Facilitation of Hands-on Learning to Foster Innovation in Universities

Tapio Koskinen, Head of Technology
Aalto University School of Arts, Design and Architecture
Merger of three leading Finnish universities

1849
Helsinki University of Technology

1871
University of Art and Design Helsinki

1911
Helsinki School of Economics

2010
Aalto University
National mission

Strengthening Finland's innovative capacity through first-class research, art and education.
A diverse community

In 2018, our students graduated with:
263 doctoral degrees,
1628 master’s degrees,
1218 bachelor’s degrees,
290 graduates from the MBA and EMBA programmes

12,000
full-time equivalent degree students

A staff of about 4,000, of which nearly 400 are professors. Share of international academic faculty is 40%.
Six dynamic schools

School of Arts, Design and Architecture
architecture; art; design; media; film, television and scenography

School of Business
accounting; economics; finance; management studies; marketing; information and service management

School of Chemical Engineering
bioproducts and biosystems; chemistry and materials science; chemical and metallurgical engineering

School of Electrical Engineering
communications and networking; electronics and nanoengineering; electrical engineering and automation; signal processing and acoustics

School of Engineering
built environment; civil engineering; mechanical engineering

School of Science
applied physics; computer science; industrial engineering and management; mathematics and systems analysis; neuroscience and biomedical engineering
We are committed to identifying and solving grand societal challenges and building an innovative future through our seven key research areas.
Tenure track system for professors has been the key investment in the implementation of Aalto strategy.

Clear internationally known predictable academic career system, where also more junior researchers can compete.

Talent pool

268 tenure track recruitments since 2010

70% of the applicants are from outside Finland
Research performance

From 2010:
+250% ERC-funded projects

From 2010:
+56% international peer-reviewed articles in scientific journals

From 2010:
+43% doctoral degrees

From 2010:
+81% competitive research funding
Building excellence in all the key research areas

ICT and digitalisation
ShanghaiRanking: Telecommunication Engineering 28 (2017: 31)

Global business dynamics
ShanghaiRanking: Management 36 (2017: 49)
Business Administration 34 (2017: 51–75)

Advanced energy solutions
ShanghaiRanking: Electrical & Electronic Engineering 51–75 (2017: 76–100)

Human-centred living environments
QS: Architecture/Built Environment 42 (2018: 46)

Arts and design knowledge building
QS: Art & Design 7 (2018: 9)

Health and wellbeing

Materials and sustainable use of natural resources
ShanghaiRanking: Mining and Mineral Engineering 51–75 (2017: 46)
Artistic excellence

Fashion Programme ranked 5th in the world

Art & design education ranked 7th the world

The Business of Fashion 2018

QS 2019

Students have excelled in the annual Designers’ Nest competition for consecutive years

Students in the final of Hyères Fashion Festival 6 years in a row
Outside the box

Top young universities

9th best young university in the world
Top 50 under 50, QS 2018

Top technology challenger universities

55 top institutions that have thought outside the box on research collaboration and funding
THE 2017

Top most international universities

55th most international university in the world
THE 2018
Research infrastructure

Long-term (5–7 years) funding commitment

Regular assessment using infrastructure-specific indicators

Continue to increase the level of investments to 4–6% of budget
Multidisciplinary research: sustainable value chain

- Forest
- Chips
- Cellulose
- Fiber
- Yarn
- Textile
- Product
Integrating science, design, industry and education

The unique collaboration between arts and design and chemical engineering in order to produce new concepts for the forest industry begun with the CHEMARTS project for students. Applications vary from smart clothing to new cellulose fabrics.
A unique collaboration hub

