



MADE



Manufacturing Academy of Denmark, - Intro 2024

- Welcome to MADE
- Short introduction of participants and purpose of your study trip
- MADE presentation – who is MADE and how does MADE work?
 - Structure and case examples
 - International perspectives
- Questions, dialogue and perspectives

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When preparing your visit

1. How do you foster innovation/support the knowledge transfer from lab to market?

(answer part of research platform presentation exemplified with FAST)

2. What are your best practices and achievements in cluster development? And how have you accomplished them?

(answer part of presenting the MADE development/growth from 26 to 200+ company members, growth in activities and now employees)

3. National/regional co-operation: how to generate and operate nationwide network of companies & R&D actors?

(from reach out through RTO partners to own regional representation, DK is a small country)

4. What kind of impact analysis do you conduct? Does the state have some model / indicators for you to fulfil?

(All innovation projects based on project description and self-evaluation of impact)

5. Prospects of growth and internationalization of Danish companies/manufacturing industry? How do you support these prospects?

(answer part of IntNat. presentation slides)

We create and support *world-class Danish manufacturing*

In the beginning of the 2000's Danish manufacturing was facing its greatest challenge - *outsourcing*.

Funds, associations, companies and research communities joined forces in a new collaboration. **MADE – Manufacturing Academy of Denmark**, launched in 2014.

Our vision: Denmark as one of the world's leading manufacturing nations based on a strong ecosystem for production in Denmark.



A national and local network of expertise

Here you find MADE



MADE

Manufacturing Academy of Denmark

* Since 2023

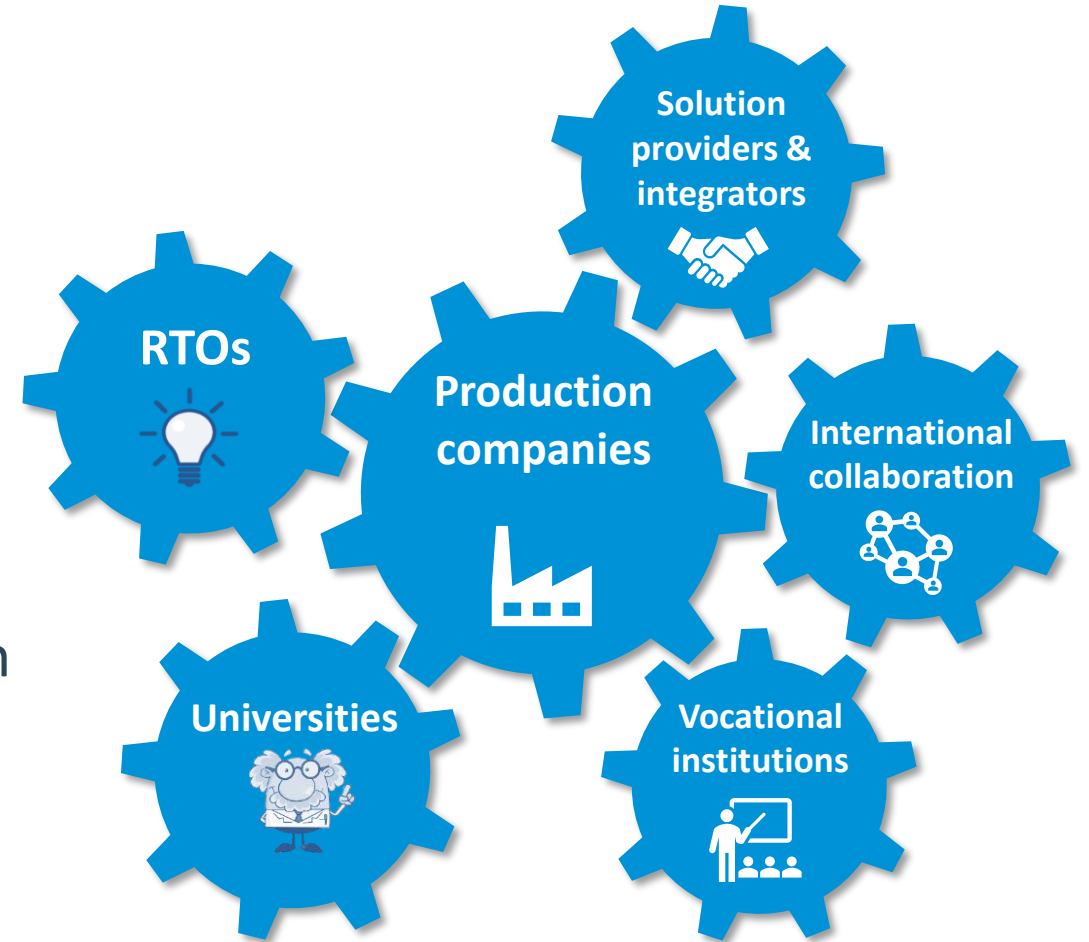
MADE unites the Manufacturing community

The 274 MADE members are (Jan. 2024):

- Large and small companies
- Universities: AU, AAU, CBS, DTU, KU and SDU
- RTO's
- Educational institutions

More than 250 are industrial members, of which more than 8 out of 10 companies are SMEs.

