

Translating innovation challenges: the OntoTrans approach



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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.



Innovation challenges

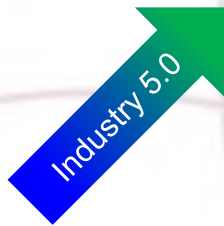
Embrace translation in a holistic way¹

- The **high-level innovation challenge** is global, and so is the **high-level** value to be realized.
- DIN EN ISO 9000:2015-11 uses a process approach for managing activities,
 - each organization's processes may operate as a complete integrated system.
- ⇒ In view of global challenges, managed ecosystems are being formed to
 - gain speed
 - join efforts
 - comprise further generations.
- ⇒ An individual innovation case and new product is part of a global scenario.

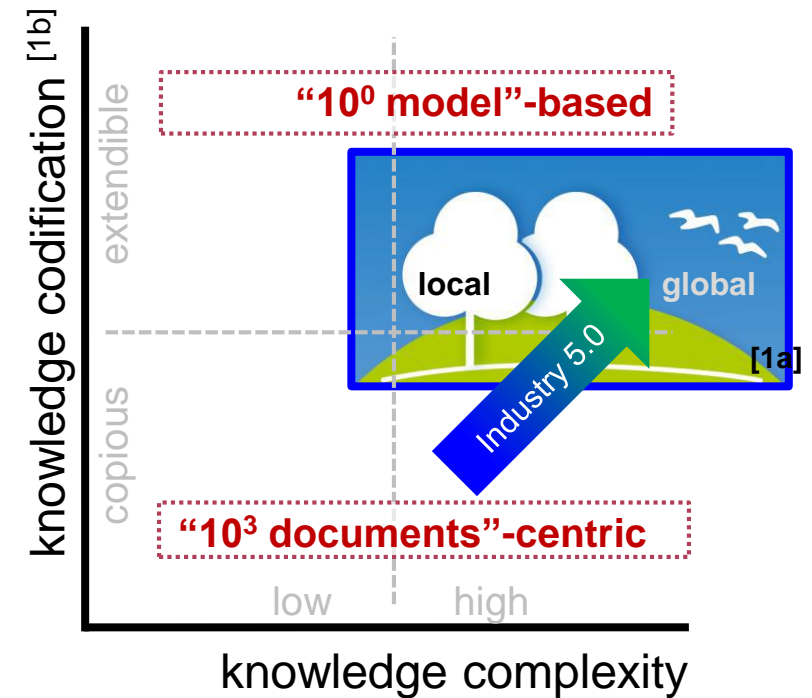
¹ P. Klein et al., Translation in Materials Modelling – Process and Progress, DOI: 10.5281/zenodo.4729918

Innovation complexity

Embrace individual documentation and communication



- Each innovation case **input** is complex.
- Impact of **innovation outcome** is global.
- ⇒ Increased customer **value** is aspired,
 - e.g. by co-innovation with (**human**) users.
- ⇒ Relevant information is required,
 - i.e. relevant {data + meaning}.
- ⇒ Missing data is to be generated,
 - rooted in documented concepts;
 - for achieving end-to-end solutions.



... from manufacturer's perspective

^{1a} B. Mayer et al., Circular Economy and Adhesive Bonding Technology, DOI: 10.24406/iml-n-603186, ^{1b} plot adopted based on Xie et al., DOI: 10.1016/j.technovation.2015.12.002

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.

