Industrial and academic time-scales and modes of working – can they ever be compatible?

Jesper Friis & Natalia Konchakova

Industrial and academic time-scales and modes of working – can they ever be compatible?

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From "Modern Times", Charlie Chaplin

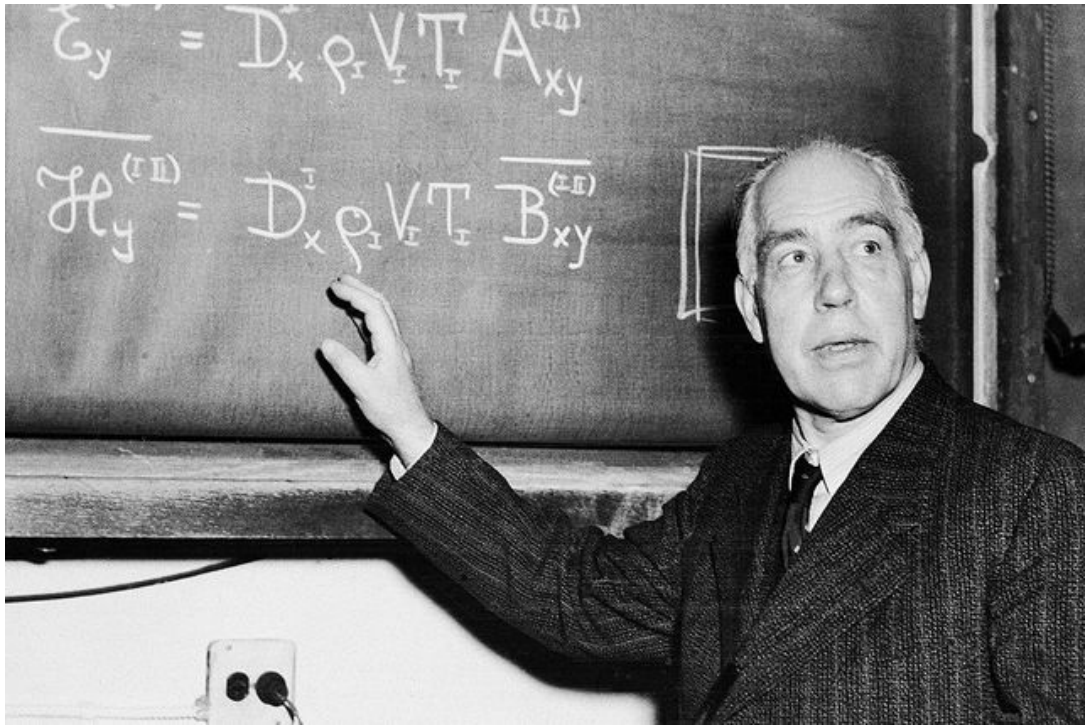


Photo: Alain Richard

Drives academic and industrial research

Both industry and academia do push & pull

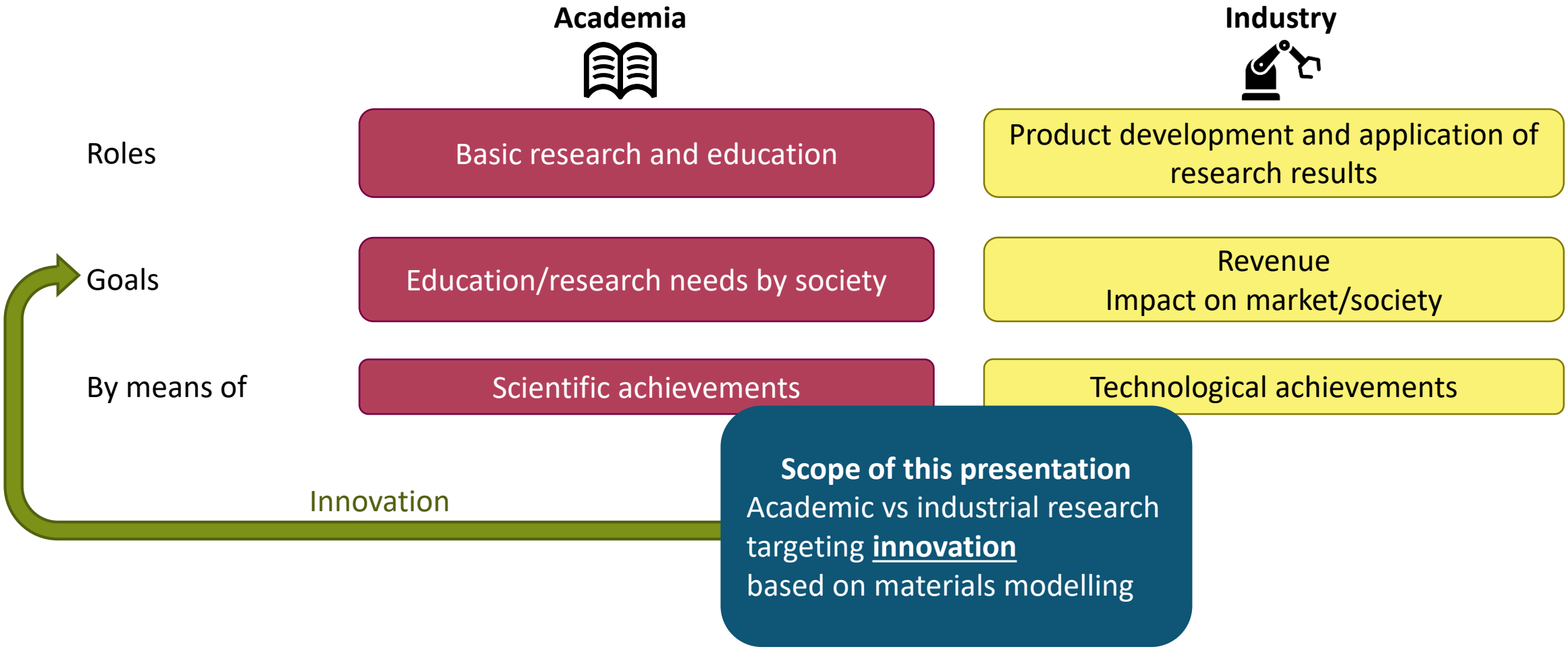
Push

New technology/knowledge
May create a need

Pull

Demands by market/society
Filling a need

Limiting the scope of this presentation

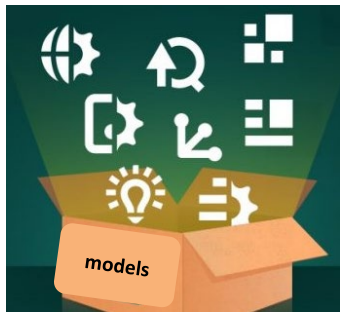


Enabling innovation