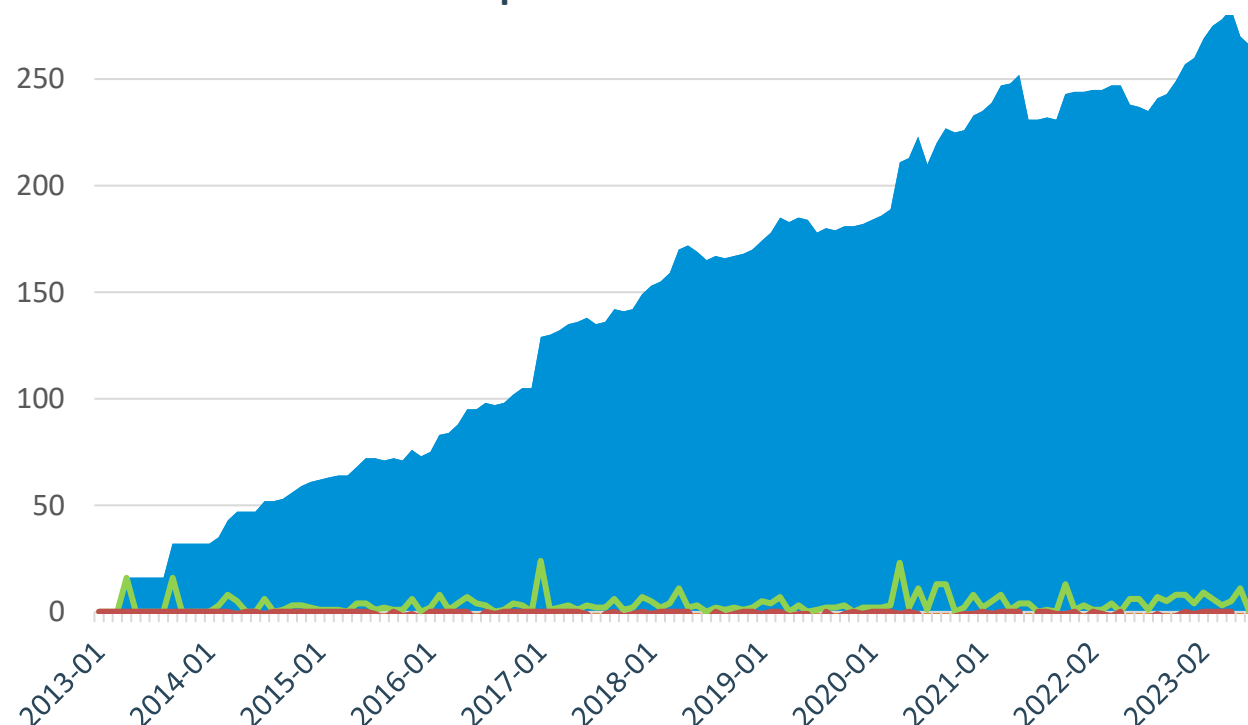
MADE is a platform that represents Denmark internationally.



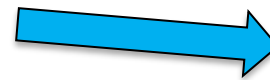
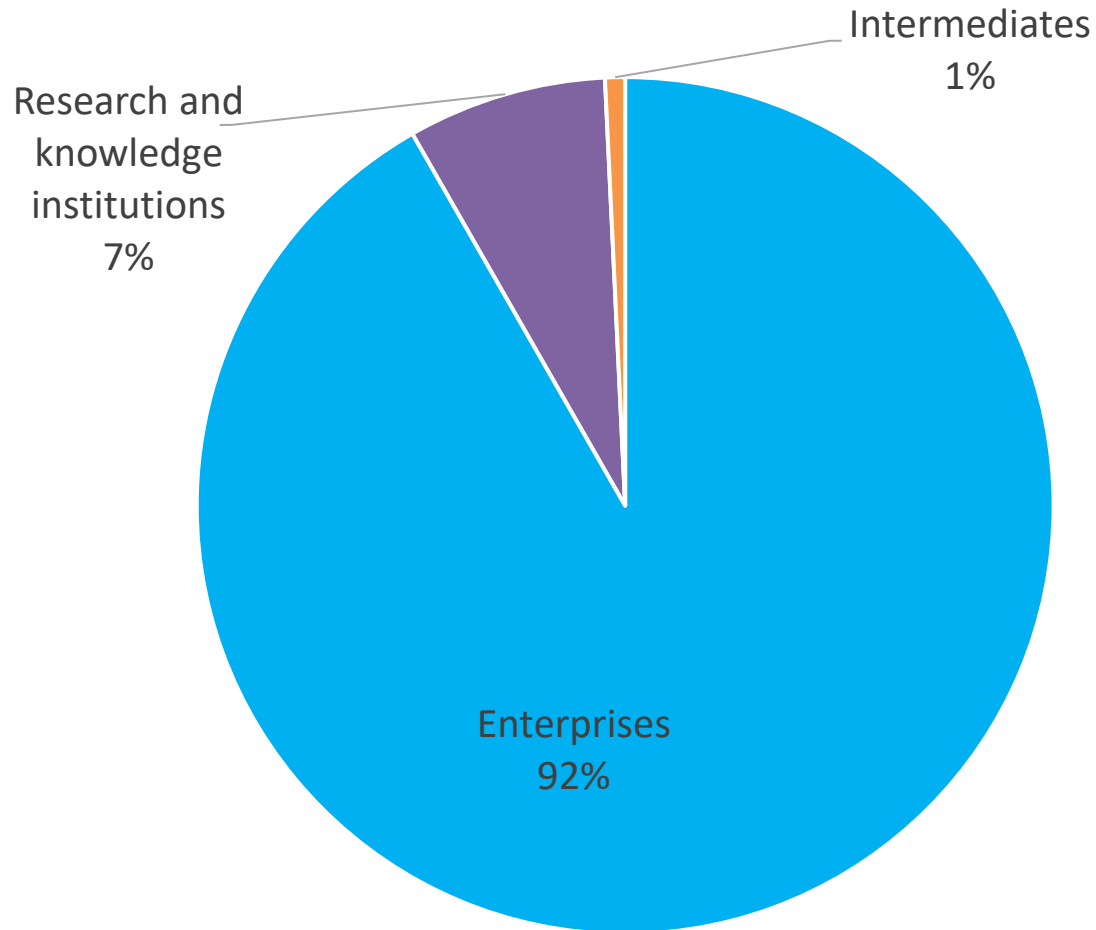
A strong and growing Danish manufacturing ecosystem