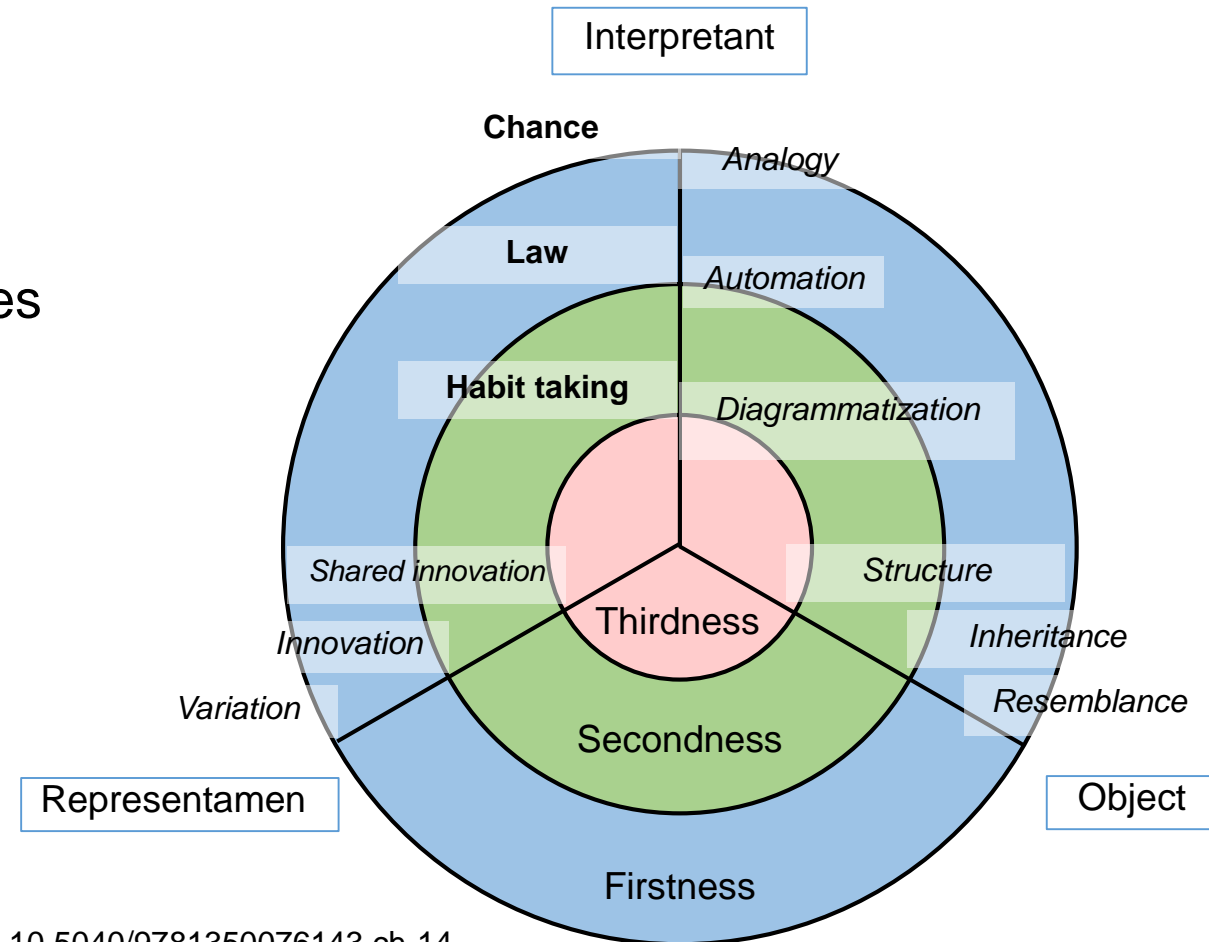
Translation challenges

Follow a human-centric way

- Translation in (natural) language:
 - dynamically applying $A \rightarrow D \rightarrow I$ triades
 - for achieving “shared innovation”^{2a}

Diagrammatic reasoning at three consecutive levels

- “reveal the **chance**/challenge”
 - **A**bductive reasoning (firstness), intersemiotic
 - start “from the best fitting guess”^{2b}
- find the **law** to be **applied**”
 - “**D**eductive reasoning (secondness), interlingual
 - “conclusion guaranteed”^{2c}
- **habit**ually/customarily perform magic!
 - **I**nductive reasoning (thirdness), intralingual
 - “move from the specific to the general”^{2c}