Meilahti Health Campus

University of Helsinki

Maria 0-1 Startups

Ruoholahti Business District

Keilaniemi Business Park

Collaboration hub

Aalto University

Aalto University

Meilahti Health Campus

University of Helsinki

Maria 0-1 Startups

Ruoholahti Business District

Keilaniemi Business Park

Collaboration hub

Aalto University
Developing campus

2018
School of Arts, Design and Architecture, shopping centre A Bloc and startup community A Grid open

2019
School of Business opens, building in Töölö and the old shopping centre renovations begin

2020
New student housing and office buildings, improvement of green areas on campus begins

2021 – 2022
Aalto Works & Otakaari 2 opens, building of Student Life Centre and development of Konemies block

2023 – 2035
Development of Marine Tech block, Kivimies block and Maarinranta area, new residential buildings
Entrepreneurship ecosystem
A Grid is a gateway for startups to Aalto’s international network of resources, talented students and cutting-edge research and technology.

A creative community for startups

25000 m² cooperation hub for creating new ways of working with 120+ startups, small-size companies, creative businesses, networks, maker’s spaces
Promoting entrepreneurship

70 to 100 companies are founded every year in our ecosystem.

50% of Finnish start-ups that originate from universities come from the Aalto community.

Entrepreneurship is a more popular career option than ever – in the last six years, over 3,000 students have studied through the Aalto Ventures Program.

Aalto University
Students as co-creators and leaders

Startup event Slush became world-renowned in the hands of Aalto students, attracting over 20,000 global participants annually.

CEOs of more than 100 listed companies present
3,100 startups
20,000 participants
2018
Case: Design Factory
Traditional method of university education: lecture + exam
Learning died because of overdoze of information
'Innovations are born on borders of disciplines'

Design Factory Prof. Kalevi Ekman
Aalto University
• PBL
• Theory and Practice
• Easy access
• Interdisciplinary

Terms of Design Factory
Product Development Project (PdP) course

During academic years 1997-2019

• 262 projects
• 2559 students
• 21 universities
• 120 partners
Design Factory from Hell

Bureaucracy  
Theory  
Conventions  
Restrictions  
Hierarchy  
Safety  
Administration
Challenges

• Unpredictability
• Contracts
• Purchasing
• Traveling
• Safety
• Tendering process
• Recruitment
Making
Maker Movement

• Maker movement is an ecosystem of individuals and organizations that adopted making as a means for creating and learning -Dale Dougherty, 2000

• Since 2000, the maker movement has migrated into higher education, with the lessons learned from the nonacademic makerspace ecosystem guiding the development of higher education makerspaces.

• Before this time, engineering labs and machine shops provided some of the functions common to modern makerspaces, but did not provide the broad range of bundled services afforded by makerspaces.

• The creation of Fab Lab at MIT in 2002 marked the entry of large-scale university programs into the makerspace network.
because it's the right place.
Origins of Fab Lab

• MIT's Center for Bits and Atoms (CBA) was launched by a National Science Foundation award in 2001 to create a unique digital fabrication facility that gathers tools across disciplines and length scales for making and measuring things.

• CBA is an interdisciplinary initiative exploring the boundary between computer science and physical science. CBA studies how to turn data into things, and things into data.

• CBA manages facilities, runs research programs, supervises students, works with sponsors, creates startups, and does public outreach.

• CBA's work is shared through outreach programs including a global network of field fab labs that provide widespread access to prototype tools for personal fabrication, and initiation of an office to provide scientific advisors for popular media.
Fab labs began as an outreach project from MIT's Center for Bits and Atoms (CBA). Today it has grown into a collaborative and global network with over 1750 nodes in 2019.

Fab labs provide widespread access to modern means for invention. Fab Labs focus on using and learning practical skills and applying them to reference designs.
Why making is growing in popularity?

