Project carried out with a financial grant of the Research Programme of the Research Fund for Coal and Steel

# Project Deliverable Report


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| Technical Group: | **TGA2** |

## Mapping, Educating, Training, Applying models in continuous CASTing

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| Project Acronym | **METACAST** |
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| Author(s): | **M. De Santis, E. D'Amanzo (RINA- CSM), K. Marx (BFI), P. Ramirez Lopez (SWERIM), C. Gruber (K1-MET), N. Egido Perez (SIDENOR I+D)** |

## INDEX

## LIST OF FIGURES

## 1. INTRODUCTION

As mentioned in the Project Grant Agreement, METACAST, as a RFCS Accompanying Measure, consists of dissemination, awareness-raising, communication, networking, in a common background on modelling, as well as training and learning reinforcement activities as key to maximising its impact at the industrial, environmental, and socio-economic levels.

The ambitious aim of the presented project is to strengthen in all the actors (stakeholders, R&D references, people undergoing a dedicated education up to postdoc level) the awareness of modelling as powerful tool to turn industrial issues into technical problems which can contribute to problem solving and at the same time, to increasing knowledge and improving the management of work processes and places. To boost this action, interaction with the players is fundamental, so their feedback is of major importance to define current status and future trends of modelling.

In this view, this report shows statistics about stakeholders' feedback on the training approaches and needs.

## 2. ACTIVITY PERFORMED

The METACAST survey collected insights from 21 users of continuous casting (CC) modelling tools across European producers, RTOs and technology providers. The respondent pool shows a balanced mix of engineers, researchers and operational staff, with heterogeneous levels of familiarity and expertise in modelling.

The overall set of questions is shown in Appendix. It was set up in a Microsoft Forms frame and composed of general common questions (e.g. on respondents role and skill) and others well defined and targeted more on a) model users; b) training aspects; c) management position vs modelling as a valuable resource, d) on future trend and expected role of the players. The feedback from points a), c) and d) is described in separate deliverables. This document refers to feedback concerning the aspects related to training.

The figures presented show the results in terms of percentages of respondents. For multi-select questions, percentages are computed as the share of respondents, each item over all respondents who answered that question.

Figures 1–3 show roles, familiarity, and self-declared expertise levels, all expressed as percent of respondents.