^{2a}sketch adapted following J. Pelkey, Peircean Semiotic for Language and Linguistics, DOI: 10.5040/9781350076143.ch-14

^{2b}Upmeier zu Belzen et al., DOI: 10.3390/educsci11090495; ^{2c} <https://www.butte.edu/departments/cas/tipsheets/thinking/reasoning.html>

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 **Guide**³

⇒ e.g. using today’s document-centric input for each innovation case
- 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

⇒ e.g. towards a model-based approach in OntoTrans

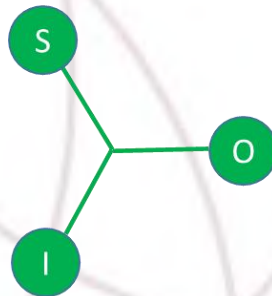
³ D. Hristova-Bogaerds et al., EMMC Translators Guide, DOI: 10.5281/zenodo.3552260

Translation as a process

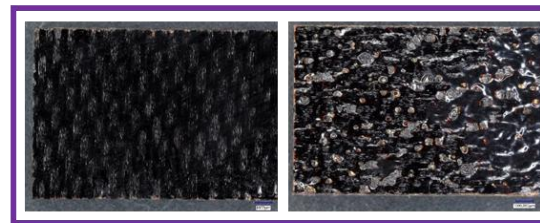
... starting from input perceived from distinct perspectives

⇒ A dialogue partner may not immediately “understand” surprising input

S ... sign
I ... interpretant
O ... object



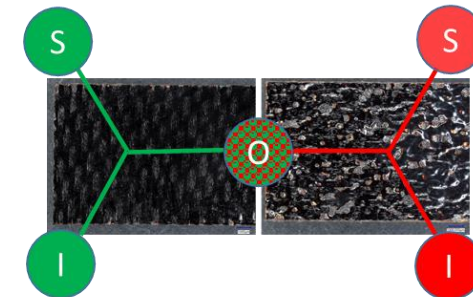
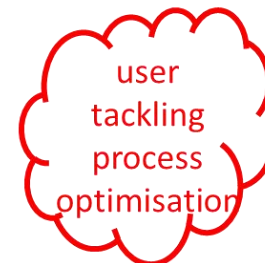
O ... a photograph of real-world objects



