



EMMC-CSA
European Materials Modelling Council

Report
Sessions on
Translation and Training for Companies
within the
EMMC International Workshop 2019
FEB 25-27, 2019, Vienna Austria

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1. Executive summary

1.1 *Description of the deliverable content and objectives*

The EMMC International Workshop 2019, organized in Vienna on 25-27 February 2019 has been an invitation-only event, that was attended by more than 170 European and International Experts to discuss and contribute in setting a common direction among stakeholders in all areas of Materials Modelling. The outcome of this event will form the basis of the EMMC Roadmap 2019.

Three sessions were organized by the EMMC Working Group "Translation and Training for Companies", namely:

- Session 3: Towards the Translator as a key professional
- Session 6: Translation for and by SMEs
- Session 9: Training for translators, with emphasis on economic concepts and skills

The objectives of the three sessions are as follows. For Session 3, to outline strategy to establish and to further develop the role of the translator as a key player in enhancing the industrial use of modelling. For Session 6, to highlight the benefits of using material models in SMEs and to make SMEs more aware of how they can use materials modelling for value creation. For Session 9, to provide an overview of the training requirements that have been identified for the Translators, with particular regards to the economic concepts. This document reports a summary of the invited talks at the abovementioned sessions and the related discussion with the experts attending the meeting. These latter discussions have allowed to collect valuable feedback to the objectives of the three sessions, which is reported in the next section in a summarized form.

1.2 *Major outcome*

The main outcome of the three sessions can be summarized as follows:

Translator as a key professional

- Translators need to have the list of existing models
- It is extremely useful to provide for Translators online collaborative tools
- To develop/provide new success stories/ translation cases
- Translators can invite subcontracting for the modeling projects
- The business model for translation is very important
- Role of Translators is identified as key enabler for Ind. 4.0

Translation for SMEs

- Identifying the business case, especially stating explicitly and clearly the benefits
- Using the SW already used by the client
- Inform about success stories. Best practices.
- Talks in industry-specific meetings or SME clusters
- Infographic or Fact sheets; Short Videos
- Marketplaces: Lower the cost and time the SME need to spend
- Translators should be trained for SME communication and special needs
- Public funding to mitigate the economic risks
- Creating free access repositories with case studies



Training for translators

- Translators need economic skills.
- Costs for modelling project are referred to person-time. For the successful support of the modelling project the translation service/ consult must be convincing.
- Translator is like project manager with complex skills
- Assessing the value is mandatory – value chain, value capture of Technology, costs modelling
- Assessing the advantage – time to market
- Reducing iterations is aimed, Cycles vs. KPIs
- Knowledge on IP is beneficial
- Experience and Network towards a broader communication is expected by customers
- Academic/ student training has multidisciplinary nature (tech, soft, economic skills, ROI)
- Training issues are that there are no designed courses for that.
- Concept of training shall include data mining for industry

2. Progress report (main activities)

2.1 Session 3: Towards the Translator as a key professional

2.1.1 Overview

Chair

Denka Hristova-Bogaerds (DPI, NL)

Impulse 1

Ronan Le Goff (IPC, FR)

How to make an academic a professional translator?

Impulse 2

Yuri Kadin (SKF Research & Technology development, NL)

Modelling of surface defects in ceramics: translation of industrial challenge into modelling solution

Rapporteur

Natalia Konchakova (HZG, DE)

Session presenter at Podium Discussion

Denka Hristova-Bogaerds (DPI, NL)

Introduction

Within EMMC, translation is considered as the process of translating an industrial challenge/ problem into a solution with the help of modelling. The experts that are performing this process are called Translators. They provide a service for the companies and can be either academics, software owners/engineers, internal employees of the company or independent translators (not related to specific research/industrial institution).



Translators are primary players at the interface between industrial end-users on the one hand and software owners and modelers on the other hand. Translators support the usage of materials modelling in industrial R&D to the same level as experiments are used today.

Objectives

The session will reflect on the required skills and competences of different types of translators, with the goal to outline strategy to establish and to further develop the role of the translator as a key player in enhancing the industrial use of modelling. The objectives of the session are:

- To discuss and outline the necessary steps from academic institutions and industry in establishing/emphasizing/developing the translators' role
- To discuss the business model for translators
- To identify the most important barriers and specific bottlenecks in the translation process and in developing the translator role. Discuss how to overcome those.

Background information and documents

EMMC collected in the last few years, during different events and via online surveys, the input from various stakeholders on the translation concept and on the skills of the translators. This input was used to prepare the Translator Guide outlining the generic translation process and profile of translators. The first Translation Cases were collected, representing different types of translators and different types of industrial clients. Training sessions and webinar were organised to further explain the concept of translation to different potential translators and users of modelling.

- Translators Guide
<https://emmc.info/wp-content/uploads/2018/01/Translators-Guide.pdf>.
- Translation introduction webinar 20-12-2018
<https://polymers.webex.com/recordingservice/sites/polymers/recording/playback/a80a95b1da6843fca00735cd24939b0c>
- The EMMC RoadMap https://emmc.info/wp-content/uploads/2018/09/EMMC_Roadmap2018V5a-del.pdf.
- Training for Translators within joint ECCOMAS Conferences ECCM-ECFD 2018
<https://emmc.info/events/emmc-training-for-translators-within-the-eccm-ecfd-2018-conference/>
- Translation Plenary lectures at IWCMM27 (<http://iwcmm27.be/prog.php>, Leuven, Belgium) and CAE (<https://www.caeconference.com/programme.html>, Vicenza, Italy) Conferences



2.1.2 Summary and collected feedback

Impulse 1

Ronan Le Goff (IPC, FR)

How to make an academic a professional translator?