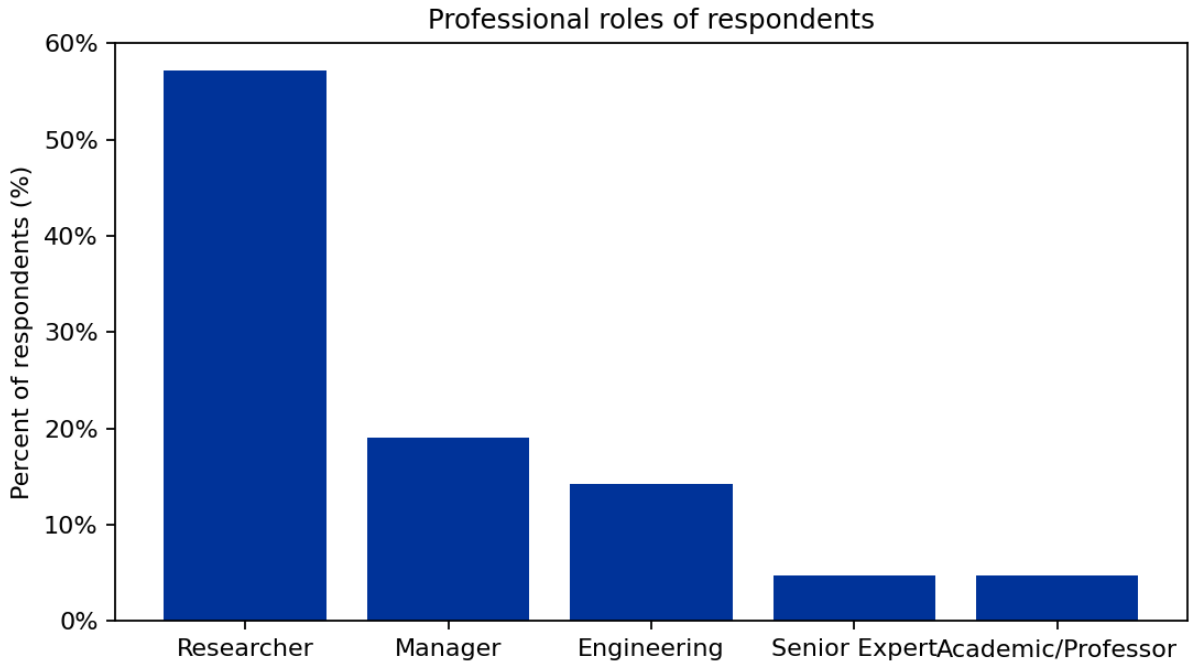



**Figure 1 – Professional roles of respondents (% of respondents)**

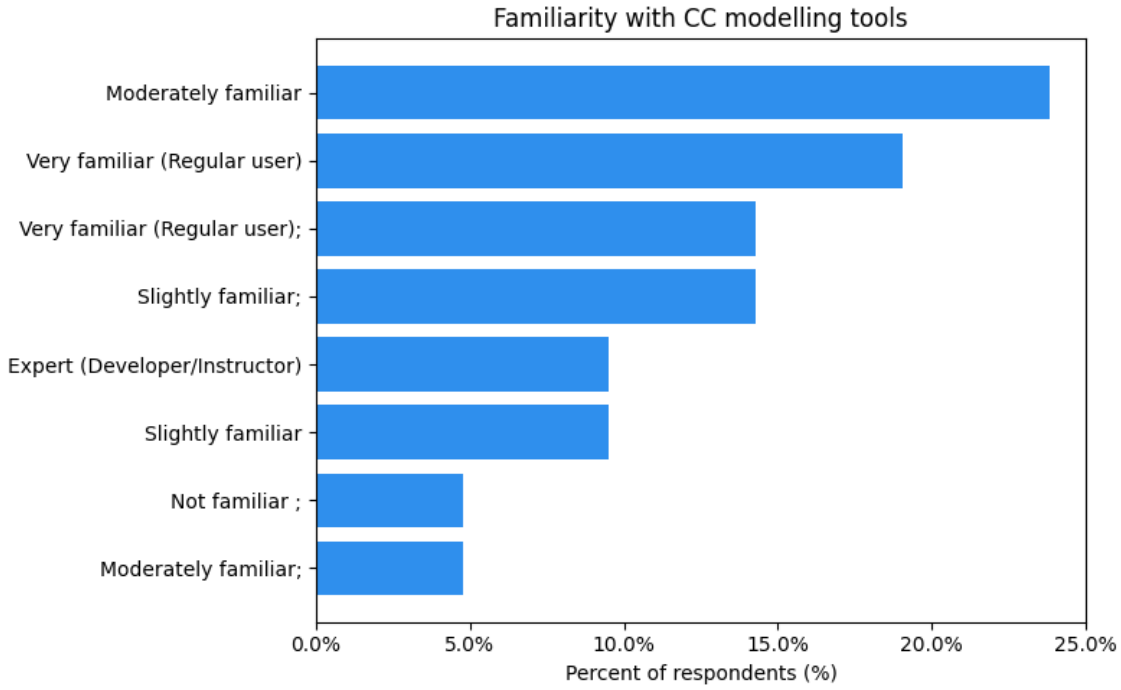



**Figure 2 – Familiarity with CC modelling tools (% of respondents)**

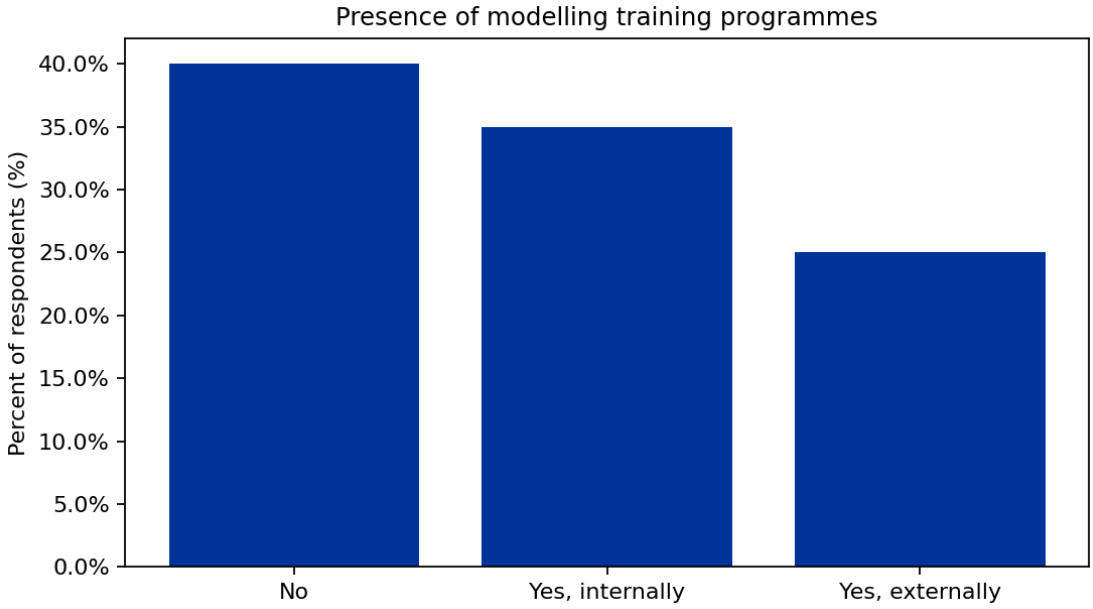



**Figure 3 – Presence of training programmes (% of respondents)**

The information presented in Figures 4 to 7 covers several aspects related to modelling training. Figure 4 describes how the training is organised, indicating whether it is delivered internally using in-house expertise, provided by external trainers, or not offered at all. When training is not conducted, Figure 5 shows that the proportion of respondents who consider it either unnecessary or too expensive amounts to 50% in total. Figure 6 identifies the main target audience, which consists almost entirely of R&D researchers. Finally, Figure 7 outlines the baseline level of skills required for potential modelling trainees.