Observer 1



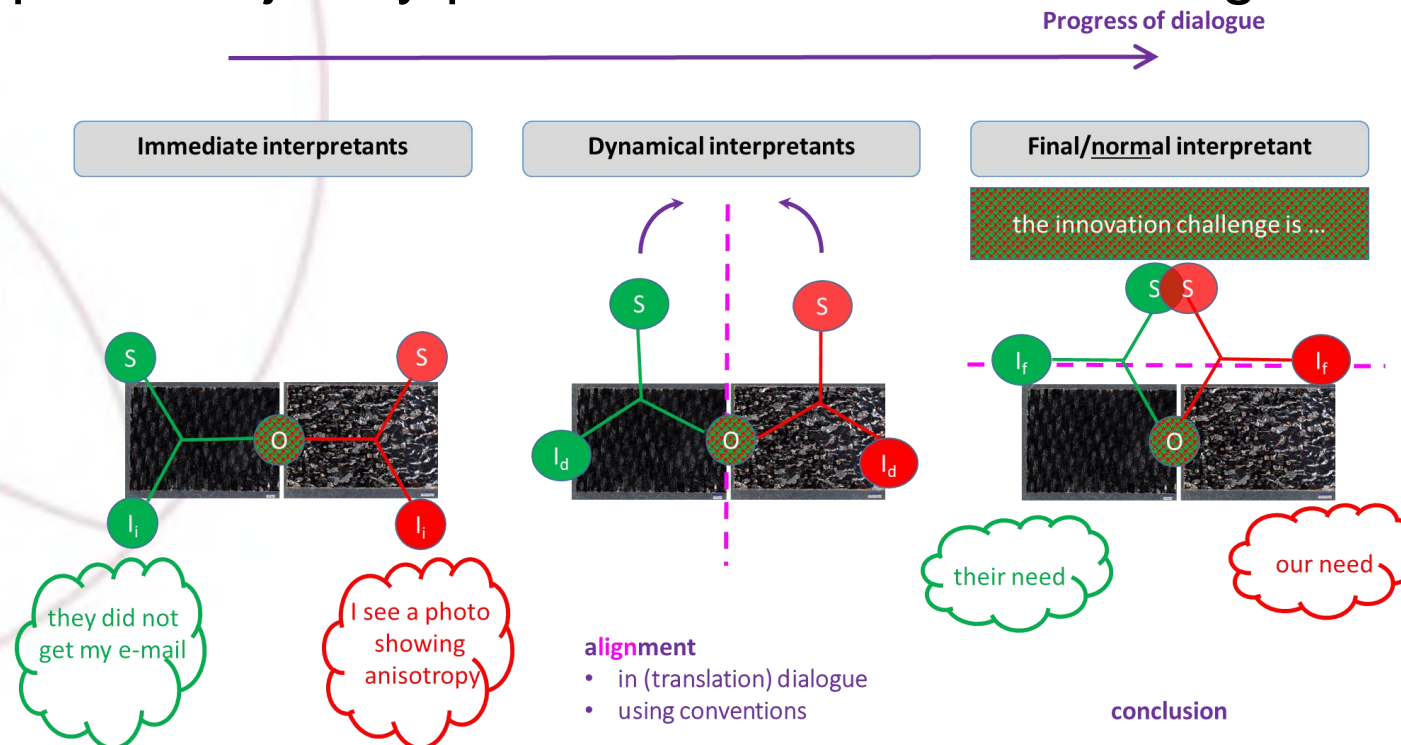
Observer 2



Translation as a dialogue

Cooperation to understand the innovation challenge

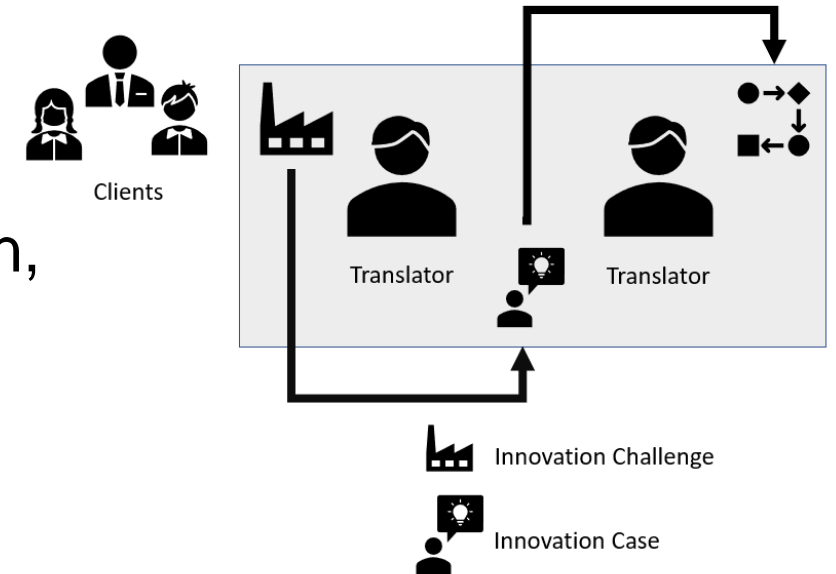
- Dialogue partners jointly perform abductive reasoning and conclude



FAIR Translation and Innovation

OntoTranslator uses ontologisation

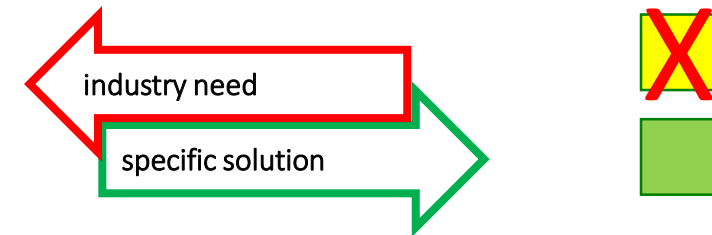
- Translators perform translation,
 - a dialogue-based semiotic process.
- In OntoTrans they also perform ontologization,
 - a further semiotic process.
 - This requires the expertise of an OntoTransLator.