Translating industrial challenge/problem into a solution (with help of modelling)

Industrial world

- Often not aware of the full potential of modelling
- Often needs guidelines in selecting the suitable modelling workflow(s) for solving their problem(s)



Academic world

- Often not fully aware of the nature of industrial problems

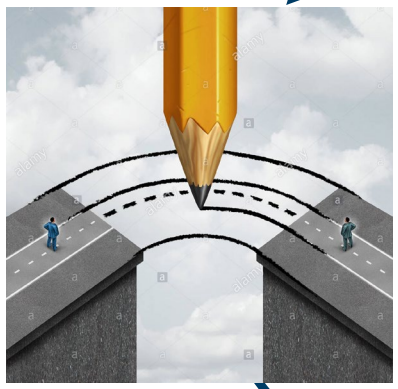
Translator

- Expert(s) performing translation; bridging the gap between academia and industry
- Understand both worlds and speak both languages!
- Multi-professional specialists or team of professionals
- A **role**

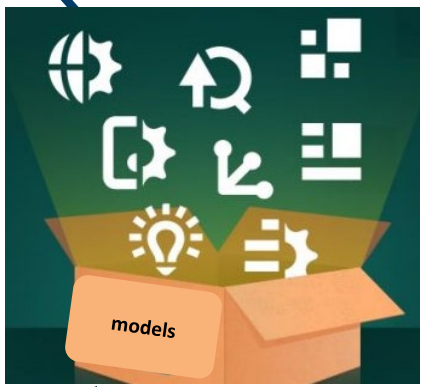
Adapted from: *EMMC lecture at* EuroNanoForum 2019: Translator Guiding Industry in Decisions