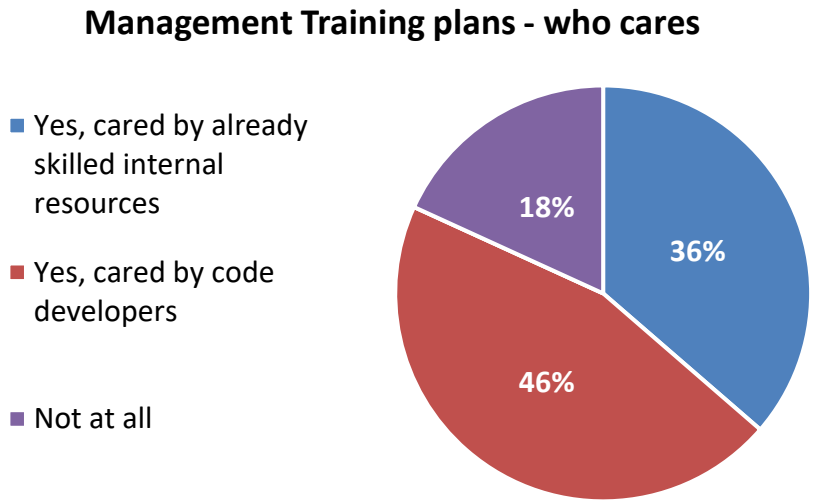



**Figure 4 – On management training plans: who 'cares' (acting as 'teacher').**


**Figure 5 – Reasons for absence of training (% of respondents)**

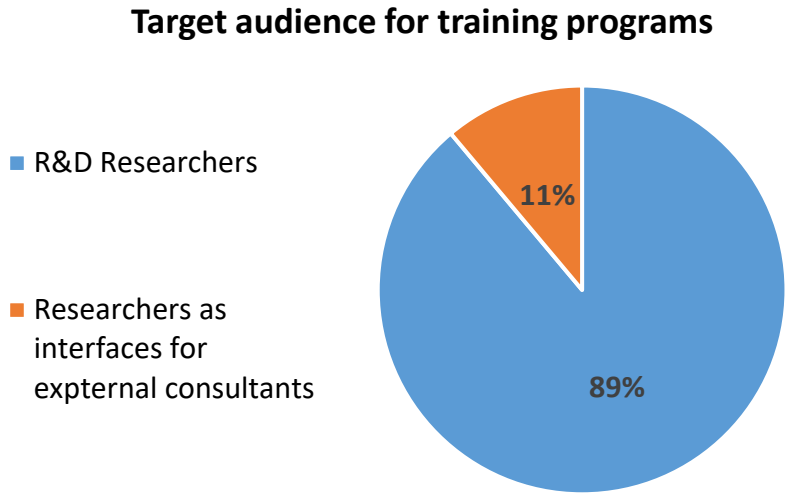



**Figure 6 – Target audience for the training programs audience (% of respondents)**

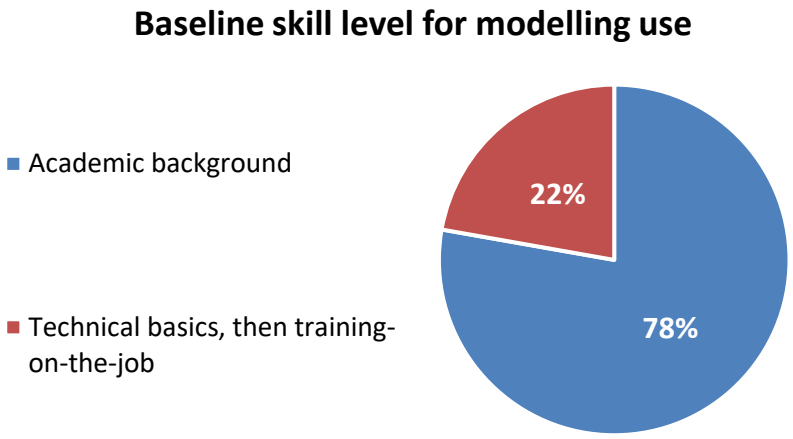



**Figure 7 – Baseline skill level required for modelling users**

The subsequent figures deal with management strategy vs modelling approach. Figure 9, highlights the claimed main barriers obstacles against model training strategies. As remarked in other answers, the 'model reactivity' in translating an approach to problem solving outcome is relevant, together with the model availability, either for its adequacy in describing a process, and, when existing via commercial codes, as regard to the licence's fees. All these aspects, together with showcasing success stories, are consequently claimed as aspects improving/fostering model training (figure 9).