Conclusion, Questions, Remarks

Q- Question ; A- Answer ; R- Remark

Q1: How Translators can chose the best model ?

A1: It is very important, to give to Translators the possibility to compare the models without pay-per-use model. Translator need to have the list of existed models including the full picture of the models characteristics.

Q2: Why a client would like to use your “super-model”?

A2: Normally, the client knows our expertise and is familiar with our competence. That is why he asks to provide the modelling and simulation services for him. Moreover, in this case we have the model “in-house”. Nevertheless, you need to assure the client on the modelling results with the application of your model. However, if you do not have the “super-model” in your hand, you need to find the suitable model for your client. Moreover, you should search the model or other modeling specialists. It could be an issue.

Q3: How you can convince your client to use your model for the solving of specific problem?

A3: You need to demonstrate the “success story”.

Q4: It is well known that the first contact with client is very important for the successful translation. How do you implement the first step?

A4: We use the cooperation project to test the case and understand the client business and industrial problems. On the other side, we test and improve our model to correspond to the client’s expectations and requirements. Moreover, during the collaboration project we can estimate the recourses which would be needed to provide the modelling service for the concert problem. On the basis of the project results we prepare the “success story” to demonstrate the possibility of our models. If the client is satisfied with the project results, he would be happy to contact you again and use your model and your expertise for other cases.

Q5: It is clear that the successful translation could be executed after the first case. How difficult and expensive could be to get new expertise and prepare the new “success story”?

A5: New ideas and new models are the big challenge. You need to invest additional time and effort to achieve the suitable results. Sometimes, you need to involve new people into your group to finish the project.

R5: If we are speaking about the consulting, that the new ideas could be included into the project risks and reach until 50% of project / service consulting fee.

Q6: Neutrality is the central point of each translation service. Perhaps the automatic service is the solution of the problem?

A6: The end-user or your client is choosing the model, which would be executed to obtain the results. He takes into account the accuracy, limitations, costs and your expertise. It would be very good if translator can obtain the automatic help to receive the overview regarding the focused modelling tools. However, Translator is the expert, who needs to work with company until the end of the project and translation process to provide the modelling results for the client.

R6: It is important to collect the long-term expertise and benefits from different cases.

Q7: How do you find the translation request for your organization and right people to implement the project?



A7: I am working at the research center. It is not the business organization. For us the modelling project is the part of our scientific investigation. That is why it is not the big issue for us to find the experts in modelling of focused problems in the framework of the institute competence.

Q8: Why to be a good translator is not enough to be a good researcher?

A8: Translators need to obtain many interdisciplinary skills. That is why they need to have the interdisciplinary education or training system. Moreover, they should obtain the excellent communication skills.

R8: Maybe European universities would provide the new education system to prepare modelling translators.

Q9: What kind personal and professional skills are important to provide successful translation?

A9: Translator needs to have good modelling skills, software knowledge, project management and communication skills. Sometimes, he tries to explain the coupling of models and adaptation of specific software. He works with experts to advance the existed models. If it is necessary, he can invite subcontracting for the modeling project.

Q10: Is it translation **reusable** for customers?

A10: Yes, we deliver the model which client can use many times. However, for SMEs the translation is the one-time service. They can use the model many times as well, but they need to invite additional specialist to execute the model for other cases or modify the model. It is the relative expensive extra activity.

Q11: What needs translator to provide the professional service?

A11: Professional service is possible in the framework of the **consulting**. It is the business model which would be realistic for independent translators. Translator provides the modelling solution for customers, calculate the ROI or prepare the quality benefits, which could be an alternative description of the modelling project advantages. The discussion of **business model for translation** is very important topic.

Q12: Who provide the translation in your organization?

A12: It could be a research group or one scientist. Normally you work with the client intensive and support the circle of Translation for the good service. Anyway, the first contact is very important.

Impulse 2

Yuri Kadin (SKF Research & Technology development, NL)

Modelling of surface defects in ceramics: translation of industrial challenge into modelling solution

Conclusion, Questions, Remarks

Q- Question ; A- Answer ; R- Remark

Q1: Which translation attributes can you select as more important to provide the effective service?

A1: First of all, it is the good modelling expertise, excellent communication skills and wide overview of the relevant software and modelling tools.

Q2: How translators can find the data for the model validation?

A2: Translator can contact the experimentalists or people working in the focused area and applied the same model. It is very effective to use the professional contacts with experimental research institutes/ university experimental groups.

Q3: Do you contact your client only on the start phase of the modelling project?



A3: We update our clients constantly. It is important to give the information regarding the project progress to the customer. Interaction with the client can improve or correct the project aim and development line as well as the project estimation and expectation. However, the first step gives the most important impulse on the whole translation process.

Q4: Do you agree that the translation could be more effective in the concept of translation team?

A4: It is correct if you have a good team which can work productive together. However, you need to prepare first the strategy of the project and the team, including the risk management.

Q5: Which main risk factor can you formulate for the translation activity?

A5: Do not use any "exotic" models! In the case of new (or "exotic") model, you cannot find the information regarding the maturity of the model and cannot estimate the success of your modelling project as well as predict the client benefits from the modelling.

Q6: How long do you work to obtain the modelling and translation success?

A6: I spent 20% of my working time for the translation activity. Each model needs approximately two years to mature. We use the special government program for two years scientific modelling projects to reach the level of advanced industrial models.

Q7: How do you find the project partners?

A7: It is really important for the successful project to find the right people. To reach the aim, we use our professional contacts, ask our international project partners, and we contact groups which we find in the relevant publications.