The translation process

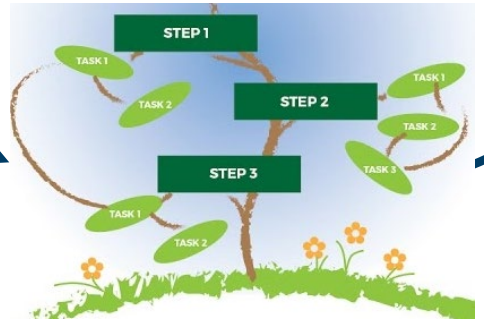
Analysis of the industrial problem



Translation process:
usually **iterative**



Translation into parts that can be simulated



Interpretation of modelling outcome

Building modelling workflows

Source: *EMMC lecture at* EuroNanoForum 2019: Translator Guiding Industry in Decisions

Translation tasks

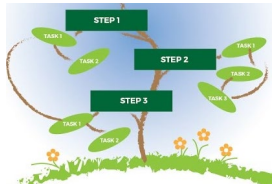
Understands the business case

Understands the industrial case

Industrial/Business case
- Expected outcome & impact
- Budget, risks & timeline
- Technical problem definition and specifications
- KPIs

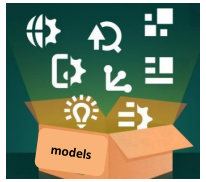
Analyse the available experimental and modelling data

Translate to (preferably more than one) modelling workflows



Propose modelling executor(s) and strategy for model validation

Translation to modelling solution
- **Data assessment** (existing data, quality, additional data) → investment: dedicated experiments
- Proposed **models** (types and criteria, model accuracy) → investment: software, additional R&D
- Propose who/where the workflow is executed. How should the results be validated?



Translate the modelling results to information that is understandable, reliable and usable for the client

Interpret modelling results & evaluation
- recommendations
- evaluation of the translation process

Based on: Translators Guide
https://emmc.info/translation-and-training-for-companies-resources

Skills required by the translator

- Industrial background
- Knowledge of economic impact
- Deep and broad knowledge of modelling
- Broad understanding of different experimental techniques and data analysis
- Software and analytical skills
- Communication skills
- Project management
- …

*The Translator is often not an individual person but a role which is usually best fulfilled by a **team of people** with the required skills!*

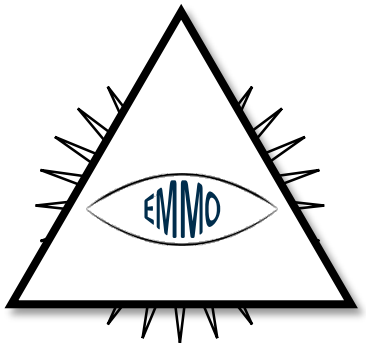
Common language and standardisation

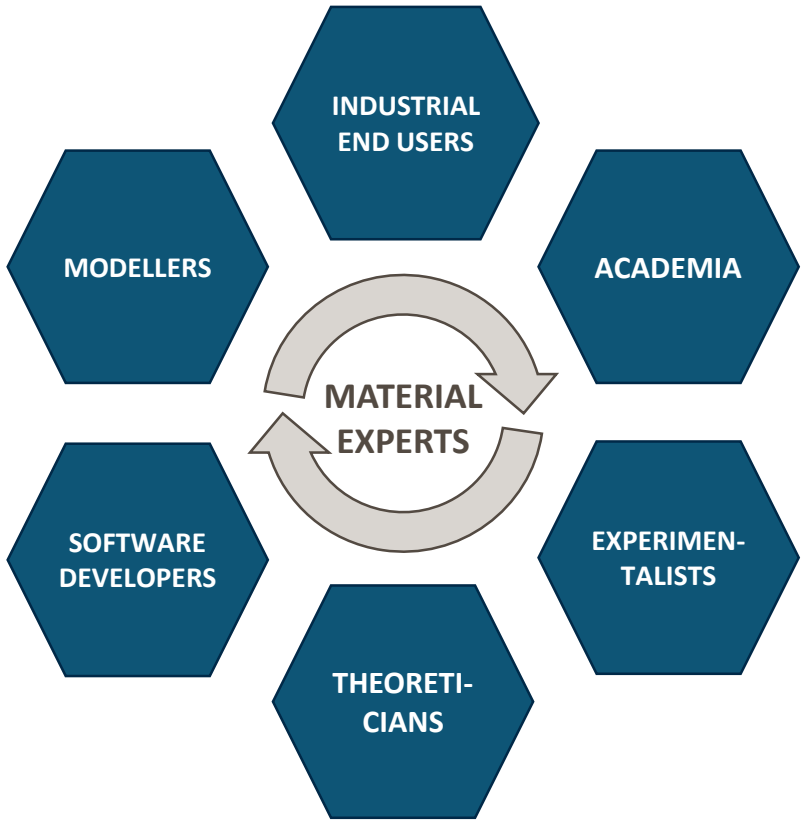
Modelling of industrial problems is **multidisciplinary**
Requires combining different models and materials data