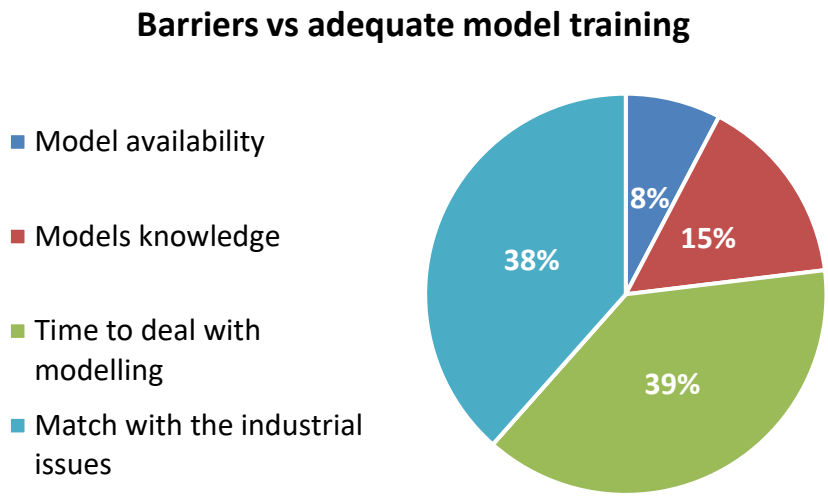



**Figure 8 – Main barriers/obstacles hindering adequate model training**

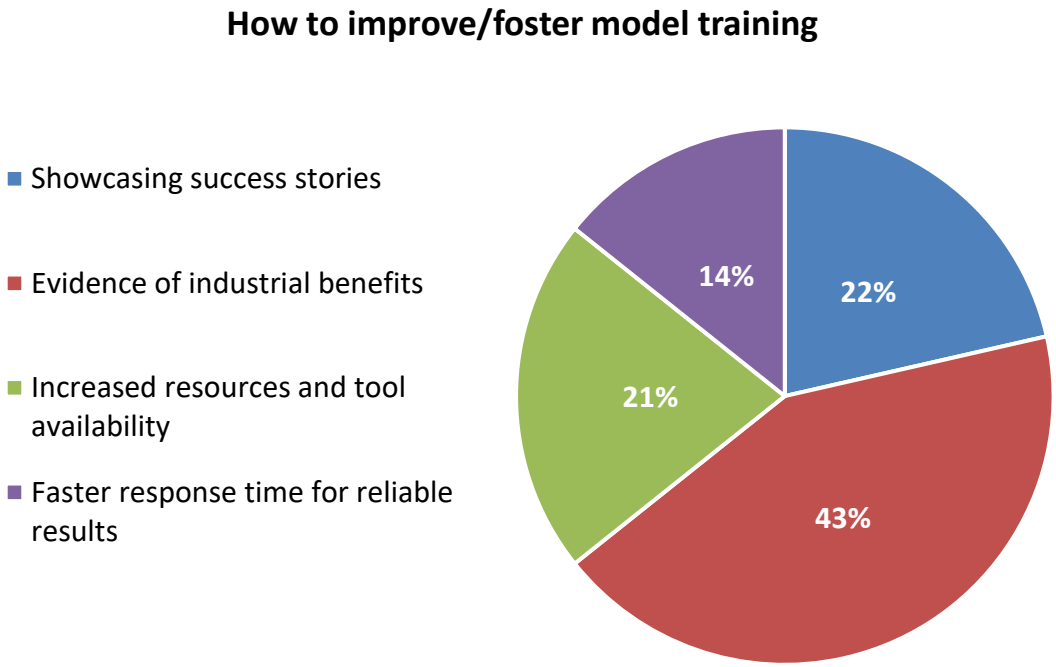



**Figure 9 – How to improve training (top items; % of respondents selecting)**

Finally, as training strategies are strictly related to management awareness of the modelling approach importance, whilst details are shown in a dedicated deliverable (D5.3), here some info is given at a glance on problems identification and possible strategies.

In this view, figure 10 and 11 shows respectively the barriers 'preventing' management for investing in modelling in general, and on training in particular. Clear evidence of the Return of Investment (outcomes/success stories vs investment on people, software, hardware) is claimed as relevant and, again, the 'reactivity' of the model approach to provide for problem solving is the biggest lever to convince management in taking the modelling strategy as valuable tool.