- Hunger for Innovations
- Rise of Creative Industries
- New Business Models
- Sustainability
- DIY Culture (iFixit)
- Availability of Digital Fabrication
- Hacking
- Open Source
- Open Design
- Need for Rapid Prototyping
- New Students Unexperienced
- Humans are Makers
- Garage Culture
- Diminishing Agricultural Society
- Arts & Crafts
North America: HEMI and ISAM

The Higher Education Makerspaces Initiatives (HEMI) is a collaborative effort from leading universities focused on solving the challenges of academic makerspaces and making their combined learnings available to others.
https://hemi-makers.org

The first International Symposium on Academic Makerspaces (ISAM) held at the MIT in November 2016. The proceedings and addressed culture and community, programming, outreach, safety, staffing, management, metrics of effectiveness, entrepreneurship, and campus collaborations.
ISAM2019 was held at Yale
https://isam2019.hemi-makers.org
North America: Student Shop Managers' Conference

The SSMC Conference is designed to bring Student Shop managers and directors together to discuss important safety issues and concerns in student shops across the nation.

The third conference in 2019 was held at Yale University

https://ssmc.wildapricot.org/conference2019
Europe: ETHO

• The 3rd annual Art and Design Academies Technical Service Workshop was hosted by Aalto University on April 4–5, 2019.

• More than 130 participants from 30 academies in 14 countries participated in the workshop.

• Program consisted of selected good practice case studies on management and delivery of technical service.

The 3 core components of Technical Service

1. PERSONNEL
   ✓ Maintenance
   ✓ User support and guidance
   ✓ Development

2. EQUIPMENT
   ✓ Machines
   ✓ Tools and devices
   ✓ Materials
   ✓ Occupational safety

3. SPACE
   ✓ Laboratory
   ✓ Workshop
   ✓ Studio

Supporting hands on learning, teaching, studying, research and artistic work
Relocating School of Arts, Design and Architecture
Key figures 2018

- 5 Departments
- 161 Bachelor’s degrees
- 330 Master’s degrees
- 14 Doctoral degrees
- 2434 Students
- 470 Staff members of which 58 are professors
- 330 Doctoral students

Aalto University
School of Arts, Design and Architecture
Departments

Architecture
Art
Design
Film, Television and Cinematography
Media
Creative impact

QS ranking in Art & Design education (2019)

7th

Aalto students finalists at Hyères Fashion Festival

7 years in a row

BoF ranking in Fashion BA (2017)

5th
New facilities for arts, design and architecture

• Planning started in 2011
• International architectural competition
• New building completed in July 2018
**SPECIALIZED LEARNING SPACES**
Tailored to specific functions or teaching modalities

- Limited setting types: formal teaching, generally enclosed
- Access: Embedded, departmental
- Tend to be:
  - owned within departments, subject specific
  - involve specialized equipment
  - require higher levels of performance specification
  - often higher security concerns

**GENERIC LEARNING SPACES**
Range of classroom types

- Range of setting types: formal teaching, open and enclosed
- Access: In general circulation zones, access by schedule
- Tend to be:
  - generic teaching settings
  - often limited in flexibility by furnishings
  - used when scheduled

**INFORMAL LEARNING SPACES**
Broad definition of learning space

- Wide range of setting types: informal and formal, social, open and enclosed
- Access: Public, visible, distributed, inclusive
- Tend to:
  - encompass richer range of settings
  - allow choice
  - be loose fit, unscheduled
  - work as a network of spaces rather than singular settings
  - have food!
Seven Principles of Learning Space Design

**Comfort**: a space which creates a physical and mental sense of ease and well-being.

**Aesthetics**: pleasure which includes the recognition of symmetry, harmony, simplicity and fitness for purpose.

**Flow**: the state of mind felt by the learner when totally involved in the learning experience.

**Equity**: consideration of the needs of cultural and physical differences.

**Blending**: a mixture of technological and face-to-face pedagogical resources.

**Affordances**: the “action possibilities” the learning environment provides the users, including such things as kitchens, natural light, Wi-Fi, private spaces, writing surfaces, sofas, and so on.