EACH COMMUNITY
HAS ITS OWN TERMINOLOGY
AND WAYS OF REPRESENTING DATA

Translator has to talk and understand the language of each community and formalise it digitally

Using a **common representational framework**, like the European Materials & Modelling Ontology (EMMO) is a key enable cross-disciplinary modelling and data shareing





Who can act as a translator?

University scientist

- peak competences, state-of-art
- basic & applied research
- broad access to experimental & modelling facilities
- aim: basic knowledge

Contract researcher

- experts, broad competence
- applied research targeting needs by society and industry
- access to experimental & modelling facilities
- aim: value creation for customer

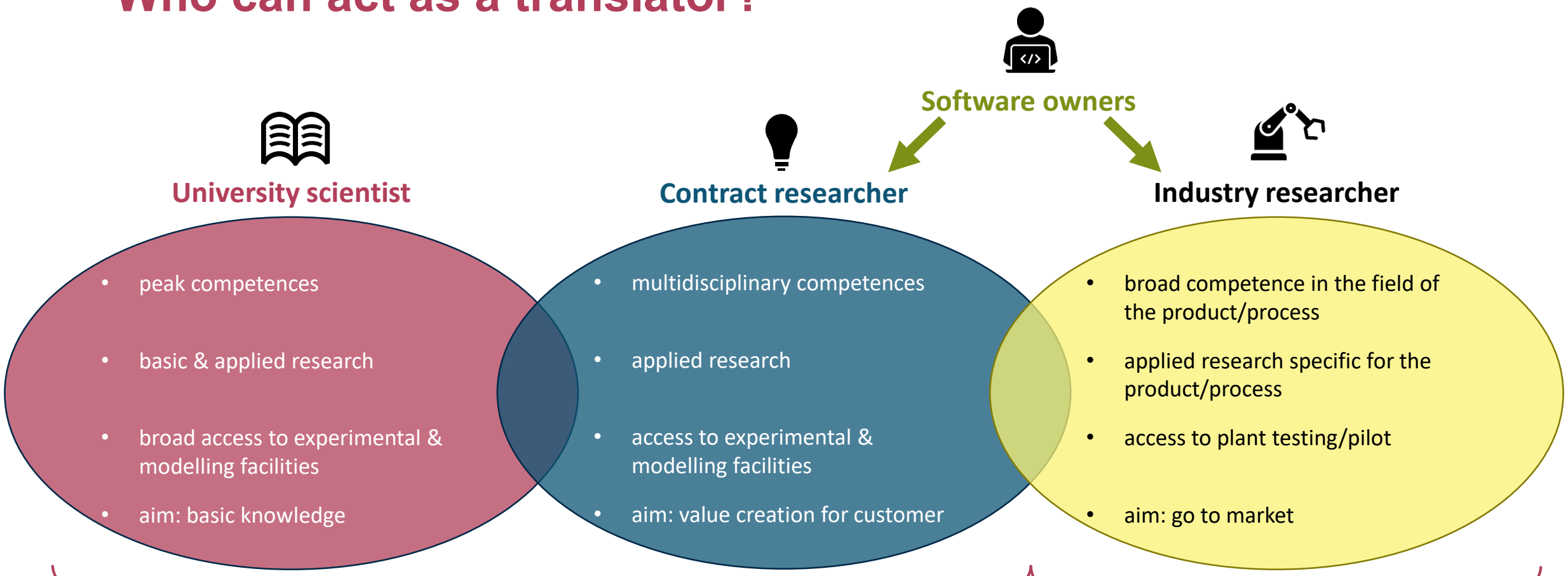
Software owners

- experts in the field of the software
- applied research dedicated to the software
- access to latest features of own software
- aim: improve the software and create value for users

Industry researcher

- experts in the field of the product/process
- applied research specific for the product/process
- access to plant testing/pilot
- aim: go to market

Who can act as a translator?