FAIR Translation and Innovation

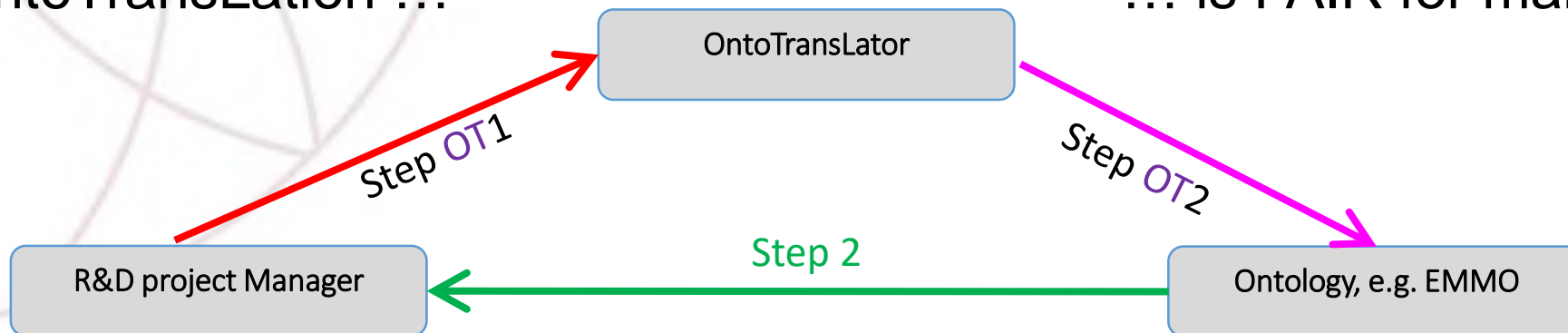
OntoTranslator uses semantic technologies (e.g. **ontologies**)

- Innovation in manufacturing



- OntoTransLation ...