Q8: If we speak about translation as a professional activity, how you could find people to provide the professional translation?

A8: Unfortunately, it is very difficult to find people for this task. You need to prepare your people. One possible way is to train student and build your team based on different successful projects.

Discussion points and questions

The following points summarize the issues for this session, includes the results of the survey.

- **Translator role and modelling executor role: advantages and disadvantages. What would the client prefer?**

An easy and quick solution.

To be a single person or a person working very closely with the translator. If the executor doesn't fully understand the needs of the end-customer, the value of the simulations may not be fully realized.

Individuals experienced in both roles (awareness of company needs and modelling practice) would be perfect to develop a common language.

Translator role.

Depends on the client; If skilled persons are available that can handle Simulation packages and do the translation process, they will need input only from a MOD-expert instead of the full TRANS-expert.

The main advantage of dividing the translator and modeler role is to overcome the language and understanding gap, which usually occurs. The main disadvantage is the additional step making the process probably slower.



The client prefers to talk to someone who understands (and in the end solves) its problems. This is not related to defined roles.

Most of the time the same person/institute are performing both roles.

Marketplace can be online collaborative tools where these roles can be separated and a neutrality in translation can be obtained (even if the same person/institute are registered as translators and modelers).

Translator would have a broader spectrum of the question whereas modeler will have a focus mainly on the modelling part.

If a client has internal translators, then he/she will prefer to get a modeler (in case there is a lack in modelling capability).

If a client does not have internal translators, then he/she will prefer a translator. The goal is to obtain solution.

It depends of the client profile. For SMEs & not material-focused industry: Translator will offer a great solution, as the client won't have to be a Professional in modelling

The position of the translator is near the industry and the modeler nearer the university or research Centre.

Unique (one single people)

Very aware of main industrial concerns (not only technical modelling)

- **Internal and external translators: interactions, training, pros and cons?**

Internal are preferable. Given the complexity of today's materials problems, to be a good translator it probably takes several years to become familiar with a certain domain, e.g. delayed hydrogen cracking in alloy development or design of polymers for batteries. If external translators do not carry the responsibility for delivering valuable modelling results, there could be disappointment from unmet goals due to over-promising.

Large companies: Internal translators preferred due to partly complex internal workflows, which must be considered in the modelling process (e.g. coordination of stakeholders). To be inspired by experienced external translators.

Both approaches are good, but still the main target should be education of researchers and engineers in material modelling aspects.

"External to the company, aware of modelling state of the art.

Translators are mainly needed for modelling coming from academia. They somehow replace the sales network of a modelling software company.

External translators can provide a new view on the industrial problem whereas internal translators have a better understanding of the problem and all its features.

Internal: Requires training with costs to do steps 3-6 of the translation process, but steps 1-2 come easily and at almost no cost. External: The opposite.



Internal and external translators may interact, e.g. in workshops or joint trainings. For larger enterprises, it will usually make sense to have an internal translation service, which is not the case for SMEs. Therefore, both categories are worthwhile having.

Internal translator has the advantage to know the product and the history of the R&D process in an industry and the main disadvantage is that sometimes the best ideas proceed from mixing different fields solutions.

- **Business model for translators. Market Places and Open Translation Environment?**

Seems to be a consulting business.

This is a consulting business and should be seen as such. It can be part of software/services companies or it can be provided by individuals or specialized consulting companies.

Both can help.

Market places and Open translation environments are an option. But not the only one. Translators can position themselves as consultant experts, offering their services in liaison with other existing and well introduced materials service offering businesses, such as LCA environmental consultancies, or together with modelling software companies.

Within the software vendor (e.g. FE-Developing companies are offering this nowadays); An EU-Wide Marketplace to search for experts/translators; An on-call scheme to assist internal translators.

Market places are a good way to make translation available and visible. Open translation is a difficult task in term of value creation and the appreciation of the translation service.

Yes, there must be a well-defined business model for translators. Currently, translators are either consultants or internal translators or professors from academia. This can continue in the same way but on marketplace we need to define a business model not only for translators but also for modelers, software owners and the online collaborative tools owner.

The question of IP should be a part of the business model for translators. It could be a service as well (and the translator will be paid for it).

Translation process should be paid at the right price, including translator salary. Then a business model should be developed, most likely ending in independent companies

- **Translation Cases: the benefits of having those and how to overcome the difficulties in preparing them?**

Scientific publications, patents, and the web-site of leading software materials modelling companies are good sources.

Desirable: Search functions for successful use cases. Examples for reliability testing (tool robustness).

Translation cases can be very diverse. There should be an agreement in how to classify them, by modelled phenomena, by materials type, etc. This would facilitate identifying which cases are missing. It would also facilitate target modelling users finding relevant cases to them.

Cases might be too generic, unreadable for the industry end-user (e.g. MODAs);



Provide specific translation "modules" that can be reused in future translation (e.g. material modelling of metals can be used in translation for crash and NVH?)

It is very beneficial for each translator, to have a set of successful translation cases (e.g. a "case book"). The main difficulties arise, because it is just not common to write these cases. It should be a common practice for every translator to keep track of every translation activity in the sense of a translation case, which can be very short, specific, and quickly to write. The template provided should aim at making the process as quick as possible with less focus on the details.

The cases are the best to demonstrate the added value of translation. The main difficulty is to find a global / relevant example for a wide range of clients' translation cases are mandatory to convince clients and users. Money should be found to develop them prior the translation offer is on the market.