External translation
Independent of the client

Internal translation
Translation for their own company and/or company's customer

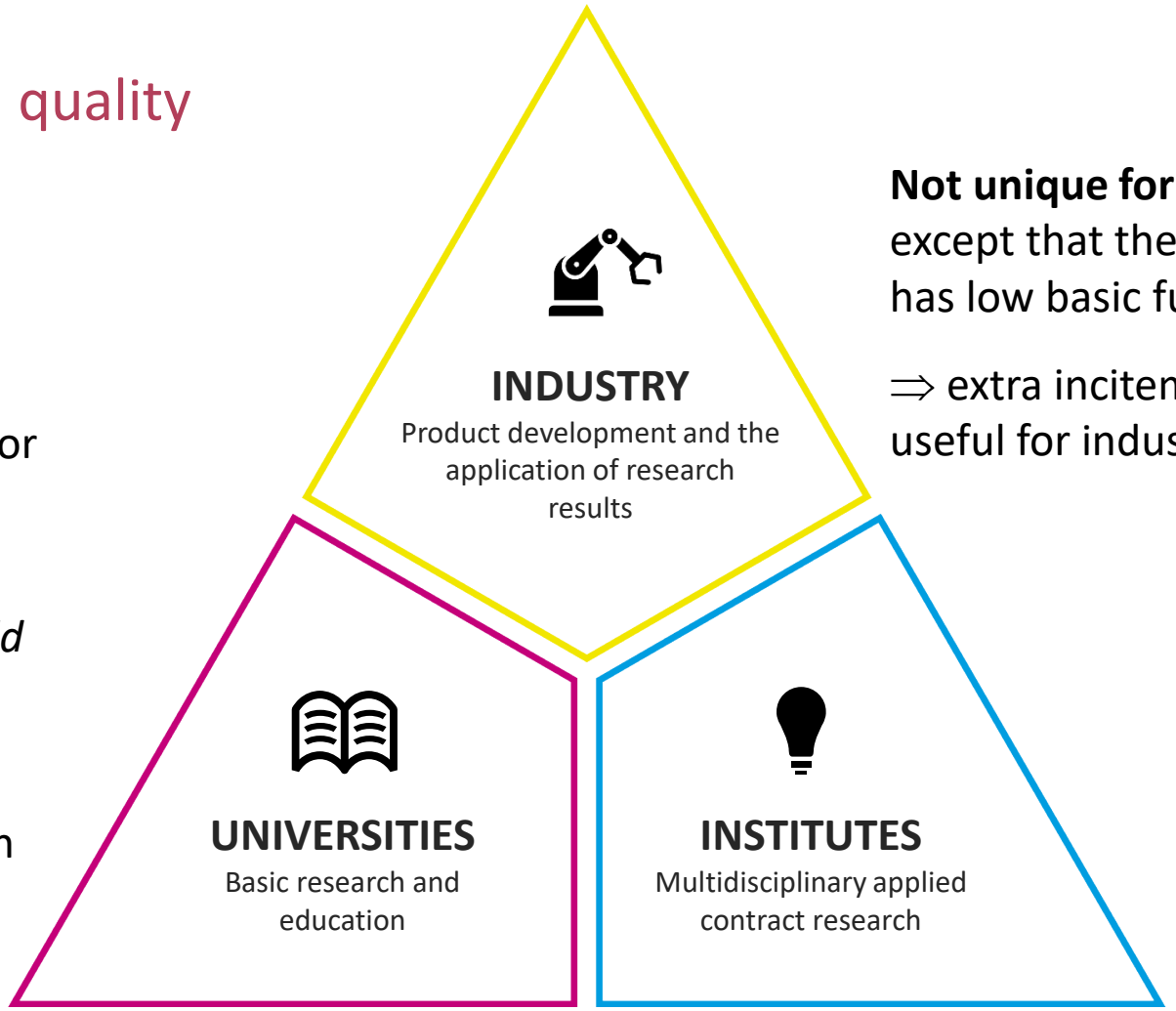
The "Norwegian" model

…for generate innovation and high quality

NTNU was ranked as number one for collaboration with industrial partners.

