Tackling Materials and Manufacturing Innovation Challenges with Digitalised Translation – from conceptualisation to ontology

Michael Noeske, Fraunhofer IFAM, DE
Jesper Friis, SINTEF, NO
Emanuele Ghedini, UNIBO, IT
Our perspectives

Tackling Materials and Manufacturing Innovation Challenges with Digitalised Translation – from conceptualisation to ontology

Michael: How can we accomplish innovation in manufacturing?

Emanuele: How can we understand materials and each other?

Jesper: How can we communicate and share materials data?
Translation in manufacturing

Make innovation a white box and FAIR – for us

- In manufacturing, following DIN EN ISO 9000:2015-11
  - innovation relates to a new or changed object realizing or redistributing value
  - activities resulting in innovation are generally managed.
- Translators support innovation managers by
  - performing translation, a dialogue-based semiotic process
  - translating a need into a solution.

R&D project manager → industry need → specific solution

manufacturer

human need → individual solution

end user _1

end user _2
Innovation challenges

Embrace translation in a holistic way¹

• The high-level innovation challenge is global, and so is the high-level value to be realized.

• Ecosystems are formed to
  • gain speed
  • join efforts
  • comprise further generations.

• An individual innovation case and new product is part of a global scenario.

---

¹ P. Klein et al., Translation in Materials Modelling – Process and Progress, DOI: 10.5281/zenodo.4729918
Information challenges

Embrace translation in a holistic way

• The quality of products (materials, services) is governed by the quality of information exchange.
  • The communicative key expertise “translation” facilitates mutual understanding.
  • Holistic dialogues are meant to comprise more than two stakeholders.

• Ontologies are fundamental for level-comprehensive, holistic and cooperative translation.
  • In H2020 OntoTrans, ontologizing (based on EMMO) is pathbreaking for boosting translation.
Translation challenges

Follow a human-centric way

• Translation in (natural) language:
  • dynamically applying A → D → I triades
  • for achieving “shared innovation”
  • sketch adapted2a

Diagrammatic reasoning at three consecutive levels
• “reveal the chance/challenge”
  • Abductive reasoning (firstness), intersemiotic
  • “taking your best shot”2b
• find the law to be applied”
  • “Deductive reasoning (secondness), interlingual
  • “conclusion guaranteed”2b
• habitually/customarily perform magic!
  • Inductive reasoning (thirdness), intralingual
  • “move from the specific to the general”2b

2a https://www.butte.edu/departments/cas/tipsheets/thinking/reasoning.html 2b J. Pelkey, Peircean Semiotic for Language and Linguistics, DOI: 10.5040/9781350076143.ch-14
Translation as a White Box

Communicate the way and conclude step by step

• Dialogue partners may opt for convention-based semiosis (translation),
  • e.g. DIN EN ISO 17100:2016 “Requirements for translation services”
  • e.g. DIN 6701-3:2015-12 “Adhesive bonding of railway vehicles and parts - Part 3: Guideline for construction design …”, a (check)list of requirements
  • e.g. EMMC Translators Guide³

• Stepwise conclusion among dialogue partners
  • after each A, D, or I step
  • after each A→D→I triade (“dynamic interpretant”)
  • after each of the six steps of translation in Materials Modelling

³ D. Hristova-Bogaerds et al., EMMC Translators Guide, DOI: 10.5281/zenodo.3552260
FAIR Translation and Innovation

OntoTranslator uses ontologisation

- Translators perform translation,
  - a dialogue-based semiotic process.

- In OntoTrans they also perform ontologization,
  - a further semiotic process.
  - This requires the expertise of an OntoTransLator.

FAIR Translation and Innovation

OntoTranslator uses semantic technologies (e.g. ontologies)

- Innovation in manufacturing

- OntoTransLation … … is FAIR for managers
FAIR Translation and Innovation

OntoTranslator and manager „share“ concepts

• Dialogue partners may opt for convention-based ontologisation,
  • e.g. in step OT1, Manager|Translator sketch their conceptualisation
Innovation Cases in Organisations

OntoTranslator and manager agree on project framework

- in dialogue manager|translator
  - innovation-relevant options for changes are elaborated

FAIR Translation and Innovation

OntoTranslator and manager cooperatively find a first solution

- Holistic OntoTranslation helps to translate human needs!

R&D project manager → industry need → specific solution

R&D project Manager → Step OT1

OntoTranslator

Ontology, e.g. EMMO

Step 2

End user _1 → end user _2

• Holistic OntoTranslation helps to translate human needs!
**Innovation Case in Ontology**

**OntoTranslator formalises Manager|Translator’s conceptualisation**

- following dialogue manager|translator, the OntoTranslator (team)
  - integrates objects and processes of the innovation case
    - with a FAIR framework provided by an ontology
  - realises the perspective used by the Manager
    - greatly profiting from guidance by a multi-perspective ontology, e.g. EMMO
  - links conceptualisation with (e.g. perspective-specific) ontology branch
    - concepts are related to appropriate ontological classes
    - interactions are related to ontological relations
    - individuals are related to ontological entities/things
Our perspectives

Tackling Materials and Manufacturing Innovation Challenges with Digitalised Translation – from conceptualisation to ontology

Michael: How can we accomplish innovation in manufacturing?

Emanuele: How can we understand materials and each other?

Jesper: How can we communicate and share materials data?
Our perspectives

Tackling Materials and Manufacturing Innovation Challenges with Digitalised Translation – from conceptualisation to ontology

Michael: How can we accomplish innovation in manufacturing?

Emanuele: How can we understand materials and each other?

Jesper: How can we communicate and share materials data?
The OntoTrans project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement No 862136.