- **Translation Profile: How can Translators increase their visibility? How client can understand /estimate the level of the translation expertise?**

This is a question of marketing professional services and can use the same media. In any business, marketing and sales, i.e. the winning of customers requires very significant investments and skills.

Exemplary simulation cases could help. By creating free access repositories with case studies.

Establishing joint actions with other agents already visible: OEM of manufacturing equipment companies, manufacturing service providers, RTOs, consultancies.

Visibility: Trough integration into the software-packages; Trough industry-interest groups;

Expertise: In Marketplace reviews/recommendations?

The visibility for internal translators should be handled in the corporate boundaries and is depending on the relevant industry. For external translators, a joint e.g. marketplace with translators presenting their casebooks and experiences might be a first step. However, this is a marketing question.

Participating in scientific meetings, EU-projects, national associations or clusters...

Translator should prove (curriculum vitae) to gather knowledge and +/- experience in:

- Technical materials modelling. Preferably in a given material class.
- Business and management.
- Intellectual properties issues
- Appropriate laws.

2.1.3 Conclusions

- To choose the best model Translators need to have the **list of existing models** including the full picture of the focused models potential and limitations, relevant software and modelling tools.
- To convince the client to use the recommended model for the solving of specific problem Translators need to demonstrate the "success story". It is extremely useful to provide for Translators online collaborative tools for the collection and selection of the **translation success stories** (including the client business and industrial problems, specific requirements /modelling service, project costs and recourses, model accuracy, limitations, and translator's expertise). Moreover, the online collaborative tools should have the option to involve new users and **update** the sources constantly.



- To develop/provide **new** success stories/ translation cases translators can use results of new modelling project. **Project risks** should be included into the project estimation and could reach until **50%** of consulting service fees of the project. To **minimize** the project **risks** translators, need to avoid to use the *“exotic” models*. **New model** needs approximately **two years** to mature and reach the level of advanced industrial model.
- Translation is **reusable** for companies. Large companies utilize the translation results many times. However, SMEs use the modelling results not many times: the company needs to involve additional specialists to implement the model for other cases or modify the model.
- **Automatic tools** can help a translator to receive the overview regarding the focused modelling solution. However, **Translator** is the expert, who needs to **work** with company **until the end of the project** and provide the modelling results for the end-user/ client. Translators collect the long-term expertise and benefits from different cases.
- Translators work with experimental and industrial experts to advance the existed models. If it is necessary Translators can invite **subcontracting** for the modeling projects. Translators use their **professional** (international and interdisciplinary) **contacts** to invite the right people to modelling project realization.
- Translation as a Professional service is possible in the framework of a **consulting**. The **business model for translation** is very important open subject which should be discussed in the details.



2.2 Session 6: Translation for and by SMEs

2.2.1 Overview

Chair

Jesper Friis (SINTEF, NO)

Impulse 1

Amit Bhave (CMCL Innovations, UK)

Synthesis of desirable nanoparticles and reduction of unwanted nanoparticles: Translation process and learnings

Impulse 2

Nicola Gramegna (Enginsoft S.p.A., IT)

Material modelling in Design chain of lightweight components

Rapporteur

Micol Pezzotta (SINTEF, NO)

Session presenter at Podium Discussion

Jesper Friis (SINTEF, NO)

Introduction

A wider use of material models will make European SMEs more competitive on the market. The potential of material modelling for shortening the product design phase and decreasing the production costs is recognized by the manufacturing industry across Europe, including SMEs (EMMC roadmap 2018). In this session we illustrate and discuss the importance of materials modelling for SMEs through successful examples.

Objectives

The objective of the session is to highlight the benefits of using material models in SMEs. We want to make SMEs more aware of how they can use materials modelling for value creation. Further, we want to discuss how to facilitate the use of material models by SMEs. Peculiarities of the translation of industrial problems of SMEs to material modelling will be discussed as well as hindering factors and the role of translators. Another aspect that will be discussed is how to make research more easily accessible for use and implementation in industry, in particular SMEs. Briefly the objectives of the session are:

- Present and discuss additional challenges for translators for SMEs.
- Discuss common practice and ways of making translators, and thereby material modelling, *more accessible* to SMEs. By more accessible, we mean easier to find translators and easier to understand or use material models.
- Discuss ways of making the use of translators and material models *more attractive* to SMEs. More attractive is related to the capability of creating value.



Background information and documents

Applications of material modelling for both the materials and manufacturing process design have been demonstrated but is not yet common practice. Ease of use, level of accuracy and inability to answer specific questions in a timely manner are recognized as some of the obstacles to a wider use of materials models. Investments in terms of people (expertise), infrastructure and capital as related to potential benefits need also to be considered, especially by smaller companies.

As materials are increasingly important for the European competitiveness and sustainability, it becomes more urgent to achieve a tight interaction between the material modelling community and industry. Therefore, the importance of dissemination of results, good communication between the modelling community and industry, and translation of this knowledge into industrial applications becomes vital. Even with many successful cases of scientists in the manufacturing industry translating business problems into problems to be solved by material models, industrial scientists do not normally have the resources or skills to do this. Usually the manufacturing users of modelling lack the expertise necessary to integrate reliably material models into their development and production workflow (this is particularly true for SMEs). Hence, there is the need for players who can do the job of translating industrial problems into simulation cases. Lack of validation is also a factor hindering the use of material models in industry: specific industrial sectors (e.g. aerospace and health) often require long test procedures for certification of products. The use of material models for such purposes must also be improved (EMMC Roadmap 2018).