- Our characteristics are joint & transdisciplinary efforts between industry, academia and innovators.
- **MADE has a clear structure and processes that works and have proven to give impact**
- MADE is also a platform **that represents Denmark internationally** – participating in EU projects and create matches between needs and solutions

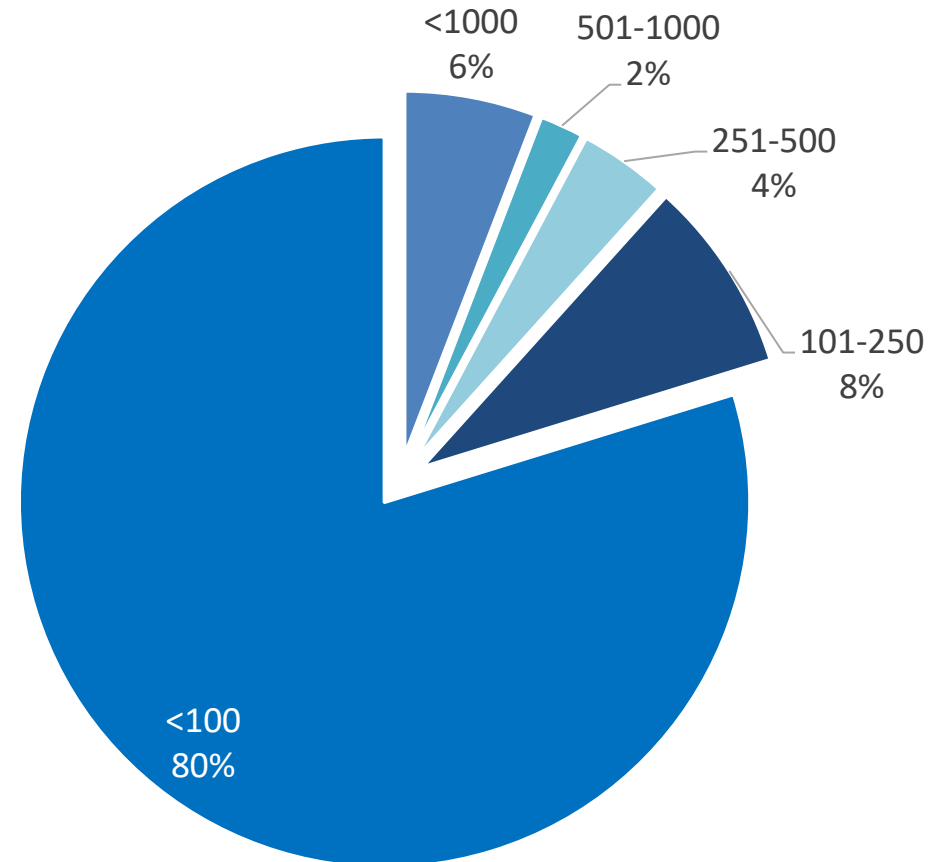
Development in MADE members



Distribution of MADE Members



The distribution of companies
Employees



World-class manufacturing



Research

MADE **creates and shares knowledge** based on industrial research into current needs and challenges for Danish companies.



Innovation

MADE ensures that new **knowledge and technology is widely disseminated** in the Danish industry through open innovation activities and offers targeted at SMEs.

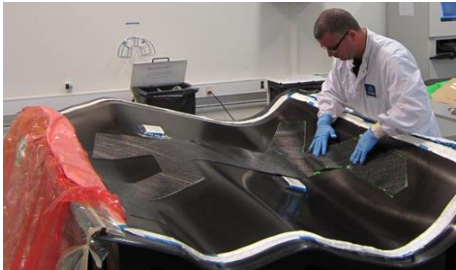


Education

Across educational levels MADE helps to **shape the educations of the future** in production.

Linking Industry, Research and Innovation

Industrial challenges



Research & Innovation



Research



Innovation

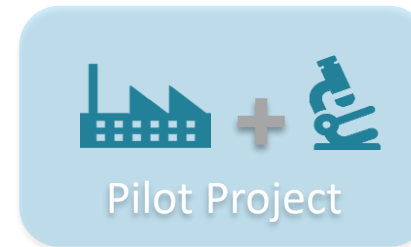
Pilot projects



Pilot Project

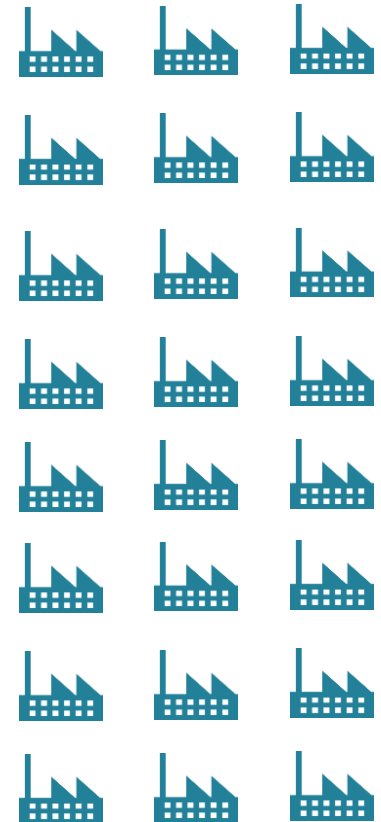


Pilot Project



Pilot Project

Implementation



LEGO Group

“SEEDS FOR THE FUTURE: “WE WANT TO GROW BRAIN POWER”,
The world’s largest manufacturer of toys will invest in new knowledge from universities to develop skills, tools and factories of the future.