**Repurposing**: the potential for multiple usage of a space.
The Flipped Classroom

**OUT OF CLASS**

**BEFORE**
- Students prepare to participate in class activities

**DURING**
- Students practice applying key concepts with feedback

**AFTER**
- Students check their understanding and extend their learning

**IN CLASS**

**GOAL**

Source: CENTER FOR TEACHING+LEARNING, THE UNIVERSITY OF TEXAS AT AUSTIN
The so-called 'traditional' teaching method in art and design, as far as studio work is concerned, has relied very heavily on a one-on-one tutorial that generally takes place between the tutor and the student as a discussion about the particular project on which the student is working. It is usually an examination of the work 'on the drawing board' and often results in the tutor demonstrating his/her own expertise to improve some aspects of the student's work - more or less a 'sitting-by-Nellie' approach. Most of the teachers in art and design would call it a traditional 'atelier' method derived from the master artist/craftsman showing an apprentice how to do it, which is a kinder description but it comes to the same thing. (Swann, 2002 p. 50)
Experiential Learning

Concrete Experience

Active Experimentation

Learning through observation, experimentation and interaction with the environment

Reflective Observation

Abstract Conceptualization
Learning Art, Design and Architecture

- The learning model adopted by the school combines theory and practice.
- The spatial solution supports successful implementation of the learning model.
There are two main types of specialized learning spaces at Aalto ARTS that are essential from the point of view of the generic learning model adopted by the school: *Studio and Workshop*
Studio

Studios should be flexible and user configurable. Interior surfaces preferably unfinished.

Key learning facilities, such as the specialized workstations are part of the studio. The studio is well connected to the workshops to enable students to easily move their work between the workshops and the studio.

Each of the three Studio Clusters consists of the following facilities:

**DESK WORK AREA:** This is the hearth of the studio. The set-up and furniture varies and does not necessarily include conventional desks. The space can be easily re-configured by its users. Student lockers are located within the space.

**SOCIALIZING AREA:** Kitchen / coffee shop area, living room and space for ad-hoc meetings

**GROUPWORK AREA:** Small, Medium and Large project/meeting rooms, serve meetings, group work and classroom sessions.

**COMPUTER WORK AREA:** Specialized workstations with software specific to the area of study.

**STORAGE ROOM:** for student work

**FACULTY WORKSPACE:** offices for professors, lecturers and researchers.
Workshop

The workshop structure comprises of several dedicated workshops that are used by the five departments of the school. Workshops serve also needs of other schools.

Each workshop consists of three zones. Ideally the PUBLIC zones of several workshops should be merged.

Minimum height 4 m (floor-ceiling) in all workshops.

All workshops require occasional changes of machinery/equipment

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**PUBLIC (Informal and Group Learning)**
- Lounge and gallery area. Furniture for ad-hoc meetings and laptop work.
- Common public area for several workshops.
- Easy access to studios (students will take their work to studio and back)

**Hands on Learning**
- Equipment that can be used without supervision
- Includes storage space for unfinished student work
- Induction required for 24/7 access.

**Machine Room**
- Equipment, materials and machinery that requires supervision and special focus on workplace safety.
- Induction required for access. Open 5 days a week, also evenings.
- Access to materials storage space
Managing Technical Service
44 Specialized Learning Environments

44 Professionals Supporting Learning

www.aalto.fi/arts-infra
Enhancing Open, Flexible and Safe Access to Learning by Doing

Information on the workshops equipment, machinery, service, access

Blended / Flipped Learning on How to Work Safely

MyCourses online induction

On site F2F induction

Digital Access Control

Learning by Doing @ ARTS infra workshops

Augmented assistance on site

aalto.fi

A!Ole
Challenges in Technical Service Provision

- Uneven workload dominated by course scheduling
- Servicing research, education and startups with the same facilities
- Users from different backgrounds
- Managing health and safety
- Non-academic staff status (statistics)
- Lack of opportunities for career development
Entrepreneurship in Higher Education

RCA graduates create more startups than Cambridge and Oxford combined.

Art, design and architecture has the highest percentage of entrepreneurs among Aalto University graduates.
Towards a better world.

aalto.fi