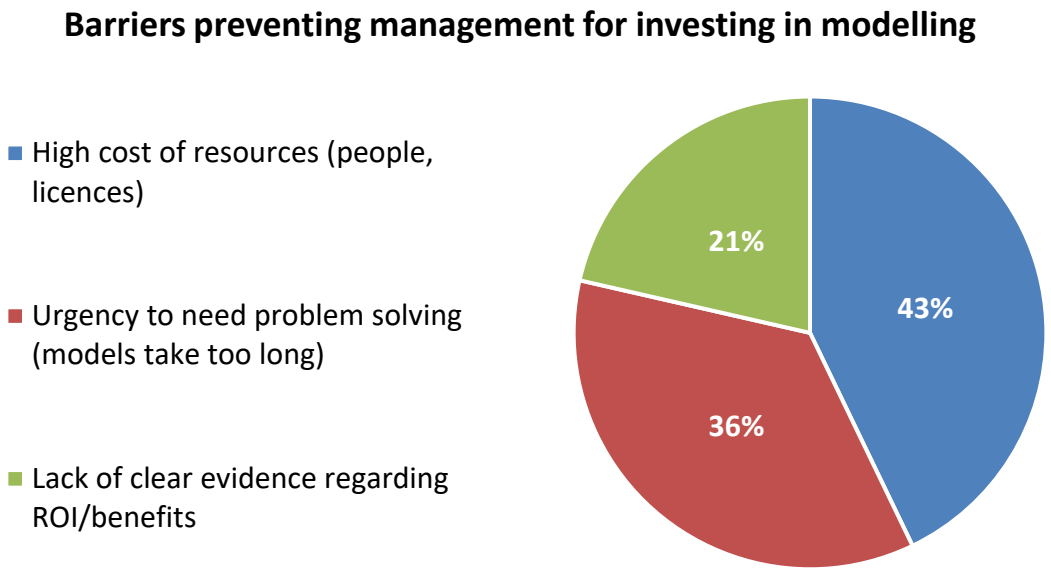



**Figure 10 – Main strategic barriers for management against investing in modelling**

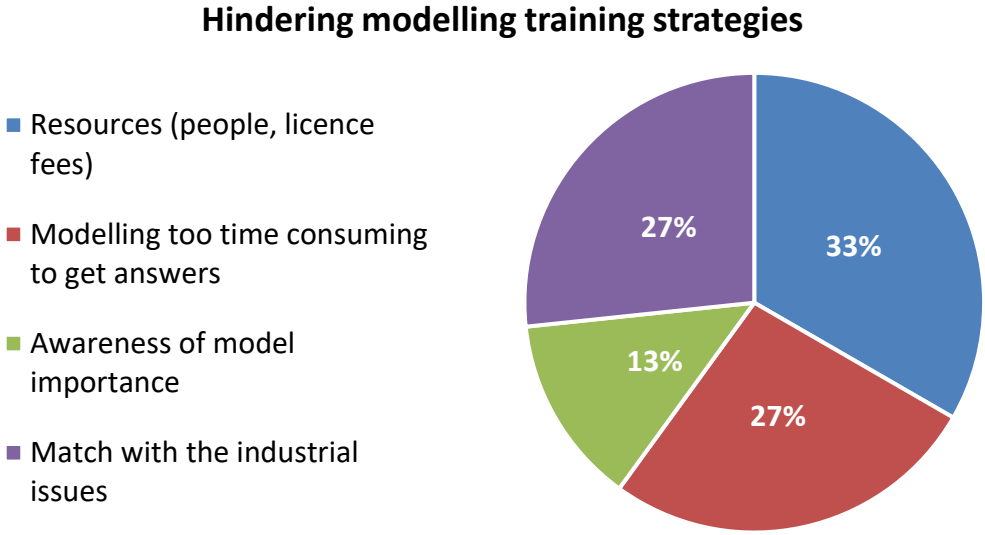



**Figure 11 – Main barriers/obstacles hindering a modelling formation strategy**

Summing up the outcomes from the answers, training practices related to CC modelling show substantial variability across organisations. While some respondents report internal or external

training programmes, many highlight limited availability, insufficient expert resources, or lack of strategic prioritization.

Training audiences span both academic background users and technicians requiring progressive on-the-job learning. Skill gaps mainly concern modelling knowhow, time availability, and the alignment of training content with real industrial issues.

Barriers to effective training include absence of validated success stories, unclear evidence of industrial benefits, limited resources, and lengthy model response times.

Management perspectives mirror these concerns: investments compete with daily operational urgencies, and training plans are only partially formalised. Improvements expected by stakeholders include wider dissemination of results, clearer impact evidence, better access to tools and resources, and stronger integration between industrial partners and academia.