The following documentation can be useful

- The EMMC RoadMap 2018 for Materials Modelling and Informatics; https://emmc.info/wp-content/uploads/2018/09/EMMC_Roadmap2018V5a-del.pdf.
- J. Zoric, S.T. Johansen, K.E. Eianrsrud, S. Solheim "On pragmatism in industrial modelling" 10th international conference on CFD in Oil and Gas, Metallurgical and Process Industries, SINTEF, Trondheim (2014)
https://www.sintef.no/globalassets/project/cfd2014/docs/official_proceedings_cfd2014-redusert-filstr.pdf
- Natalia Konchakova, Denka Hristova-Bogaerds, Daniel Höche, Pietro Asinari and Luca Bergamasco, "Translation from industrial challenges to materials modeling solutions", European Materials Modelling Council (EMMC)
https://emmc.info/wp-content/uploads/2018/06/EMMC-Translation_2018.pdf
- EMMC "Translators guide"
<https://emmc.info/wp-content/uploads/2018/01/Translators-Guide.pdf>.
- Materials Modelling: expectations, benefits and Key Performance Indicators (KPIs);
<https://emmc.info/business-benefits-and-key-performance-indicators-kpis-of-materials-modelling/>



2.2.2 Summary and collected feedback

Impulse 1

Amit Bhave (CMCL Innovations, UK)

Synthesis of desirable nanoparticles and reduction of unwanted nanoparticles: Translation process and learnings

Conclusion, Questions, Remarks

This presentation included two cases of translation carried out by CMCL Innovation as SME itself and software owner, for a SME high-end nanomaterial producer and for an SME-sized automotive R&D centre. Emphasis was put on the role of the distributors of the company for reaching out to customers and for the successful outcome of the translation process. It was also pointed out that the translator cannot only propose viable solutions but needs to take an active role towards suggesting the choice and the strategy to be adopted. Being on time and on budget are important aspects for the success of the translation and modelling job for a SME. The easiest way to quantify the value created by/with the modelling for the customer is by estimating the ROI (Return On Investment), calculated as benefits versus costs. Some benefits are not (easily) quantifiable though. Hindering factors of translation for SMEs may involve issues with data, the capability of the translator to be flexible, the SME not having standardized internal (decisional) processes, and the fact that the translator is seen as a solution provider. The explanation of results (obtained with the material model) must be a part of the translation.

Questions were raised as regards:

- The duration of the translation process (indicated as 6 months) and the involved activities (explained as assessment with the company, establishment of a collaboration agreement, communication of recommendations).
- The ownership of the IP of the translation in case 2: as the businesses of the translator and of the client are different, no issues were encountered with that. The translator (and software owner) owns the IP on the SW (background IP).
- Standardization of translation: develop ontologies for different clients/sectors so that in the long-term machine may be able to do translation. When there are many variables, the computers may be better than human in finding possible solutions, but it is still a person that needs to make the decision and explain the results.
- How to find the distributors? For some countries it was easy, and they were found during conferences. They are technically oriented people, not academic (e.g. a professor owning his own company or a distributor of their own SW)
- Difference between distributors and translators: the distributors facilitate the translation process (first two steps of the translation process as depicted in the EMMC translators guide) but do not do the translation.



Impulse 2

Nicola Gramegna (Enginsoft S.p.A., IT)

Material modelling in Design chain of lightweight components

Conclusion, Questions, Remarks

EnginSoft is a distributor and their business entails consultancy for companies: they use many SW and keep themselves up-to-date by participating in R&D EU projects and collaborating with research partners such as universities or end-users, for validation as well. A case of material modelling for designing lightweight components was illustrated. EnginSoft cooperated with a university and a software vendor/developer to create a tool that was integrated by the client into its production process in order to obtain a product of improved quality. The innovation was done by the university and implemented by the SW vendor and the translator acted as mediator. The result became something the client could use independently, even if at the project start it seemed something only for experts. The need of the manufacturer stimulated the innovation of the supplier and the use of more advanced tools.

Discussion points included the following:

- Identifying the business case, especially stating explicitly and clearly the benefits, is a difficult part. The translator needs to listen carefully to the client.
- How comfortable was the SME with integrating the solution into their design process? Using the SW already used by the client, facilitated this step.

Discussion points and questions

The following questions summarize the issues for this session. The results from the EMMC survey were used as starting point for discussion in the last part of the session.

- **How can we increase the awareness among SMEs of the benefits with materials modelling?**
 - SMEs do not want to know the physics behind the models, but the solution. Big companies have (materials/modelling) experts, so they are more motivated to understand the details. Showing successful cases of materials modelling for SMEs will attract SMEs to use the approach.
 - OEM/Big companies could facilitate the use of material models at their suppliers/smaller companies by communicating the value that materials models can generate.
 - SMEs learn from webinars, etc. as well nowadays.
 - SMEs are often parts of clusters.
- **How can we make translators, and thereby material modelling, more accessible to SMEs? (note: the points below seem to focus more on making more accessible material models, not the translator)**
 - Marketplace will facilitate the access to material models for all companies, but a translator will always be necessary.
 - A reduced cost for the use of the SW may help. Free open SW helps only big companies.
 - Software services are emerging. The use of SW is not the bottleneck; the licensing costs are hindering.
 - The level of maturity of the SW determines how easy it is to use the SW also for people with less expertise.
- **What additional challenges does a translator face when performing translation for SMEs? Is there a need for training of translators tailored towards SMEs?**
 - Suppliers often lack extensive knowledge of material modelling, so it may be harder to approach them.