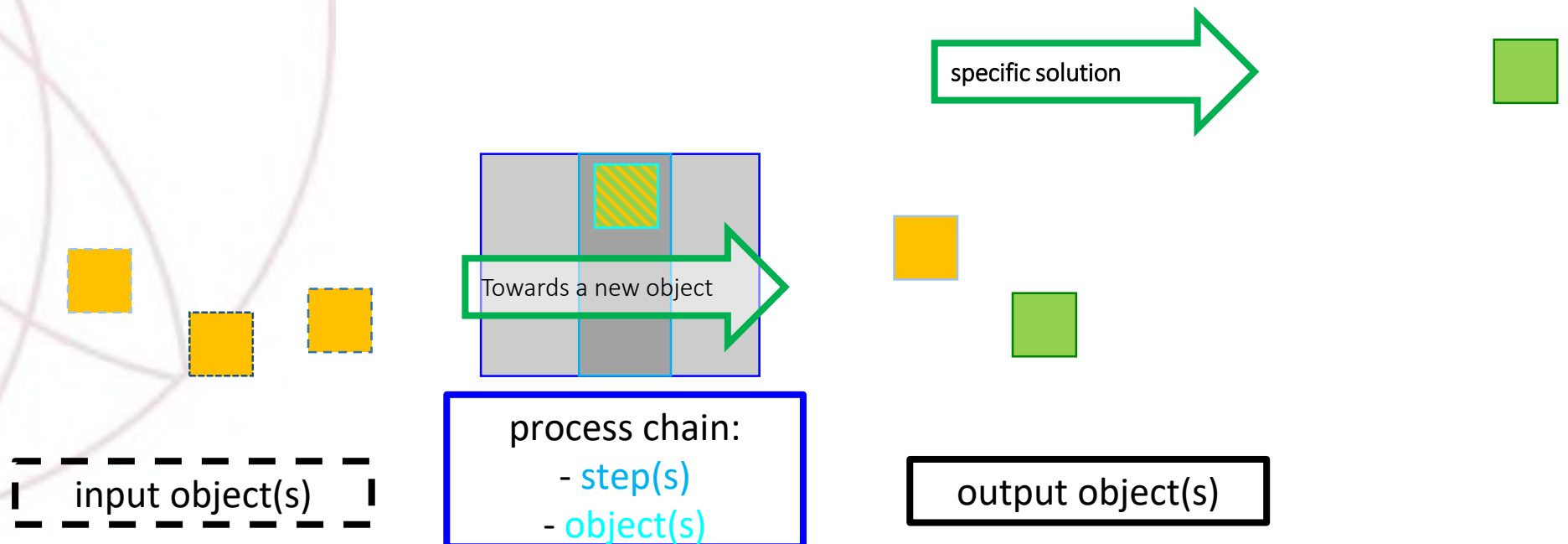
... is FAIR for managers



FAIR Translation and Innovation

OntoTranslator and manager „share“ concepts

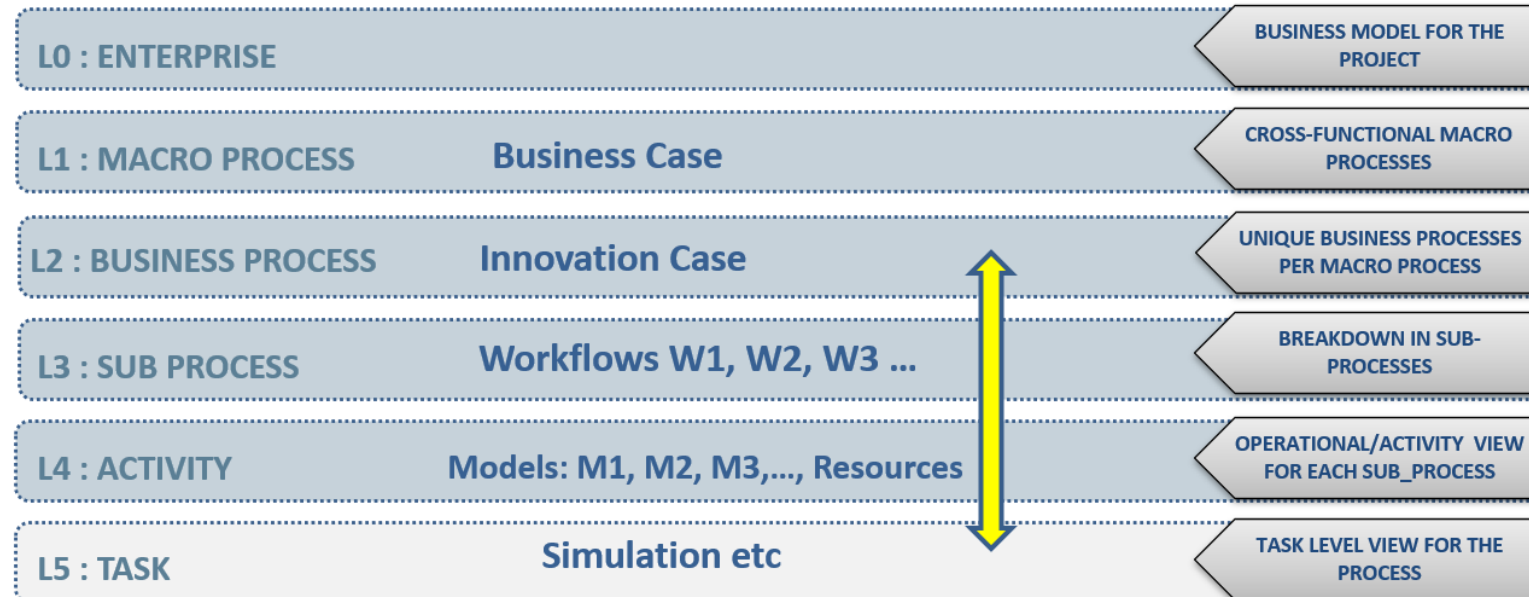
- Dialogue partners may opt for convention-based ontologisation,
 - e.g. in step OT1, Manager|Translator sketch their conceptualisation