- How can we use 3D printing and AM to make the route from concept to mass production as fast and flexible as possible?
- Collaboration to print plastic inserts for injection moulding to replace traditional metal tooling requiring milling and polishing, enabling them to proceed from design to production in a few hours rather than several weeks or even months.
- *“We need collaboration...”* inviting others to *share knowledge and be part of an open innovation adventure where the journey is equally important as the destination.*
Per Høvsgaard, Director R&D, The LEGO Group.



Assembly of PCB's at SME Danchell

Automate small batch assembly of through hole components onto printed circuit boards

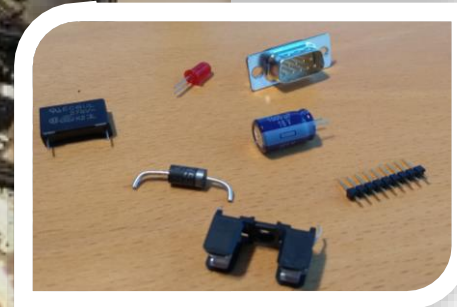
Main challenges

- Feeding of components
- Grasping
- Insertion into PCB
- ... with emphasis on flexibility and reconfigurability

Success criteria

- 1 M. Dkr.
- 10 sec. per component mounting

Potential for huge reduction of labour cost



LEGO GROUP



Research and innovation platforms

1. MADE SPIR

Vision: Strengthen the Advanced Manufacturing ecosystem in Denmark
Budget: 184 M DKK
Period: 2014-2018

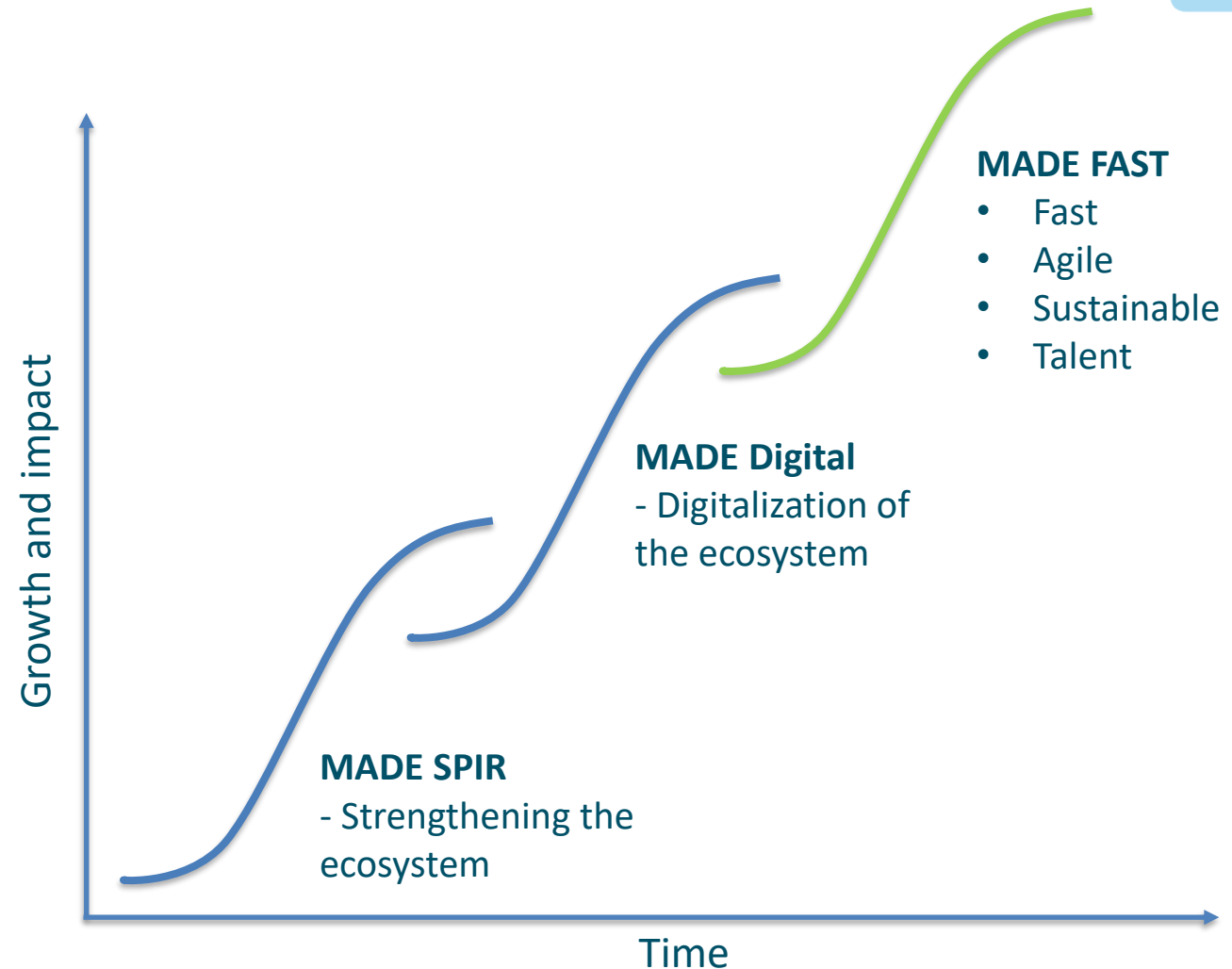
2. MADE DIGITAL

Vision: Development of a Industry 4.0 solution for Danish manufacturing
Budget: 200 M DKK
Period: 2017-2019