- When there are funded projects, SMEs are easier to involve. After working once with SMEs, they see the benefits of using material models and are more willing to use this approach again.
- Cost and timeline are usually crucial for SMEs: this makes harder serving SMEs.
- It is difficult to suggest a method that will work with all SMEs.
- IP rights may be a problem.
- SMEs prefer the human contact with people they trust. They prefer to take direct contact with the translator.
- **How can materials modelling be made more attractive to SMEs, both in terms of making use of the results in daily operation and with respect to value creation.**
 - By arranging a generic workshop especially for SMEs.
 - By reducing the risk of using/developing a material model (e.g. insurance, targeted project funding supporting SMEs). Failure (of the modelling) has a larger impact on SMEs.
 - By reducing the price for the use of material models and SW.

Final remarks

As a conclusion from the session's presentation and discussion and the survey the following points are highlighted:

- A way to *increase awareness* among SMEs of the benefits of using material models lies into making more market and sales efforts such as:
 - Inform about success stories. Best practices.
 - Talks in industry-specific meetings or SME clusters
 - Infographic or Fact sheets; Short Videos - these might be easier communication tools than detailed reports

In addition, raising the robustness and quality of materials modelling will contribute to increase the SMEs' trust in materials modelling results.

- *Accessibility* of translators (and thereby material modelling) to SMEs can be made easier by:
 - Arranging training seminars/workshops
 - Link translators to other agents: Research and Technology Organizations (RTOs) are "natural" translators
 - Marketplaces: Lower the cost and time the SME need to spend on trying materials modelling and translation
 - Integration into simulation software-packages; Visibility at interest-groups
 - Easy access for SME by highly integrated apps, where Translators are accessible.
 - Easy search within these apps to find solution to industrial use-case, where links to translators will be possible.
- Translation for SMEs involves *additional challenges* related to:
 - Low budget and time available at the SMEs
 - Willingness of risk taking (failure may bankrupt the SME)
 - No in-house people that speaks the language of scientists

Suggested actions may include:

- Translators should be trained for SME communication and special needs
- Public funding to mitigate the economic risks
- Software price models tailored to SMEs (cheap short-time access for dedicated problems)



- Creating free access repositories with case studies and more mature software technology and support may help making materials models *more attractive* to SMEs.

2.2.3 Conclusions

The importance of the company's distributors for the success of the translation process was emphasized. Translation neutrality was part of the first case: a SW outside the portfolio of the translator was suggested. Moreover, it was indicated that the translation process is not enough: the translator needs to take an active role in suggesting the possible action/s to the client.

Good communication with the OEM and supplier and cooperation with the university were among the success factors of the translation process. Data acquisition for model calibration and user-friendly workflow integrating with tools already familiar to the client were also key features of the presented case.

Expected outcome and future activities

- The publication of successful translation case studies is wished for and will be highly appreciated by the companies.
- Costs and risks are hindering factors at present as regards the use of material modelling by SMEs. Suggested measures were a "pay-per-use" system, some ways for lowering the costs of SW licenses, insurances, targeted forms of research and innovation funding. Such measures should be evaluated when establishing a marketplace.
- The process of translation does not correspond to the modelling job but more "sketching a strategy and a plan for doing the modelling". Usually more people than the translator need to be involved when doing the actual modelling. Often additional money is also required.



2.3 Session 9: Training for translators, with emphasis on economic concepts and skills

2.3.1 Overview

Chair

Natalia Konchakova (HZG, DE)

Impulse 1

Hein Koelman (DOW, NL)

What is expected from a Translator in a big company – examples and learnings

Impulse 2

Eliodoro Chiavazzo (POLITO, IT)

Artificial intelligence based tools to support translators in material modelling: The ongoing training test case at Politecnico di Torino and Politecnico di Milano

Rapporteur

Daniel Höche (HZG, DE)

Session presenter at Podium Discussion

Natalia Konchakova (HZG, DE)

Introduction

Translators are professional profiles able to bridge industrial needs and state-of-the-art academic research to drive industrial innovation; thus, they present a multiplicity of skills spanning technical and economic knowledge, communication and soft skills. In this session, we provide an overview of the training scheme defined by the EMMC, with particular emphasis on the economic concepts and skills that Translators must have or acquire.

Objectives

Objective of this session is to provide an overview of the training requirements that have been identified for the Translators, with particular regards to the economic concepts. To this end, an industrial perspective is given on what is expected from Translators, which provides an occasion for discussion and further refinement of their training scheme. An example (ongoing) project of Training for Translators in practice provides an overview of a tentative full course of training for translators, with additional challenges towards Translators in industry 4.0. Specific objectives include:

- To clarify the expectation on the Translators' work from the industry
- To refine the technical and economic training requirements for Translators
- To discuss new opportunities for Translators in the framework of industry 4.0 (i.e. digitalization of the European industry) and to propose refinements of their training schemes accordingly



Background information and documents

The following documentation can be useful

- EMMC Translators Guide

<https://emmc.info/wp-content/uploads/2018/01/Translators-Guide.pdf>

- EMMC Survey (presentation) on Translation & Training for marketplaces: <https://emmc.info/wp-content/uploads/2019/01/EMMC-MPs-survey-outcome.pdf>
- EMMC YouTube channel (economic training videos) <https://www.youtube.com/c/europeanmaterialsmodellingcouncil/>
- iMat project @Alta Scuola Politecnica <http://www.asp-poli.it/imat-digitalizing-democratizing-and-empowering-materials-development-via-artificial-intelligence/>

2.3.2 *Summary and collected feedback*

Impulse 1

Hein Koelman (DOW, NL)

What is expected from a Translator in a big company – examples and learnings

Conclusion

The Modelling Translator in a large company is the team which develops and proposes the value of a modelling route to support projects.