Times Higher Education (THE) World University Ranking in March 2017

Main reason: the close cooperation with SINTEF & Equinor



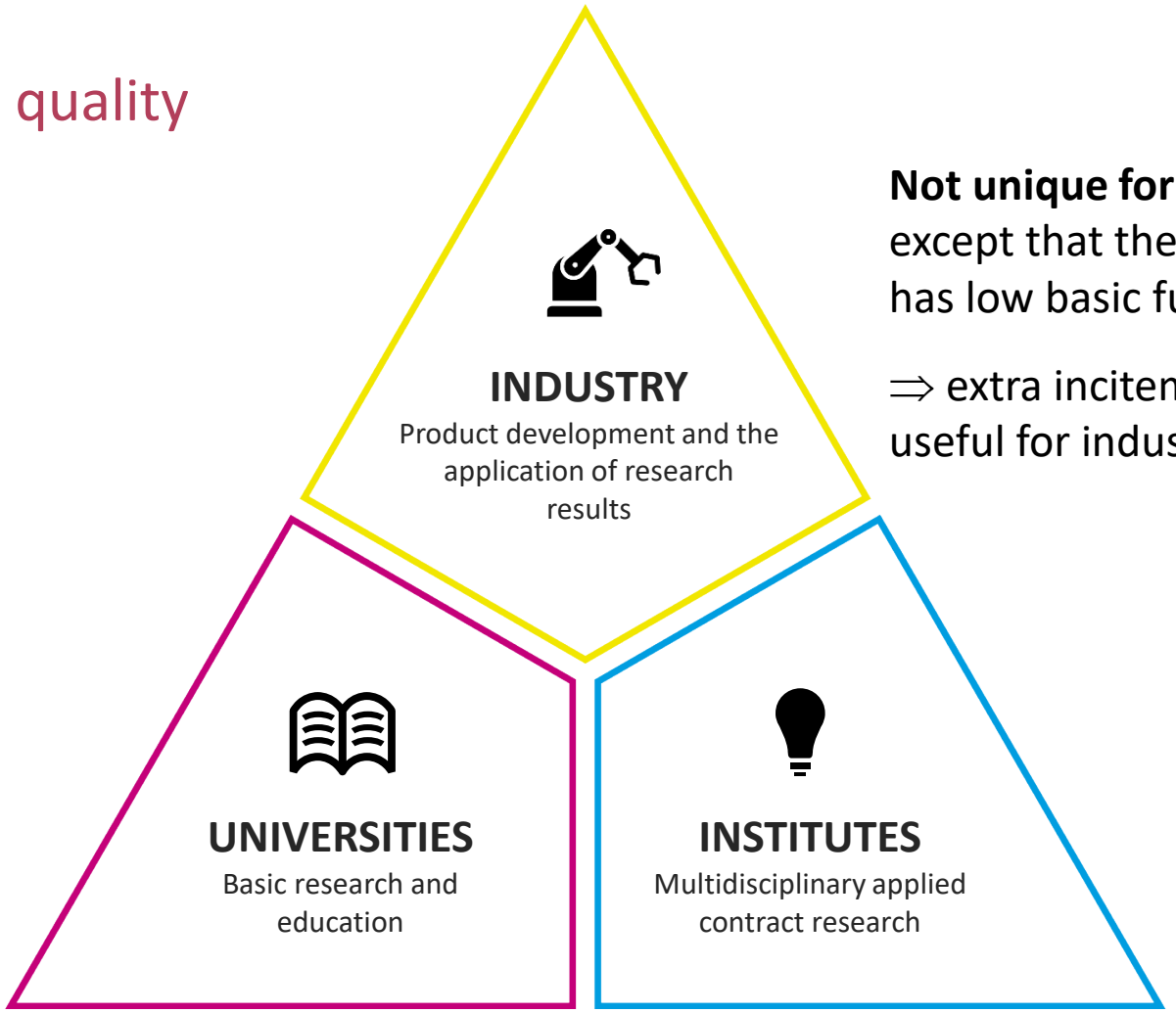
Not unique for Norway… except that the institutes has low basic funding

⇒ extra incitement to be useful for industry

The "Norwegian" model

…for generate innovation and high quality

Public funded innovation projects typically involve all 3 actors



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Industrial and academic **time-scales** and modes of working – can they ever be compatible?