3. MADE FAST

Vision: FLEXIBLE, AGILE, SUSTAINABLE manufacturing enabled by TALENTED employees
Budget: 265 M DKK
Period: 2020-2024

MADE's "S" Curves



MADE FAST Research platform



WORKSTREAM 1
SUSTAINABLE MANUFACTURING
BUSINESS MODELS AND
VALUE CHAIN DESIGN



WORKSTREAM 2
VALUE CHAIN EXECUTION
AND OPTIMIZATION



WORKSTREAM 3
AGILE PRODUCTION
SYSTEMS



WORKSTREAM 4
SUSTAINABLE UP-SCALING
THROUGH DIGITALIZATION OF
MANUFACTURING PROCESSES



WORKSTREAM 5
SUSTAINABLE AND
AGILE WORKFORCE

MADE FAST (Flexible, Agile, and Sustainable production enabled by Talented employees) is a new industrial lead research, innovation, and education partnership to develop the next generation of Danish advanced manufacturing capabilities

MADE English into video

<https://youtu.be/goQk5Qbl21A>

How is MADE FAST organized?

<https://youtu.be/a-HviYAWbUw>

One platform – five workstreams

Five thematically focused workstreams – each consisting of a team of highly qualified researchers and RTO consultants, who seek to develop innovative solutions to the company's industrial challenges

WORKSTREAM 1

BUSINESS MODELS
AND VALUE CHAIN
DESIGN

Workstream Leader
[Torben Pedersen](#)
Professor - CBS



WORKSTREAM 2

VALUE CHAIN
EXECUTION AND
OPTIMIZATION

Workstream Leader
[Charles Møller](#)
Professor - AAU



WORKSTREAM 3

AGILE
PRODUCTION
SYSTEMS

Workstream Leader
[Henrik Gordon Petersen](#)
Professor - SDU



WORKSTREAM 4

DIGITALIZATION
OF MANUFACTURING
PROCESSES

Workstream Leader
[Jesper Henri Hattel](#)
Professor - DTU



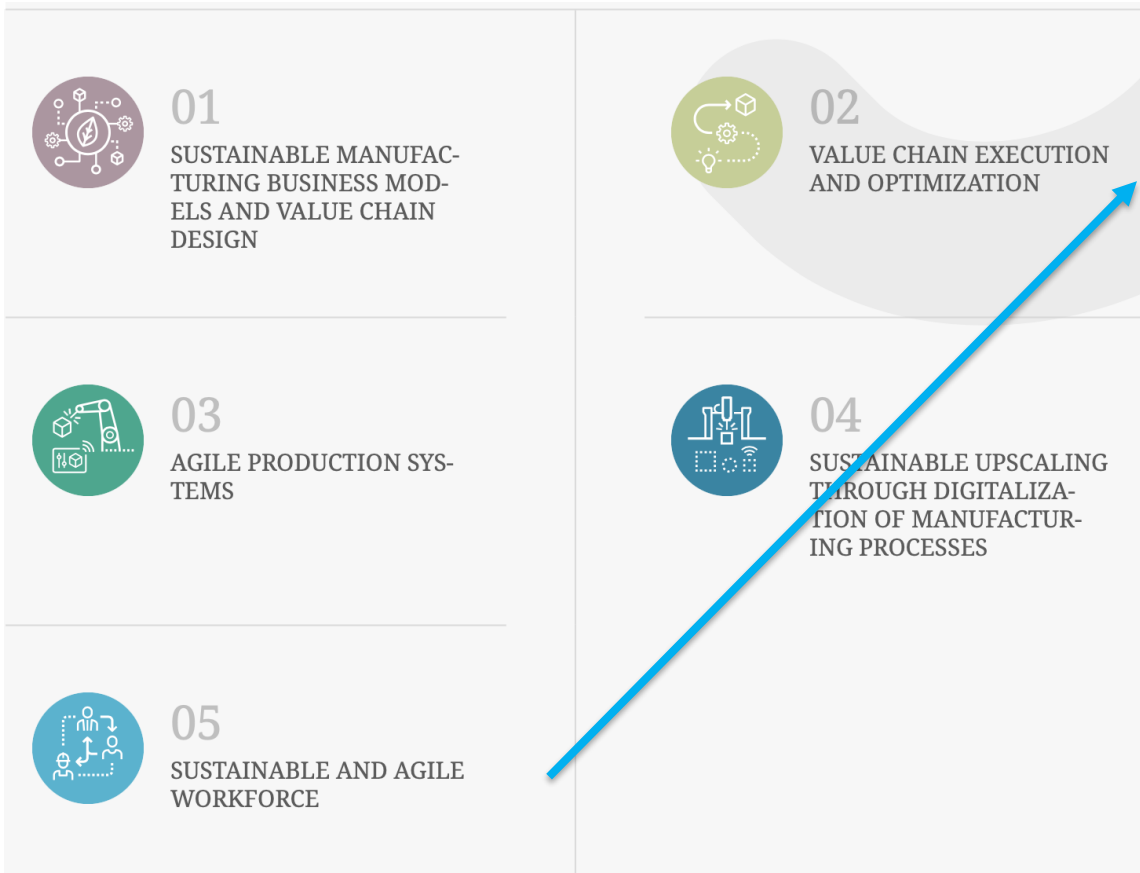
WORKSTREAM 5

SUSTAINABLE &
AGILE WORKFORCE

Workstream Leader
[Kaj Grønbæk](#)
Professor - AU



MADE FAST



WS5	Digital support for talented workforce
	WS5.1 Augmented Reality based in-situ support for workforce
	WS5.2 New and Intelligible Human Machine Interfaces
	WS5.3 Digital AR/VR based education and training support for workforce
	WS5.4 Talent Needs and Supply Models

