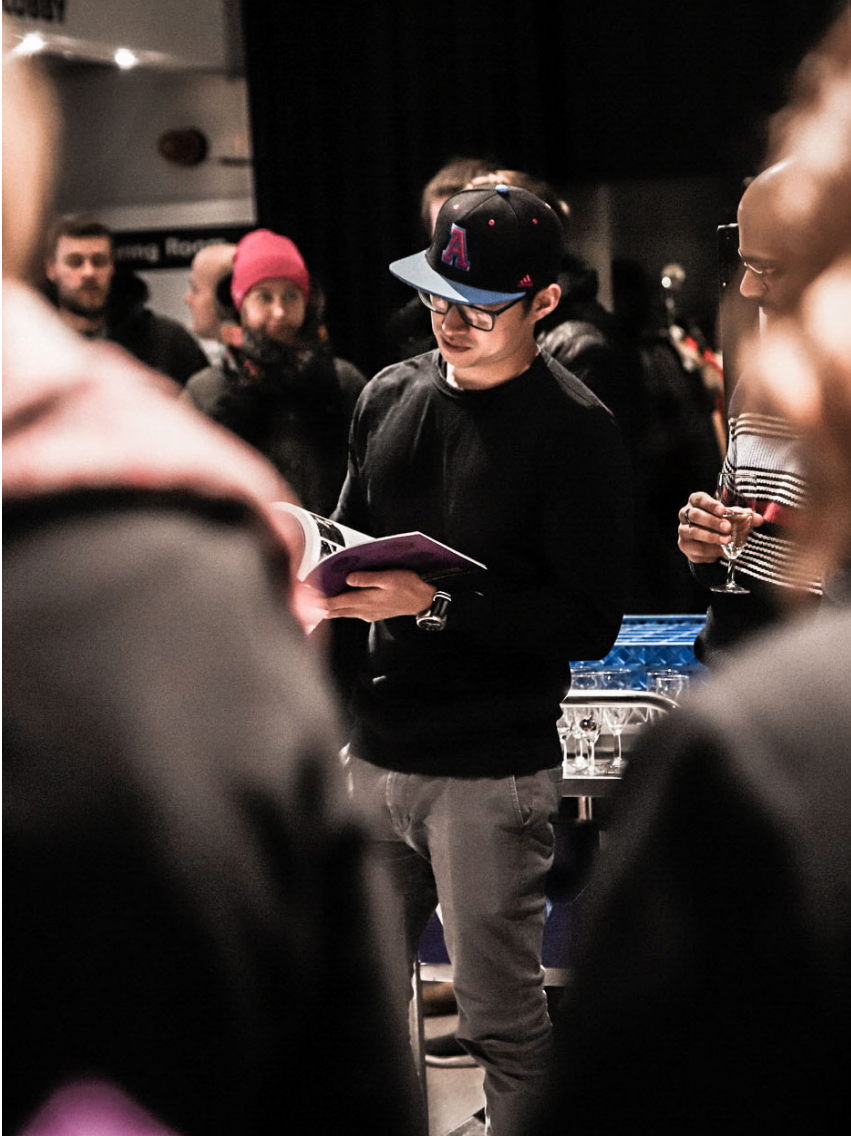
and their own sales, beer, chocolate and coffee were branded and bundled for self-quarantining, while local ventures banded together to share information on building websites, putting each other's products on their shelves and more. As a result, revenue picked up and new lessons were learned, forging horizons for businesses to move forward. Entrepreneurs really can make lemonade when life gives us lemons!

### Media Coverage:

1. Opinion piece in Helsingin Sanomat (23.04.2020) Björklund, Mikkonen, Koskinen: Poikkeustila on synnyttänyt uuvaa yrittäjyyttä. Radikaaleja ratkaisuja täytyy kyetä löytämään globaaleihin haasteisiin myös ilman koko maailman samanaikaista huomiota saavaa pandemiaa.