Overall, training maturity is uneven. Strengthening structured programmes, enhancing validation, and showcasing concrete benefits are viewed as essential steps for increasing modelling competence and use across the sector.

## 3. CONCLUSIONS

The analysis of the answers for the questionnaire focused on training issues highlights significant heterogeneity in training availability, structure, and maturity across participating organisations. While several respondents report access to internal or external training programmes, many experience limited resources, insufficient expert support, or misalignment between training content and practical plant issues.

Skill gaps remain a central challenge, especially regarding modelling fundamentals, interpretation of results, and integration into daily operations. Barriers include lack of time, limited dissemination of success stories, and the perception that modelling workflows are too slow to support immediate operational needs.

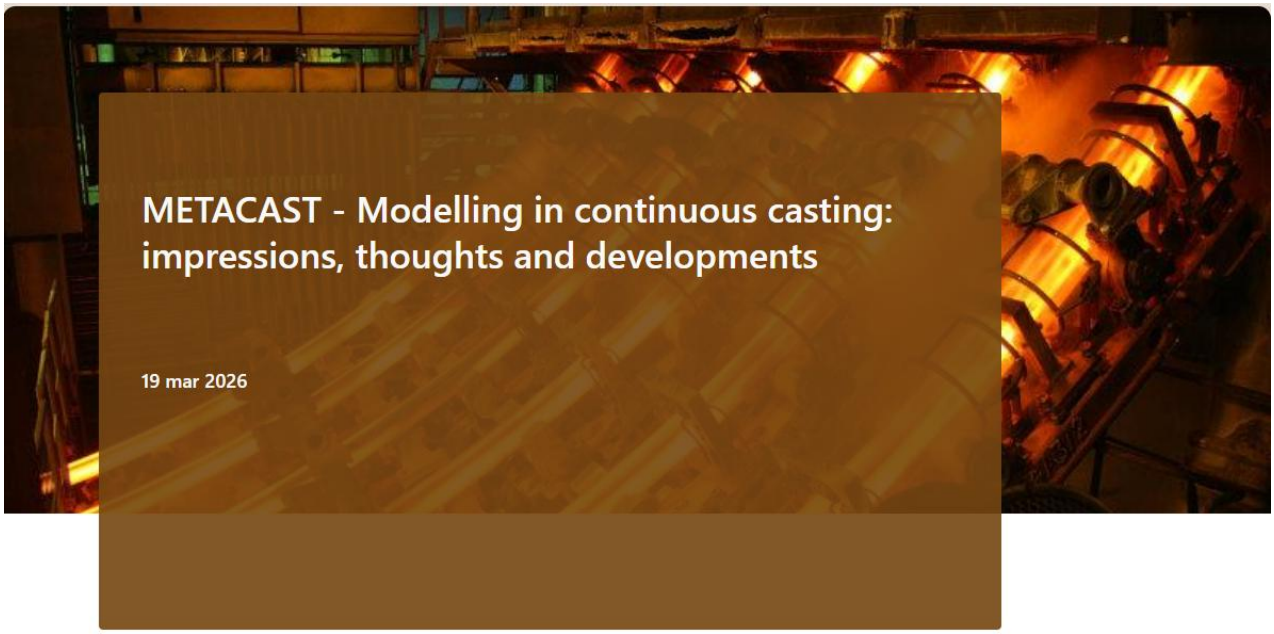
To enable real progress, future efforts under METACAST should concentrate on: what follows.