Research Part Projects

- PP5.01 - Velux & LEGO partner Ph.D. with AU
- PP5.02 – LEGO & KUKA partner Ph.D. with AU
- PP5.03 - Vestas dedicated Ph.D. with AU
- PP5.04 - Haldor Topsøe & Unity Studios partner Ph.D. with AU
- PP5.05 - LEGO & QualiWare partner Ph.D. with CBS

Development Part Projects

- PP5.06 - Stenhøj Development Project with Alexandra Institute
- PP5.07 - CAMAR Development Project with Alexandra Institute
- PP5.08 - Xcelgo Development Project with Alexandra Institute
- PP5.09 - EC Power Development Project with Alexandra Institute
- PP5.10 - Wexøe Development Project with Alexandra Institute

Extra PP on Vocational Training with UC VIA

Aalborg Portland

The goal is to set up a plant that removes CO₂ from the flue gases in cement manufacturing.



- First step: reducing CO₂ emissions by 30 % compared to 1990.
- requires the development of new technologies, that can capture and store CO₂,
- new business models need to be developed to pave the way for making a good business out of products that *will cost far more than today's conventional methods*
- MADE FAST Ph.D. project combines the technical and business areas with a focus on sustainability and CO₂.
- *“It is also the strength of MADE, that companies are moving closer together – exchanging ideas and inspiration for new competencies at the academic level too”.*

Plastix

Aim is to develop new circular business models and explore how recycled plastic can be used for food packaging.

- Are in the process of creating a completely new market for Green Plastic.
- Use this time of crisis proactively to change self-understanding in relation to the entire value chain.
- “We currently experience our partners being forced to stop and reflect on a sustainable future, - and that is stimulating the new development projects”.
- The corporate vision must be long-term, to ensure circular products, and to help solve the climate challenges – looking far far ahead - 500 years.
- Plastix and Aalborg Portland are in complete agreement.