2. Björklund & Koskinen Ylen Aamu (29.04.2020): Poikkeustila on ruokkinut yrittäjien luovuutta - "Hämmäntävällä tavalla onnenpotku" )





# Networks of ADF: striving for a resilient community

This year, we took a close look at our own creative, organizational and informal social networks. Using a social network analysis, we identified patterns in how people connect to each other and how these connections shape the network. We found three frequent forms of brokerage in our community, helping to connect would-be-collaborators. Firstly, creative brokerage was strongly connected to multifunctional and multidisciplinary community members, who linked together different functional and disciplinary social groups, helping to align different backgrounds of potential collaborators. Secondly, managers leverage broad information from the organizational

networks in which they are centred to initiate new creative relationships. This, however, does require making the switch from coordinating to hands-on doing and management connections don't automatically boost creative connections. Thirdly, extensive informal networks and strong personal connections were found to facilitate information distribution within the community, thereby increasing creative linkages between individuals. They increase cohesiveness and tend to group based on similarity in demographics and roles, so they need to be complemented by other forms of connections to ensure diversity.



# Ideation mechanisms:

Eighty-six well-documented creativity methods actually consist of only 25 mechanisms, which can be combined in an almost infinite number of ways to unleash your creativity.

We found that all creativity methods actually consist of various elements combined together in a specific way. For example, when **brainstorming** for the given duration, a facilitator helps the team ideate by *jotting down* ideas and calling them out, *aiming for a high number of ideas by suspending judgment and building on each other's ideas*. Using **random words** as *stimulation* for *individual* or *team* ideation helps make *associations* between the words and new ideas. The ideas are then *written down*.

We are shifting research from examining ideation methods to examining these elements and mechanisms in order to form an understanding of how they work and support them in different teams and projects. We recommend that you change up your usual ideation method by adding or switching mechanisms. What if you used a physical ideation approach instead of writing down ideas or what if you added an idea classification or a stimulus, such as ideation cards, to your current method? The mechanisms allow you and your team to create your own method.

(The name of a method above is in **bold** type, while the word in *italics* is a mechanism)

## Learn more in:

Kirjavainen, S. & Hölttä-Otto, K. (2020) 'Deconstruction of idea generation methods into a framework of creativity mechanisms'. ASME International Design Engineering Technical Conferences, IDETC2020 August 16-19 2020 St Louis, MO.





# Bringing design to technology organizations:

Based on over a hundred interviews with designers and managers in different organizations and countries, we've identified three typical pitfalls in bringing design into organizations – and how to avoid them:

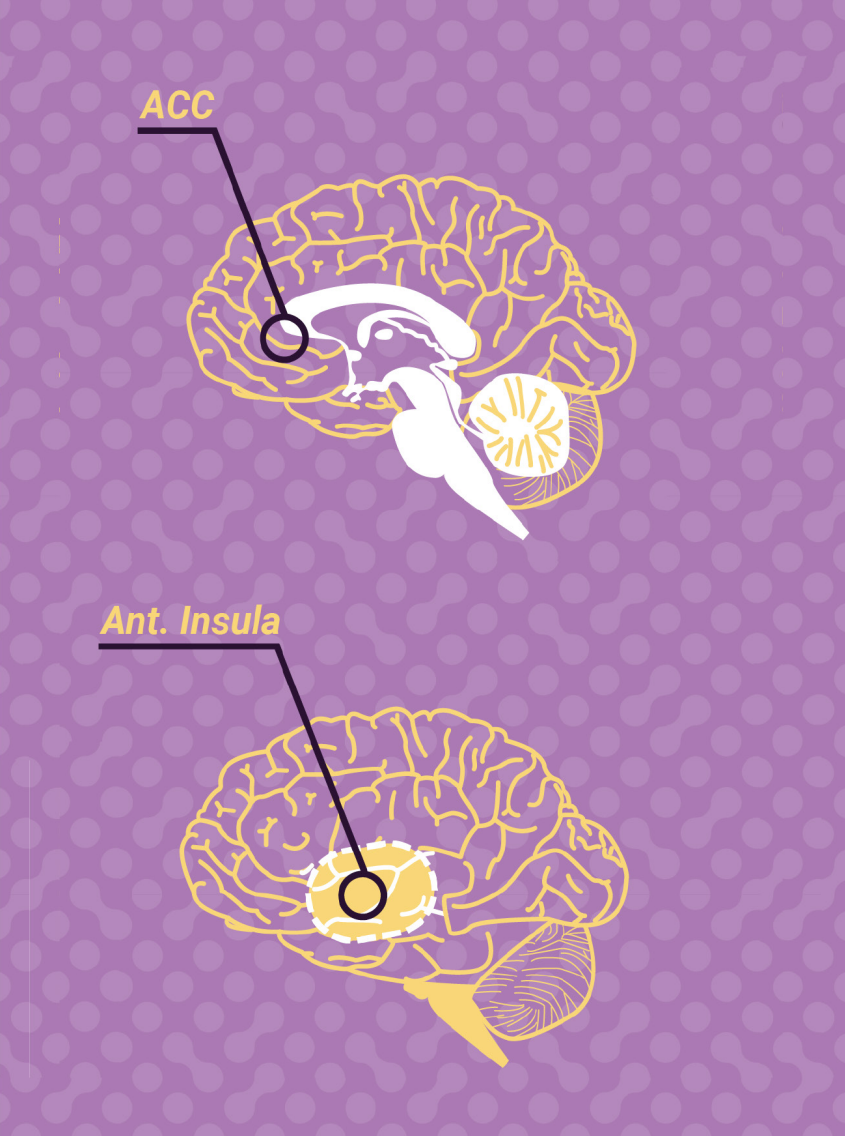
**1.** Boxing in design with ineffective cross-functional collaboration. One of the key values the design can bring to organizations is the asking of new questions, but these don't necessarily follow function and unit lines. You need to create a culture of collaboration in order to explore new ideas and low-threshold opportunities for joint efforts.

**2.** Applying design THINKING only. A lack of knowledge is rarely the main culprit in lingering change. Training needs to be accompanied by action and beginners in design thinking need design experts in order to benefit from new ways of working.

**3.** Fragmented design efforts. Be inclusive and welcome different flavours and variations of design, creating a community of designers and design-minded allies. In addition to preaching design, speak in languages – connect design to the bigger picture of your organization, sharing showcases on how design can add value to things that already matter for the people in the organization.

## Learn more in:

Björklund, T.A., Maula, H., Soule, S. & Maula, J. (2020). 'Integrating design into organizations: The coevolution of design capabilities'. California Management Review, 62(2) 100– 124.



# Empathic Accuracy

Empathizing with users is believed to result in better product development. However, no one has ever measured empathy. How well do we really understand the user? This is why empathic engineers – engineering, design, psychology, and neuroscience team members – took on this challenge. In 2019, they measured the empathic accuracy of designers. It turns out we understand only 30-50% of the users thoughts and feelings. If the empathic accuracy is calculated only

for the user's product or design-related thoughts and feelings, the accuracy is improved to 45-65%. This is better, but to improve the situation, the team is now collecting physiological and brain data in order to develop an understanding of how interpersonal synchrony, i.e. being 'in sync' with another person, can help improve this understanding. (Funded by Teknologiateollisuuden 100-vuotissäätiö & Aatos & Jane Erkkö Foundation.)

## Learn more in:

Chang Arana, A. Surma-aho, A. Li, J., Yang, M. & Hölttä-Otto, K. (2020). 'Reading the user's mind: designers show high accuracy in inferring design-related thoughts and feelings'. ASME International Design Engineering Technical Conferences, IDETC2020.