Innovation Cases in Organisations

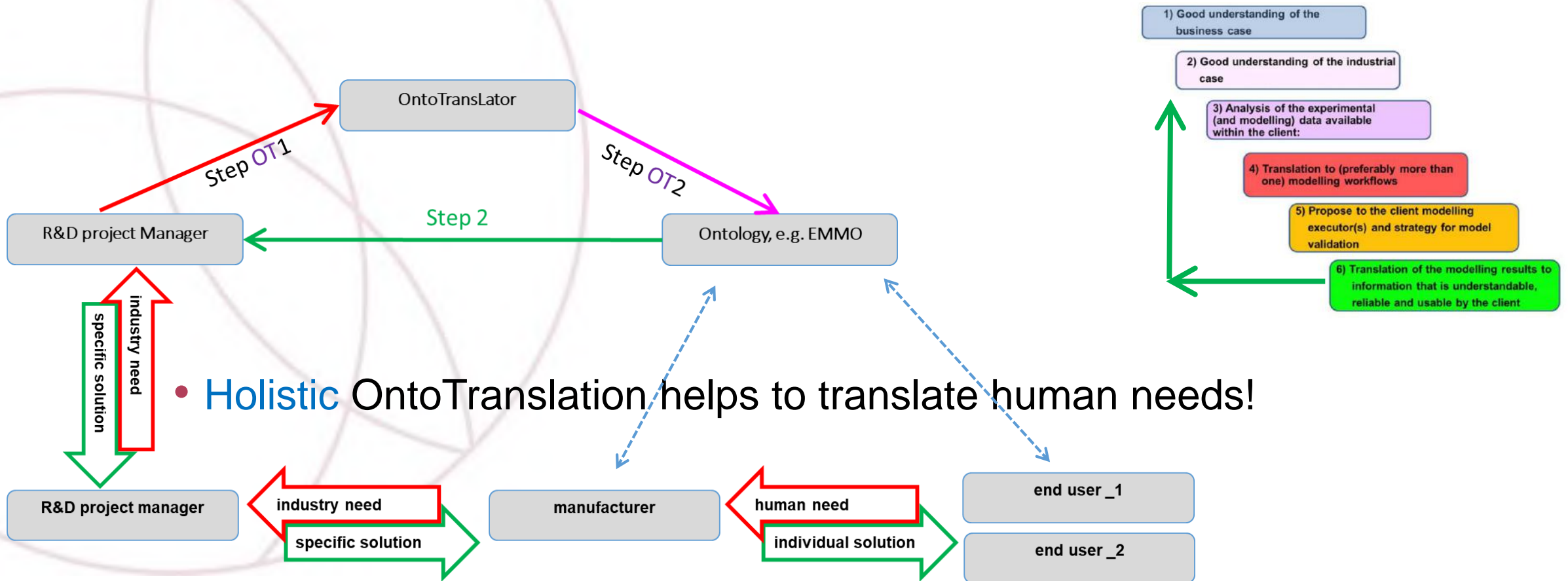
OntoTranslator and manager agree on project framework

- 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!

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
 - clears the way for an integrated model-centric engineering approach



*Thank
you!*



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