Cost of modelling is in effect the “loaded” cost of person’s time.

In the environment of a large company, materials modelling is used in support for solving customer’s problems, development of new materials and support the introduction of existing materials. In each step the translators pay the leadership role and find the answer how does modelling get involved.

Translators define a modelling scope and plan with milestones and risks, resources, timing. They communicate the risks and limitations of the modelling approaches and estimate the cost of the modelling work assessed by the business versus the value it can bring.

Questions, Remarks

Networking in the company? Big company works worldwide with sub-teams (one head is on top)

Cross communication between US / EU is important

Training is a “learning by doing” philosophy whereas additional economic skills are communicated (only eco. Training!)

Ingress of knowledge by Junior to Senior communication

Feasibility checks are team work. Thus, Translator does not decide alone.

How to measure a Translator? – project numbers and their success (show cases) are 1st ranked.

Typical Profile in companies? Translators are academics with inherent skills, but they have good core competences and can filter information.



Impulse 2

Eliodoro Chiavazzo (POLITO, IT)

Artificial intelligence based tools to support translators in material modelling: The ongoing training test case at Politecnico di Torino and Politecnico di Milano

Conclusion, Questions, Remarks

Questions:

Who is the Translator? It is not a 3rd part! She/he is acad. or from industrial partner

Challenge? – Bringing people together is priority.

How to eliminate barriers shall be addressed directly.

If required a 3rd part (like SWO) can be included to remove barriers.

Mission of Translator can be named – Complementarity

Communication helps to identify major scientific issues in feedback loops. (Aha effect)

Enabling of thinking in other dimensions on all sides is one of the best outcomes of a Translation process

The amount of work for translators shall be shared on different heads to lower stress level to keep balance. Best Translator (best expertise in the field of the use case) takes the lead.

Translation training includes leadership training

Insulating industry from the scientific problem should be avoided. Even an increase in motivation and interest is expected.

Discussion points and questions

The following points summarize the issues for this session, includes the results of the survey.

- **Do you think that the Translator profile identified by the EMMC is complete and meets exactly the expectations on their role in industry? If not, what can lead to a refinement of the role of these figures in industry?**

Translator (not always an expert) can be a project manager + some skills (most important is the entity to bring technology in)

It needs to be understood that successful translators need a unique combination of domain knowledge (e.g. materials science and technology of polymers), knowledge of simulation tools, their theoretical foundation, their accuracy and limitations, and excellent communication skills.

Translator profile is a good basis. Expectations linked to company-specific challenges cannot completely be covered by the description and have to be explained on a case by case basis.

Translators should mainly be part of private / for profit entities. This may hamper the "Scientific neutrality" but it ensures efficiency and alignment with the industrial language, timings and interests.

From my current point of view, the translator profile gives a clear picture of the scope of the translation process. However, this profile should be revised regularly, and be aligned with the (changing) expectations and experiences of translators

Translation defined by EMMC is more or less complete. In past when I looked at industrial problems, I never thought of these 6 steps. But now when I analyses the methodology we used, I can map it back to these 6 steps. However, I do not fully agree how the translator profile is presented. Translator shall not be someone



(or organization) who is a super hero and knows everything. A translator must be a person/organization or team formed by different organizations. The required competences can come from different sources (for e.g. business side can be covered from a team member from the client, modelling side can be obtained from member from academia, etc.). The team leader shall be an expert in the field i.e. the main topic (probably the material modelling part) and must know how about other competences but not necessarily in-depth knowledge. The expertise/competences shall be fetched from available resources rather than building it in the translator. The translator must have a good network, so he/she knows where the competences can be fetched from.

It is very important that translators have a serious background in business and management, for large companies as well as SMEs

- **Do you think that the Training scheme for Translators identified by the EMMC is sufficiently complete or it can be improved by additional concepts? How?**

A unified understanding of the tasks is enough

In most cases no "superwoman/man" is needed

It's a start. Successful translators will emerge from training and experience over many years.

Additional concepts:

- soft skills
- problem solving skills
- analytical skills
- systematic thinking (for e.g. TRIZ)

Intellectual property is a key point.

- **In your opinion, which are the most critical aspects in training of translators? Training should focus more on technical, economic aspects or both equally?**

Show cases are the most important

Showing up missing aspects / lack of expertise should be part of the process

Both equally. They need to cover both aspects

Deep technical knowledge is absolutely necessary, accompanied by excellent listening and communication skills. The economic aspects will come from the customer.

I think technical is more important.

Focus more on technical aspects.

It should be people with a technical background with commercial attitude and skills.

The most critical aspect is, that the technical competence of a translator should be broad, sufficiently deep and absolutely state-of-the-art. However, economic aspects are of medium importance, making the effort for the training almost equal.

Equally on technical and economic aspects but not in-depth. The pre-requisite shall be that translator is an expert in a certain domain with respect to materials modelling for instance modelling of metal forming. So, no need to train in that domain. Just give know how of other technical domains and economics. Also give training on how to evaluate the solution or choose best options.

- **Do you think Translators can have a central role in the digitalization of the European industry towards industry 4.0? If yes, how are they expected to contribute (e.g. main innovation areas and tools)?**

Tasks for the Translators and the process must be named and trained, a collection of clear task descriptions in translation processes will create Translator profiles.

The human aspect remains central, even in the age of machine learning and artificial intelligence.



Yes, if they act as facilitators and/or integrators as well.

Industry 4.0 applies Artificial Intelligence to data coming from sensors, machines, etc. Predictive models can generate data to feed the I4.0 systems, as a "middleware" in between sensors and AI. Translators should consider I4.0 applications as an additional market for modelling.