# Societal factors in scoping innovation projects

Experimenting with problem-based teaching techniques to enhance student perspectives is a core value at the Aalto Design Factory. In the autumn of 2019, we designed a mini-series of workshops and exercises for Mechanical Engineering in Society, a Master's level compulsory course for all students in the Mechanical Engineering programme. Not only did this cover course redesign efforts, but we also tracked the impact of our addition and found statistically significant improvements in taking sustainability, ethics and collaboration into consideration in scoping

innovation projects later in the course. While some environmental factors were considered by all student groups from the get-go, the students were able to integrate a wider set of economic, safety, legal and social responsibility issues, among others, in project proposals. We shared the results with the international community of engineering education scholars and won the Best Teaching Paper Award from the Entrepreneurship and Engineering Innovation division of the American Society of Engineering Education. Congrats, Sine, Senni and Tua!

## Learn more in:

Celik, S., Kirjavainen, S., Björklund, T.A. (2020). 'Educating future engineers – student perceptions of the societal linkages of innovation opportunities'. American Society for Engineering Education, ASEE 2020.



# Design Factories as hubs for co-creation

Collaboration through innovation is central to the discussion of how today's universities can respond to new interdisciplinary challenges, competitive environments and stakeholder complexity. Innovation hubs like the Aalto Design Factory represent a dynamic example of how the public sector, including higher education, responds to the need for new methods and perspectives that foster desired intra-institutional change.

We interviewed staff and students from 17 design factories in the global network, identifying six recurring enablers of change

and growth strategy through design-based experimentation. Our findings show that an institutional policy of fostering flexibility (1), securing a physical cross-disciplinary and multi-purpose collaborative space (2) to which the access is kept low-threshold (3), having upper-level support (4) and building a community (5) with serendipitous interactions (6) are all vital in ensuring design-driven experimentation that contributes to the effectiveness of higher education.

## Learn more in:

Learn more in Björklund, T.A., Keipi, T., Celik, S. & Ekman, K. (2019). 'Learning across silos: Design Factories as hubs for co-creation'. European Journal of Education, 54(4), 552-565.





# DesignBites - collaboration in designing new products

Co-creating products, sharing information and insights and aiding in product testing are among the most common ways for Finnish food and beverage SMEs to collaborate with other ventures, food and non-food alike. Collaboration examples range from co-designing products where ingredients from both partners are used and utilizing the waste from one venture's production process in the product of the other while sharing tips on the best packages.

Moreover, financial motivations are rarely behind the partnerships, rather more solidarity motivations like belonging to the same community, wanting to support other small ventures or merely having fun together. There are also noteworthy differences between collaborations in different fields in the packaged food industry, such as the extremely collaborative and open craft beer industry and the more closed new protein source industries.



# Organizational renewal and innovation through design

This year, we wrapped up a two-year research project on design in organizations, presenting the insights in a book co-authored by researchers and industry representatives. The open-access book, entitled Design+ Organizational Renewal and Innovation through design, sheds light on design thinking, bringing new designerly ways of working to organizations and provides case examples of collaboration, innovation culture and change drivers.

One of the chapters examines involving stakeholders in product development based on research and experiences at Outotec. Co-creation is not only about collaboration, but about combining the expertise and experiences of organizations to actively develop ideas and create solutions that would not be possible without the input of different stakeholders. One way to do this is by organizing co-creation workshops together with customers. At Outotec, we identified three elements that make a good co-creation workshop. Firstly, an active link between the organizations played an essential role in implementing the workshops. These personal relationships enabled mutual trust, helped identify the right partners for co-creation and ultimately got the right