- Establishing structured and scalable training pathways tailored to different user groups.
- Reinforcing competence development with validated examples and real-case demonstrations.
- Enhancing the visibility of industrial benefits via targeted dissemination actions.
- Providing easier access to tools, resources, and modern training materials.
- Supporting stronger collaboration between producers, technology providers, and RTOs.

A more coherent training ecosystem will not only improve user competence but also accelerate modelling adoption and its effective application within steelmaking operations.

Issues concerning modelling use, management sentiment and current/expected strategies on modeling use, and future trends are shown in separate documents (D4.3, D5.3 and D6.3) leaning on the overarching questionnaire form launched close to the project end and reported in Appendix.

## 4. APPENDIX – OVERALL QUESTIONNAIRE FORM




1. **What is your current professional role?** *

- ○ Researcher
- ○ Student
- ○ Manager
- ○ Academic/Professor
- ○ Legal
- ○ Marketing
- ○ HR
- ○ Engineering
- ○ Altro

2. **How familiar are you with modeling and simulation tools applied to continuous casting?** *

- ☐ Not familiar
- ☐ Slightly familiar
- ☐ Moderately familiar
- ☐ Very familiar (Regular user)
- ☐ Expert (Developer/Instructor)

## Feedback from Model Users

This section is dedicated to those who work directly with modeling tools. It aims to identify the specific technical objectives, current skill levels, and perceived obstacles from a practitioner's perspective.

3. **What is the role of model users within your organization?**

- ◯ Internal R&D researchers
- ◯ R&D committed to supporting industrial companies
- ◯ Technology providers supporting producers
- ◯ Academics supporting producers
- ◯ Altro

4. **What is your primary technical objective when using models?**

- ◯ Problem-solving
- ◯ Knowledge acquisition/Fundamental understanding
- ◯ Academic research/Training
- ◯ Altro

5. **On a scale of 1 to 5, how would you rate your modeling expertise?** ***(1 = Interpreting results only; 5 = Full model development capability)***

☆ ☆ ☆ ☆ ☆

6. **What do you recommend to improve and foster the use of modeling within this context?**

- ☐ Better information and success stories from networks
- ☐ Clearer evidence of expected industrial benefits
- ☐ Increased resources (personnel/funding) and tool access
- ☐ Reduced response times for problem-solving
- ☐ Altro

7. **What is your general 'sentiment' regarding modeling in continuous casting?**

- ◯ Positive
- ◯ Generally positive
- ◯ Somewhat positive, with application/validation drawbacks
- ◯ Useful for understanding, but limited for problem-solving
- ◯ Not successful

## Training Programme

This section targets the strategic view of modeling. It evaluates how management perceives the value of these tools and identifies the structure (or absence) of professional development programs.

8. **Does your company have a modeling training program?**

- ○ Yes, Internally
- ○ Yes, Externally
- ○ No

9. **What is the primary reason for the absence of a training program?**

- ○ Not necessary for company objectives
- ○ Prohibitively expensive
- ○ Lack of available experts
- ○ Altro

10. **What is the target audience for these training programs?**

- ○ R&D researchers
- ○ Researchers acting as interfaces for external consultants
- ○ Technology providers supporting producers

11. **What is the baseline skill level required for those entering model use?**

- ☐ Academic background
- ☐ Technical basics with on-the-job training
- ☐ Interpretation support only (work performed by externals)

12. **What are the main barriers/obstacles hindering a full and fruitful model training?**