University scientist

Contract researcher

Industry researcher

	University scientist	Contract researcher	Industry researcher
Internal projects			Setup: days-months **days - years**
Direct projects	Setup: days-months **hours - years** often 1 PhD, 3 years	Sale: days-months **weeks - years**	Offer: days-months **weeks - years**
Public funded projects	Application: 0.5-1 year **~2-5 years** often 1 PhD, 3 years	Application: 0.5-1 year **~2-5 years**	Application: 0.5-1 year **~2-5 years**
Strategic	**years** often 1 PhD, 3 years	**years**	**many years**

Special considerations for SMEs

SMEs Specific

- Technology / competitive edge
- Often shorter time-scale
- Agile in decision making

- Limited access to internal translation
- Cost of ownership of expensive modelling software may be too high

Tools for effective Translation

Efficiency and Neutrality

Open Translation Environment

Access to Models and Data

Materials Modelling Marketplaces

Standardisation

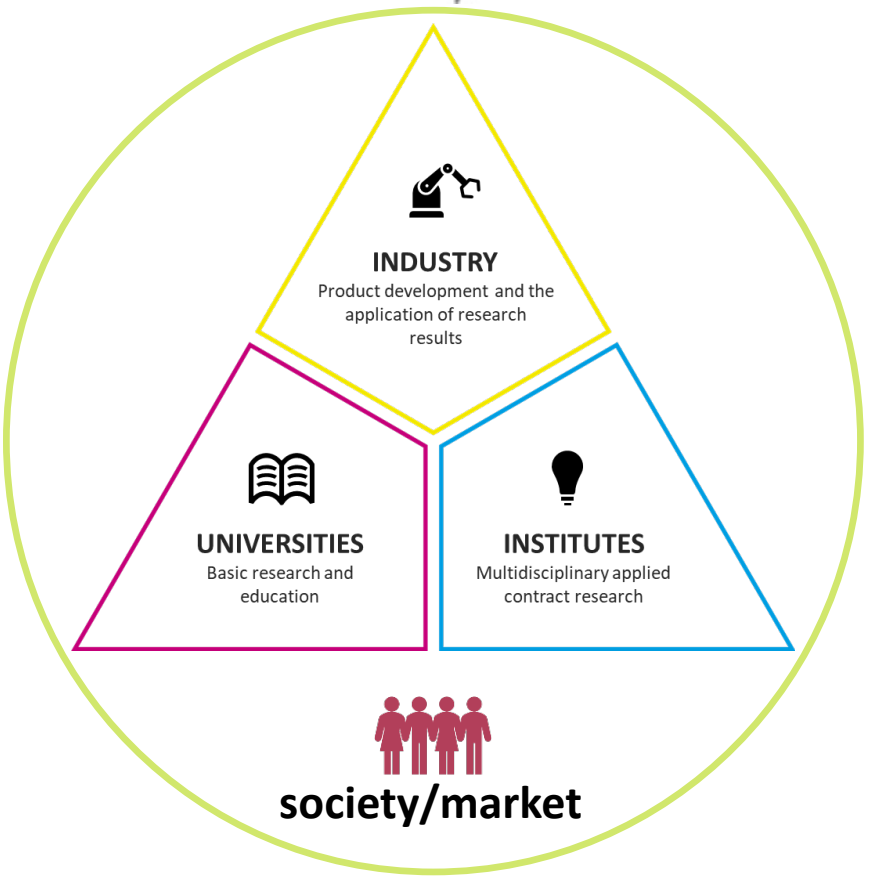
Ontology (EMMO) and **MODA**

Translators pick up industrial challenges, transform them to modelling workflows, and guide manufacturers in execution and interpretation of modelling results

Source: EMMC Roadmap https://emmc.info/main/roadmaps/

Rounding up

- **Innovation** typically involve industry 3 agents
  - Universities ↔ institutes ↔ industry
  - Different roles and modes of working
  - Comparable time scales



- Are they compatible?
  - yes, bridged by the **translator**

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SINTEF
70 år
Technology for a better society
…a result of good translation
bringing
academia, institutes & industry
together