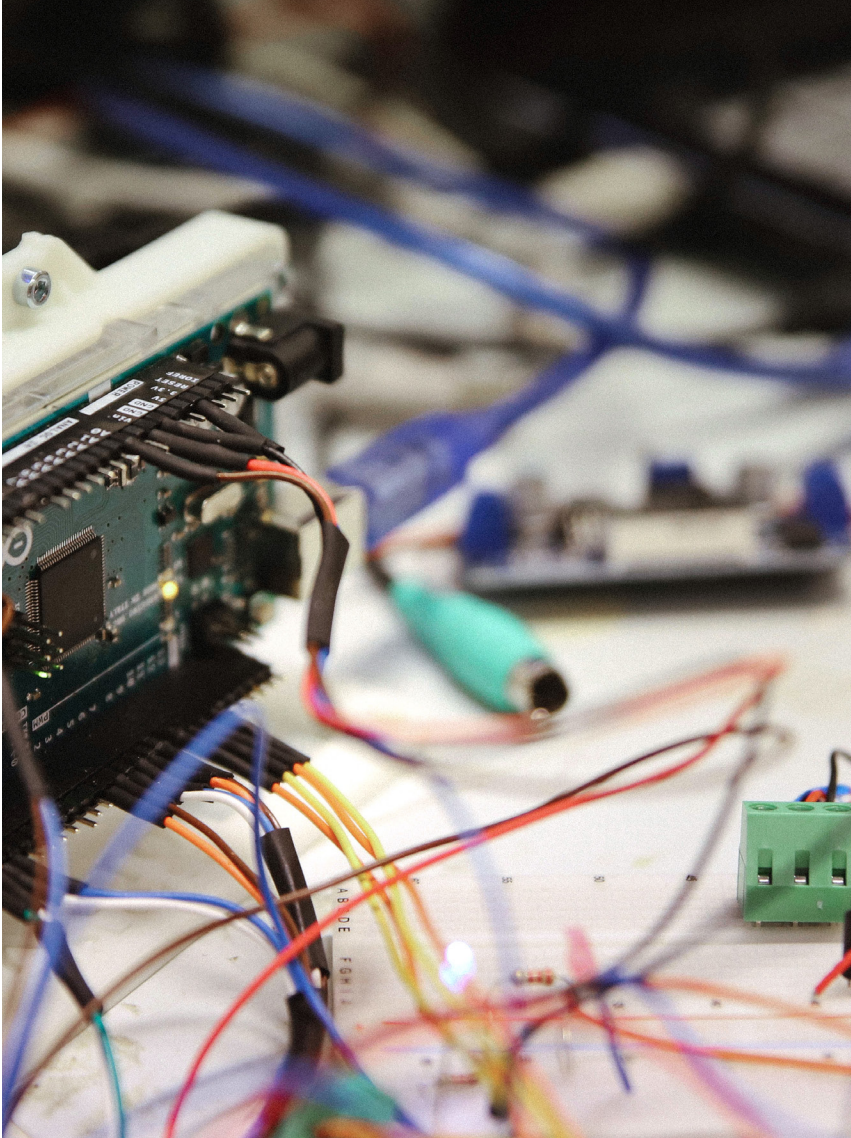
people in the customer organization to participate in the collaboration. Secondly, a champion in the customer organization was needed to push collaboration further at their end. Without a proactive attitude, the workshops would not have been possible. Thirdly, customer needs and co-created future visions should serve as the starting point for successful co-creation. Setting a clear goal in which the customer is 'heard' is essential for the success of co-creation.

The co-creation workshops have had a positive impact on our case company on multiple levels. The most important aspect of co-creation, it seems, is the bond and relationship between the collaborators, which creates massive potential for future development efforts. Co-creating with customers also helped form a good overall view on potential development problems and needs and increased future investment decisions when customers were given the opportunity to influence the development of solutions. Inside the researched organization, management and employees received qualitative affirmation to introduce design thinking and user-centricity internally, as well as a better understanding of further collaboration opportunities.