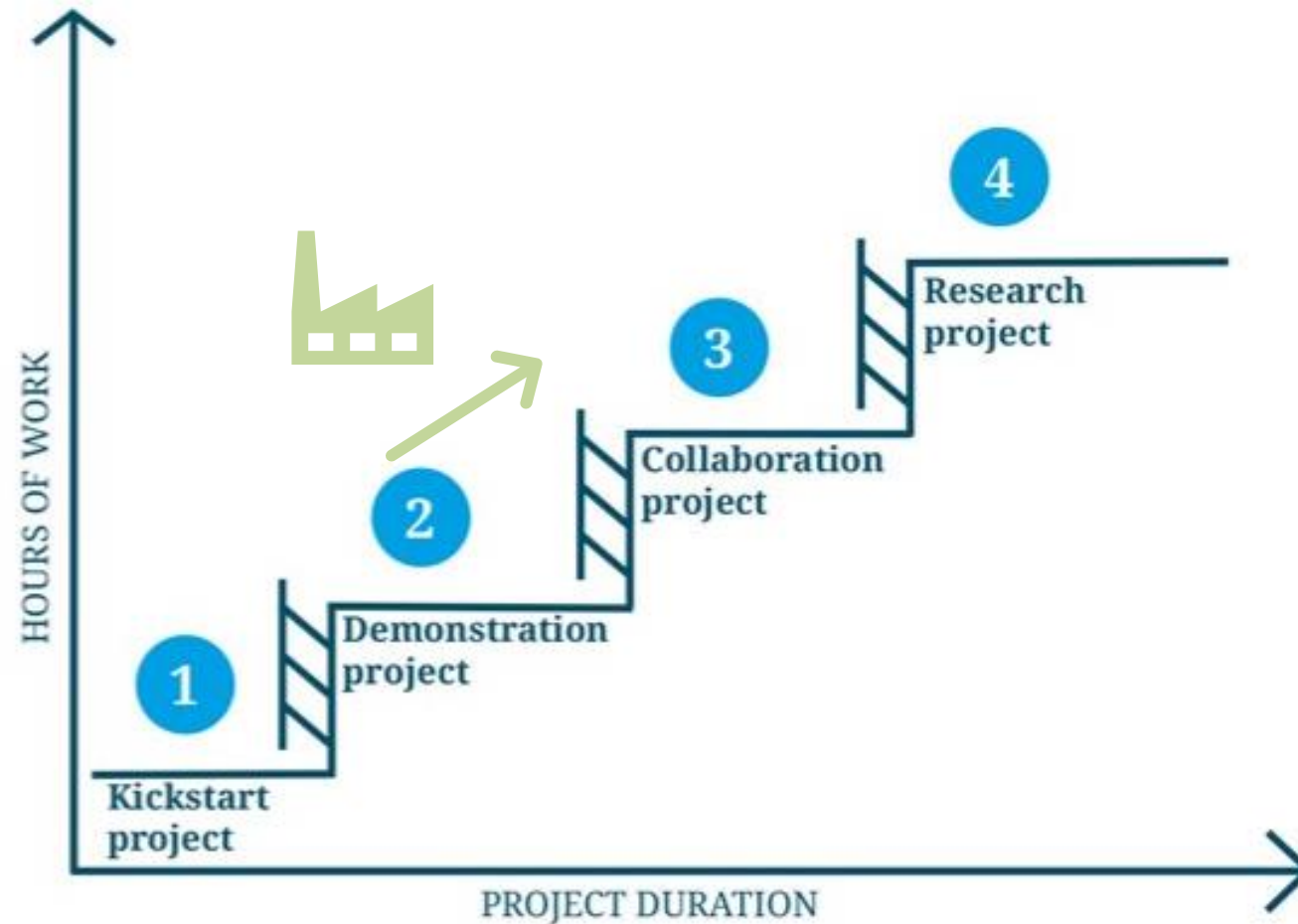


The Musketeer effect

Investment in one researcher gives direct access to many...



Knowledge and innovation through projects



Knowledge and innovation through events

Company visits



Open Lab



Innovation conferences



Networking groups



Study trips



Deep-Dive



MADE anniversary



MADE Events 2023 – example from DK web



23
Aug
2023

Open Lab: Robotsikkerhed i produktionsmiljøer



29
Jun
2023

Virksomhedsbesøg:
Bæredygtig opskalering via...



23
Jun
2023

Materiale Deep Dive: Få styr på
spændingerne i dine metaller



15
Jun
2023

Partner event: TechCircle: Digitale
tvillinger, udnyt potentialet for
CEO/CTO



15
Jun
2023

Open Lab: Large-scale manufacturing



1
Jun
2023

Partner event: greenSME 1st open call

CC Jensen

Develop & produce oil filter solutions

Digital twins to improve predictions and action

- Focus on increased digitalisation of production, and of the products after use.
- Data from ships is measured via sensors to get answers to, when maintenance is required; digital twins are used in order to predict errors as well as to analyze and respond to measured data.
- The goal is to combine the data- and the model-driven approach to the digital twilling – to become even better at predicting and acting.



MADE communication activities



MADE's KPIs – Performance measurement/Follow-up

Qualitative

MADEs (1-4 Scale points):

1. Not satisfied
2. Slightly satisfied
3. Good
4. Excellent



Used for example for:

- Project and event evaluations*
- Ongoing assessment and follow-up on projects

Quantitative



- In-kind hours from innovation activities
- Number of event participants
- Exposure of MADE communication activities*
- Number of MADE members*

* Here we have some strategic targets.



MADE's International role

- To position Denmark in international platforms based on the well functioning corporation in MADE industry/uni/RTO/Edu.
- To be a **one-stop-shop** for sharing knowledge and expertise across EU regions - using MADE as matchmaker and building on strong partner & people network in EU+DK.
- To use **European network to spot new initiatives** matching Danish interests and competences within R&D and innovation with strong clutch to industrial partners i.e. to share development costs.
- To develop international business relationships.

MADE International Partnerships



- AFIL**
Associazione Fabbrica Intelligente Lombardia
- ARMSA**
Agencja Rozwoju Mazowsza
- DIMECC**
Digital, Internet, Materials & Engineering Co-Creation
- Fraunhofer IPA**
- IMR**
Irish Manufacturing Research
- MTC**
The Manufacturing Technology Centre
- Nord-Vest RO**
Regional Development / Innovation Hub Nord-Vest
- RISE**
Research Institutes of Sweden
- SINTEF**
Stiftelsen for industriell og teknisk forskning
- Systematic**
Paris Deep Tech Eco System
- Tecnia**
- TNO**
The Netherlands Organisation for applied scientific research

12 close international partners (above), plus good relations with another 20+ European organizations + a few abroad

Early MADE engagement in EU network and projects

- **EFFRA** membership (2015-)
- KIC Manufacturing application (1st round) – later EIT MANU still no luck
2022: MN Advisory board member EIT North
- Study mission to Nürnberg – since then network stakeholder (Handelskammer&Automation Valley ao)
- MADE among the first appointed **DIHs** – Digital Innovation Hub
- MADE as EU KET-center
- EU Digital Transformation Monitor – MADE portrait
- **Impact Growth** – first EU Horizon project (2016-2018), acceleration of start ups
- **I4MS-Go** (2017-2020) Developing a large on-line community of users and service providers for the digital transformation of manufacturing SMEs and Mid-Caps
- Other EU projects: **RobotUnion** (stimulate SMEs in the robotics sector), **C-Voucher** (SMEs moving towards a circular model), **ADMA** (Dev.& testing methods to help SMEs transform into FoF)

MADE has become well known in the European Manufacturing community



MADE participation in EU projects (2023-)

ADMA Trans4mers (InnoSup 2021-2024)



Supporting innovative Manufacturing **Trans4MErs** SMEs to become Factories of the Future with access to training and expertise and individualized assistance from a Trans4MEr (coach). It all starts with the ADMA scan. MADE is one of 7 key partners, in total 30 partners represent all 27 EU countries Reach out to 1000 SMEs with funding and expertise, plus network EEN, EDIH etc.



Manufacturing SMEs

that can't wait to ride the innovation industry wave



Trans4MErs

in digital and advanced manufacturing



Digital and Innovation Service Providers

for SMEs

MADE is also partner in:

- **AI REDGIO 5.0**
Focus on digital experiments in SMEs and EDIH collaboration (AAU linked party) +40 partners
- **AddSmart** (EDIH North Denmark)
Smart Production, I4.0, AI, Advanced digital skills.
- **Techcircle** (EDIH Central Denmark)
data, data analytics, big data, sustainability challenges.
- **EDIH4MANU network** with 25 EDIHS focusing on manufacturing.