- ☐ Model availability
- ☐ Models knowledge
- ☐ Time to deal with modelling
- ☐ Awareness of model importance
- ☐ Match with the industrial issues
- ☐ Altro

13. **What do you recommend to improve and foster training on modeling use?**

- ☐ Showcasing success stories and networks
- ☐ Evidence of industrial benefits
- ☐ Increased resources and tool availability
- ☐ Faster response times for reliable results

## Stakeholders' management

**This section explores the strategic view of modeling. We seek to understand if management perceives these tools as high-value investments or merely operational costs**

14. **How does management generally perceive the value of modeling tools?**

- [ ] Essential for process control and plant solutions
- [ ] Useful for insights, but secondary to other methods
- [ ] A luxury or non-essential expense
- [ ] Altro

15. **What feedback does management typically provide regarding modeling results?**

- ( ) Positive: They value and act on the results
- ( ) Mixed: Results are useful but take too long to produce
- ( ) Negative: Results are rarely applicable to real-world issues

16. **What are the main strategic barriers preventing management from investing more in modeling?**

- [ ] High cost of resources (people and licenses)
- [ ] Urgency of industrial issues (models take too long)
- [ ] Lack of clear evidence regarding ROI/Benefits
- [ ] Altro

17. **Do the management currently arrange training plans for modelling use?**

- ( ) Yes, cared by internals/already skilled resources
- ( ) Yes, cared by model developers/code vendors
- ( ) Yes, cared by academics
- ( ) Not at all
- ( ) Yes
- ( ) Altro

18. **What do you need or should recommend to improve and foster the modelling use?**

- [ ] More information and showcasing success stories from networks (projects, academics,...)
- [ ] More evidence of the industrial benefits expected
- [ ] More availability of resources (people/money), easier availability of the model
- [ ] Reducing response times to have reliable results functional to problem solving
- [ ] Altro

19. **What are the main barriers/obstacles hindering a modelling formation strategy?**

- [ ] Resources (people, money for licences)
- [ ] Time to deal with modelling (need of quick answers to problem solving)
- [ ] Awareness of model importance
- [ ] Match with the industrial issues
- [ ] Altro

## Optimal Use of Modeling in the Steel Industry

This final section focuses on the future outlook and the most significant steps required to bridge the gap between theoretical modeling and industrial reality

20. **What is currently the most successfully achieved goal of casting modeling?**

- [ ] Problem-solving
- [ ] Knowledge building
- [ ] Academic/Training
- [ ] Altro

21. **Which aspect of casting modeling requires the most improvement?**

- [ ] Fundamentals
- [ ] Validation
- [ ] Practical Application
- [ ] Training
- [ ] Integration with ML/AI and process control
- [ ] Altro

22. **What is the most important forward step expected in model use trends?**

- [ ] Link with Machine Learning (ML)
- [ ] Reduced calculation times
- [ ] Reduced costs for model availability
- [ ] Stronger cooperation between stakeholders) (Academic/Provider/Producer
- [ ] Altro

23. **What is required from the following perspectives to boost modeling adoption?**

- ○ Workers' Skills: (e.g., Internal education vs. external experts)
- ○ Resources: (e.g., Lower costs, less time-consuming results)
- ○ Academic/R&D Engagement: (e.g., Disseminating results, dedicated seminars)
- ○ Stakeholders: (e.g., Confidence based on success stories, investing in AI skills)
- ○ Altro

24. **What is needed for the point of view of the resources for boosting the modeling adoption?**

- ☐ Lower modelling costs
- ☐ Less time consuming model results
- ☐ A fruitful link with networks able to showcase modelling fruitful use and success stories
- ☐ Altro

25. **What is needed for the point of view of the academic/RTO engagement for boosting the modeling adoption?**

- ☐ More commitment in disseminating results also from Institutional projects (EU; National, regional)
- ☐ More commitment in foster awareness with dedicated actions/seminars
- ☐ More commitment in dedicated educational plans together with stakeholders
- ☐ Altro

26. **What is needed for the point of view of the stakeholders (producers, technology providers) for boosting the modeling adoption?**

- ☐ Being more confident to modelling use based on success stories
- ☐ Invest ton people skill in this field as ML is becoming more and more relevant
- ☐ Favoring the setup of working group on dedicated topics
- ☐ Altro

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Greetings

27. **Thanks for answering. If you would like to contribute further to the survey, please leave your email and we will contact you.**

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