**For the online version:**  
 Björklund, T.A. & Keipi, T. (eds.) (2019). Design+ Organizational renewal and innovation through design. Aalto University, Helsinki. ISBN 978-952-60-3782-0. 220 p

For tips on implementing co-creation and eight more cases on advancing design and innovation: [designfactory.aalto.fi/research/](https://designfactory.aalto.fi/research/)





# Technology education

The technology education research field has played a central role in the recent public discussion on ways to strengthen the national level of technological competence. Professor of Practice Maria Clavert was featured in the Helsingin Sanomat Special Technology Issue (10/2019), promoting the interdisciplinary nature of technology education. Joining forces

with 12 leading professors and experts in the field, Clavert co-authored an opinion piece (Helsingin Sanomat 24.11.2019), stating that the innovative problem-solving process of technology education should be integrated into all school subjects. While the discussion continues in the media, initial research findings clearly indicate the benefits of co-teaching in educating future

## Media Coverage:

**Opinion piece in Helsingin Sanomat** (24.11.2019)  
'Clavert ym. Uusi oppiaine ei ole ratkaisu teknologiaosaamisen vahvistamiseen'. [Establishing technology education as its own subject would not strengthen national technological competence.]

**Invited statement [puheenvuoro] in Helsingin Sanomat**, special issue on Technology (10/2019)  
Clavert: 'Teknologinen ymmärrys kuuluu kaikille'. [Technological understanding belongs to all.]

## Learn more in:

Clavert, M. 2019. 'Teknologinen ymmärrys kuuluu kaikille'. [Technological understanding belongs to all.] in Helsingin Sanomat, Teknologia 10/2019, Helsinki: Content House Oy.



# Nordic STEM initiative

The Nordic STEM initiative is an Erasmus+ Strategic Partnership on the future of engineering education. The consortium of leading technical universities in each Nordic country works together with NORDTEK, a network of rectors and deans of the technical universities in the Nordic and Baltic countries, and the

Association of Nordic Engineers (ANE) to develop research-based solutions for education in Industry 4.0. The collaborative development areas of the project range from increasing the attractiveness of engineering education among adolescents to mapping engineering education involvement in lifelong learning.

The outcomes can be found on the project website: [nordenhub.org](https://nordenhub.org)





Journal Publications

Björklund, T.A., Keipi, T. & Maula, H. (2020). Crafters, explorers, innovators, and co-creators – Narratives in designers' identity work. *Design Studies*, 68, 82-112.

Björklund, T.A., Keipi, T., Celik, S. & Ekman, K. (2019). Learning across silos: Design Factories as hubs for co-creation. *European Journal of Education*, 54(4), 552-565.

Björklund, T.A., Maula, H., Soule, S. & Maula, J. (2020). Integrating design into organizations: The coevolution of design capabilities. *California Management Review*, 62(2) 100– 124.

Björklund, T.A. & van der Marel, F. (2019). Meaningful moments at work: Frames evoked by in-house and consultancy designers. *The Design Journal*, 22(6), 753-774.

Chang-Arana, A., Piispanen, M., Himberg, T., Surma-aho, A., Alho, J., Hölttä-Otto, K., & Sams, M. (2020) Empathic Accuracy in Design: Exploring Design Outcomes through Empathic Performance and Physiology. *Design Science* 6(e16)

Hakanen, E. (2019). Lectio: Uudet liiketoimintamallit teknologiateollisuudessa. *Tiedepolitiikka*, 44(2):40-42.

Koiranen, I., Koivula, A., Saarinen, A., & Keipi, T. (2020). Ideological motives, digital divides, and political polarization: How do political party preference and values correspond with the political use of social media?. *Telematics and Informatics*, 46, 101322.

Koiranen, I., Keipi, T., Koivula, A., & Räsänen, P. (2019). Changing patterns of social media use? A population-level study of Finland. *Universal Access in the Information Society*, 1-15.

Koivula, A., Keipi, T., Saarinen, A., & Räsänen, P. (2019). Risk perceptions across the current political spectrum in Finland: a study of party members. *Journal of Risk Research*, 22(8), 964-982.