Main translators target should be product/process engineers - that is, materials/machine related people. I4.0 expands the modelling target to the Factory floor -production engineers' people

This depends on the prospective industries. For many industries, the translation process itself may play a major role.

No. Material Modelling translators can play a supporting role but not the central role. I4.0 is technology driven and therefore it is a task for industrial engineers not materials modelling experts or translators.

Translators can support I4.0 in the following domains:

- develop algorithms for adaptive control
- part of digital twinning
- failure models for predictive maintenance

Translators will have a central place because Industry 4.0 needs data and numerical modelling of the ongoing process is likely to produce as much data than the real process itself.

- **Which would be the additional training concepts that may be useful to provide to the Translators towards industry 4.0? Concepts about data-driven modelling? Concepts and tools for machine learning? Others?**

Webinars are very important

The most effective way to train translators is to have future translators work in organizations that provide already effective translation. Educational organizations can provide the basis and offer perhaps specialized courses.

Machine learning is one of the choices. Because it could save time.

Industrial productivity KPIs, links between the model's outcomes and product quality towards a zero-defect manufacturing and in general analyzing how models contribute to the claims that I4.0 is already using to digitize industry.

In my opinion, the transition from classical modelling to "smart models" should be considered in the training. Most translators with a common, e.g. theoretical chemistry, background, tend to think in classic models which are not self-learning and self-adjusting. However, this will be one of the key points in data driven modelling.

I would strongly recommend not to do that. We must not load a translator with jobs of all disciplines. I4.0 shall mainly be performed by industrial engineers. Translators must only get a know how training on I4.0 topics. the following might be interesting

- production value chain analysis
- design value chain analysis
- product cycle analysis
- Quality control
- ICT architecture
- Cyber security
- machine interfacing
- IoT
- Automation and control
- sensor technology



Yes, Database management, machine Learning and more generally Artificial Intelligence concepts and techniques.

2.3.3 Conclusions

Translation is realized in large company by **translation team**. **Costs** for modelling project are referred to **person-time**. For the successful support of the modelling project the translation service/ consult must be convincing.

Translators need to know and understand the customer problem, to aim the full workflow (incl. inverse engineering) and recognize the customer apps (preferred solutions). It would help to find and to consider constraint/ parameters in models and testing as well as to optimize the project costs.

As an internal team player, translator is aware on root causes, knows different modelling options, knows scope and plan of the customer/project and can balance risks and costs. **Translators need economic skills.**

If a case requires a new formulation of the model, or new materials are used, translators shall be able to communicate this and predict expected outcome. That is why the quantification of performance in End application is needed. Moreover, insights into complex fabrications are expected. Translator is like project manager with complex skills (more as only modelling expert).

Assessing the value is mandatory – value chain, value capture of Technology, costs modelling

Assessing the advantage – time to market is urgent

Save of experiments is to be numbered

Need of capabilities must be defined by Translators.

Reducing iterations is aimed, Cycles vs. KPIs

Steering experimental work is a very good aspect

Knowledge on IP is beneficial as well as on black box systems and other (hidden) tasks

Own costs are transparent and satisfied

Experience and Network towards a broader communication is expected by customers

With regards to training, from impulse 2 emerged that:

Student feedback (other view point)

Academic translators might have language barrier (business reality)

The mission of academics is to be considered for a Translation process

Carrier advances should be known (rewards and ROI)

Also, academic/ student training has multidisciplinary nature (tech, soft, economic skills, ROI)

The process shall be unbiased (Maslows hammer problem)

Training issues are that there are no designed courses for that.

Another issue is that really exceptional people are required.

CV decides on carrier progression as well

Role of Translators is identified as key enabler for Ind. 4.0

AI knowledge is to become of main interest (data mining more important than modelling?)



Concept of training shall include data mining for industry

ASP project and others shall deliver Translation 2.0, to be tested

A paradigm shift of Translators is possible... Maybe AI between Academics and Industry on online collaborative tools is the future. It allows selection of dedicated training data but also supervision of Training phases



Authors	Pietro Asinari, Luca Bergamesco (both POLITICO)
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Consortium		
TU WIEN	Technische Universität Wien	Austria
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GCL	Goldbeck Consulting Limited	United Kingdom
POLITO	Politecnico di Torino	Italy
UU	Uppsala Universitet	Sweden
DOW	Dow Benelux B.V.	Netherlands
EPFL	Ecole Polytechnique Federale de Lausanne	Switzerland
DPI	Dutch Polymer Institute	Netherlands
SINTEF	SINTEF AS	Norway
ACCESS e.V.	ACCESS e.V.	Germany
HZG	Helmholtz-Zentrum Geesthacht Zentrum für Material- und Küstenforschung GMBH	Germany
MDS	Materials Design S.A.R.L	France
Synopsys / QW	Synopsys (former QuantumWise A/S)	Denmark
GRANTA	Granta Design LTD	United Kingdom
UOY	University of York	United Kingdom
SINTEF	SINTEF AS	Norway
UNIBO	ALMA MATER STUDIORUM – UNIVERSITA DI BOLOGNA	Italy
SYNOPSIS	Synopsys Denmark ApS	Denmark

Coordinator – Administrative information	
Project coordinator name	Nadja ADAMOVIC
Project coordinator organization name	TU WIEN
Address	TU WIEN E366 ISAS Gusshausstr. 27-29 1040 Vienna Austria
Email	nadja.adamovic@tuwien.ac.at emmc-info@tuwien.ac.at
Project web-sites & other access points	https://emmc.info/