Time for adjusting MADEs international work

Internal shift of role:

from isolated small silo - towards more integration with other MADE activities

- Increased awareness of:
 - Funding sources,
 - Partner considerations, n
 - nationality/skills/history of participants in the effort
 - Theme/problem related to MADE's overall focus areas
 - Gains for MADE members and/or MADE internal development Other criteria...
- Goal – Success criteria
 - We know when to say yes or no – and why
 - We know when we proactively shall work on a proposal
 - Basis for growth, - from 1-2 man-year, towards more stabile staffing and growth

Key Learnings and recommendations

- Formulate **vision and main challenge as common focal point**
 - must function as an agreed goal and guideline for all work and decisions.
- Identify **key players**, - both the competence owners and the political influencers.
- **Facilitate Open and lively dialogue between main stakeholders – to build trust**
 - and when needed the willingness to bend according to overall goals.
- Establish **strong Governance team** – with hard+soft competences + hardworking
 - must synthesize proposal goal, structure and processes.
- Define and **use systematically governance elements**, (part agreements, charters)
 - Stick to plan and KPIs and continually evaluate, learn, adjust, improve.
- **To sum up: vision, right people, structure, discipline and trust.**



Summing up – answers to InnoCities questions

1. How do you foster innovation/support the knowledge transfer from lab to market?

(answer part of research platform presentation exemplified with FAST)

Research platforms build on Ph.D. projects at specific companies

RTO consultants may also participate in research platform developments

MADE communication consultants disseminate 'stories' based on research company cases

Later developed solutions may be applied through smaller SME innovation projects with RTO consultants as guidance

2. What are your best practices and achievements in cluster development? And how have you accomplished them?

(answer part of presenting the MADE development/growth from 26 to 200+ company members, growth in activities+employees)

Building the Researcher & company trust and community, so after one platform, wish for participation in platform 2 and 3 grew

Succeeding in setting up a solid governance structure where RTO members commit to tasks defined and financed through MADE and MADE see to follow up and communicate the results and learnings

3. National/regional co-operation: how to generate and operate nationwide network of companies & R&D actors?

MADE as National cluster regional outreach first through RTOs,

now own regional representation, DK is a small country

4. What kind of impact analysis do you conduct? Does the state have some model / indicators for you to fulfil?

Research platforms: registration of hard economic figure results + others supplementing economic figures.

All innovation projects based on project description and self-evaluation of impact

Elaborations on reporting ,on public financed projects ...)

5. Prospects of growth and internationalization of Danish companies/manufacturing industry? How do you support these prospects?

(answer part of IntNat. presentation slides-) *MADE focus on manufacturing in DK*

One stop shop awareness of MADE's activities in DK and partners in EU to reach out to for learnings, inspiration and specific issues

From few project participations towards more activities integrated with DK initiatives, i.e. EDIHs

From start no export only DK based activities, but small opening towards including DK companies' manufacturing abroad linked to DK

Thank you for listening

Questions, dialogue and perspectives



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MADE – Manufacturing Academy of Denmark

One-stop-shop for Advanced Manufacturing (since 2014)



MADE has 3 tracks:



Research

Always in collaboration with industry

Present platform: MADE FAST



Innovation

Danish industry engagement, specifically SMEs

National Cluster for Advanced Manufacturing



Education

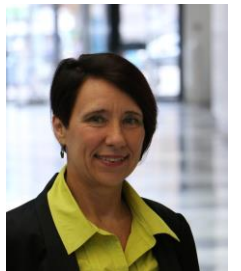
Shaping future education

Learning Factory initiative



Key figures:

- 250 out of 274 members are industrial, 85 % SMEs
- Part of **AddSmart** + TechCircle EDIHs + **EDIH4MANU**
- EU projects now: Trans4mers.eu , AIREDGIO 5.0,
- 16 employees in MADE , www.made.dk



Call me: Merete Nørby mnorby@made.dk +45 2112 3991

Hvad er MADE?

Hvad er MADE egentlig? Bliv klogere i videoen her, hvor virksomheder, universiteter, foreninger og vidensinstitutioner fortæller om arbejdet i Danmarks produktionsklynge.



MADE er samlingsstedet for Produktionsdanmark - både når det gælder SMV'er som C.C. Jensen eller giganter som Aalborg Portland eller Siemens.

32 startups får hjælp i Inkubator

Der er nu 32 startups med i MADE's Manufacturing Incubator, som hjælper iværksætterne fra prototype til reel produktion.

Startup-virksomhederne udvikler forskellige produkter som f.eks. en løsning til korrekt intravenøs medicinering, et ultralet klaver, der kan adskilles og transporteres, en cloudløsning til after-sales service på industrimaskiner, og en løsning til at høste termisk energi fra maskiner i produktionen og omdanne det til elektricitet.

I december blev de to første fælles aktiviteter afviklet: En online Expert Session om robust design og et fysisk møde med fokus på udvikling og test af et Minimum Viable Product.



2023 indledes med en lang række aktiviteter, både online og fysisk, hvor de deltagende startups får viden fra eksperter og erfaringer fra andre iværksættere. Det er blandt andet rådgivnings- og produktudviklingsvirksomheder, der deler viden om produktdokumentation, CE-mærkning, patentbeskyttelse og opsætning af værdikæder.

MADE's Manufacturing Incubator er en del af den landsdækkende indsats Beyond Beta.