Koivula, A., Räsänen, P., Oksanen, A., & Keipi, T. (2020). Risk response over time: political compartmentalization of terrorism risk perception. *Journal of Risk Research*, 1-15.

Li, J. Hölttä-Otto, K. (2020), The influence of designers' cultural differences on the empathic accuracy of user understanding, *Design Journal*, Issue 4, July, 2020.

Otto, K., Hölttä-Otto, K., Sanaei, R., & Wood, K. L. (2020). Incorporating Field Effects Into Functional Product-System Architecting Methods. *Journal of Mechanical Design*, 142(4).

Saarinen, A., Koivula, A., & Keipi, T. (2019). Political trust, political party preference and trust in knowledge-based institutions. *International Journal of Sociology and Social Policy*.

Sheppard, S.D., Björklund, T.A., Chen, H.L., Gilmartin, S.K., Atwood, S., Reynolds Brubaker, E., et al. (2020). Connecting people and ideas: Making sense of a research lab through creating a shared frame. *International Journal of Engineering Education*, 36(2).

Song, C., Luo, J., Hölttä-Otto, K., Seering, W. & Otto, K. (2020) Crowdfunding for Design Innovation: Prediction Model with Critical Factors. *IEEE Transactions on Engineering Management*, published online.

Tan, S. Y., Chia, V. Y., Hölttä-Otto, K., & Anariba, F. (2020) Teaching the Nernst Equation and Faradaic Current through the Use of a Designette: An Opportunity to Strengthen Key Electrochemical Concepts and Clarify Misconceptions. *Journal of Chemical Education*.

Conference Publications

Castrén, K. Celik, S., Björklund, T.A., Nurmi, N. (2020). Creating value in project-based multidisciplinary design courses. *American Society for Engineering Education, ASEE 2020*.

Celik, S., & Björklund, T. (2020). Social Networks as Enabler of Design Cultures [Paper presentation]. *Cumulus conference Roma: Design Culture(s), Italy*.

Celik, S., Kirjavainen, S., Björklund, T.A. (2020). Educating future engineers - student perceptions of the societal linkages of innovation opportunities. *American Society for Engineering Education, ASEE 2020*. Best teaching paper.

Chang Arana, A. Surma-aho, A. Li, J., Yang, M. & Hölttä-Otto, K. (2020). Reading the user's mind: designers show high accuracy in inferring design-related thoughts and feelings, *ASME International Design Engineering Technical Conferences, IDETC2020*.

Deo, S., Hölttä-Otto, K. & Filz, G. (2020) Creativity and engineering education: assessing the impact of a multidisciplinary project course on engineering students' creativity. *ASME International Design Engineering Technical Conferences, IDETC2020*.

Gao, S., Hakanen, E., & Rajala, R. (2020). Digital Transformation: The Interplay of Explorative and Exploitative Capability Development. In *Proceedings of the 53rd Hawaii International Conference on System Sciences*.

Hassi, L. & Kohonen-Aho, L. & Rekonen, S. "Laughter in innovation team meetings: Fuelling or killing creativity", *European Group for Organizational Studies (EGOS), 36th Colloquium*







*Hugging  
point*

# And that's a wrap!

This publication was created with the love and passion of our lovely community. Our greatest thanks and biggest hugs goes to everyone who has been a part of to the ADF spirit.

## **Annual Publication 2019/2020**

### **Editors in Chief**

Martti Jerkku, Joel Meses, Serpil Oğuz

### **Production Team**

Martti Jerkku, Joel Meses, Serpil Oğuz

### **Art Directors**

Joel Meses, Serpil Oguz

### **Photography**

ADF Community

### **Contributors**

The lovely ADF staff of enablers, teachers, researchers and workshop runners

### **Distribution**

Aalto Design Factory PO.  
Box FI-17700  
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Espoo, Finland

**designfactory.aalto.fi**

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