



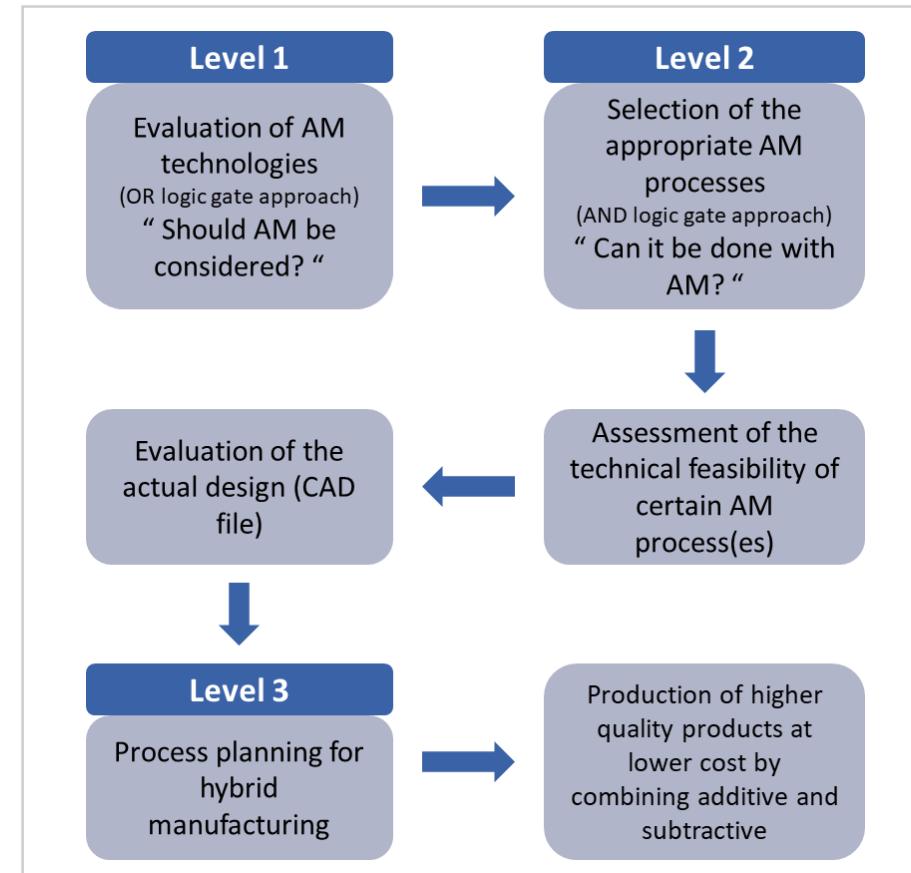
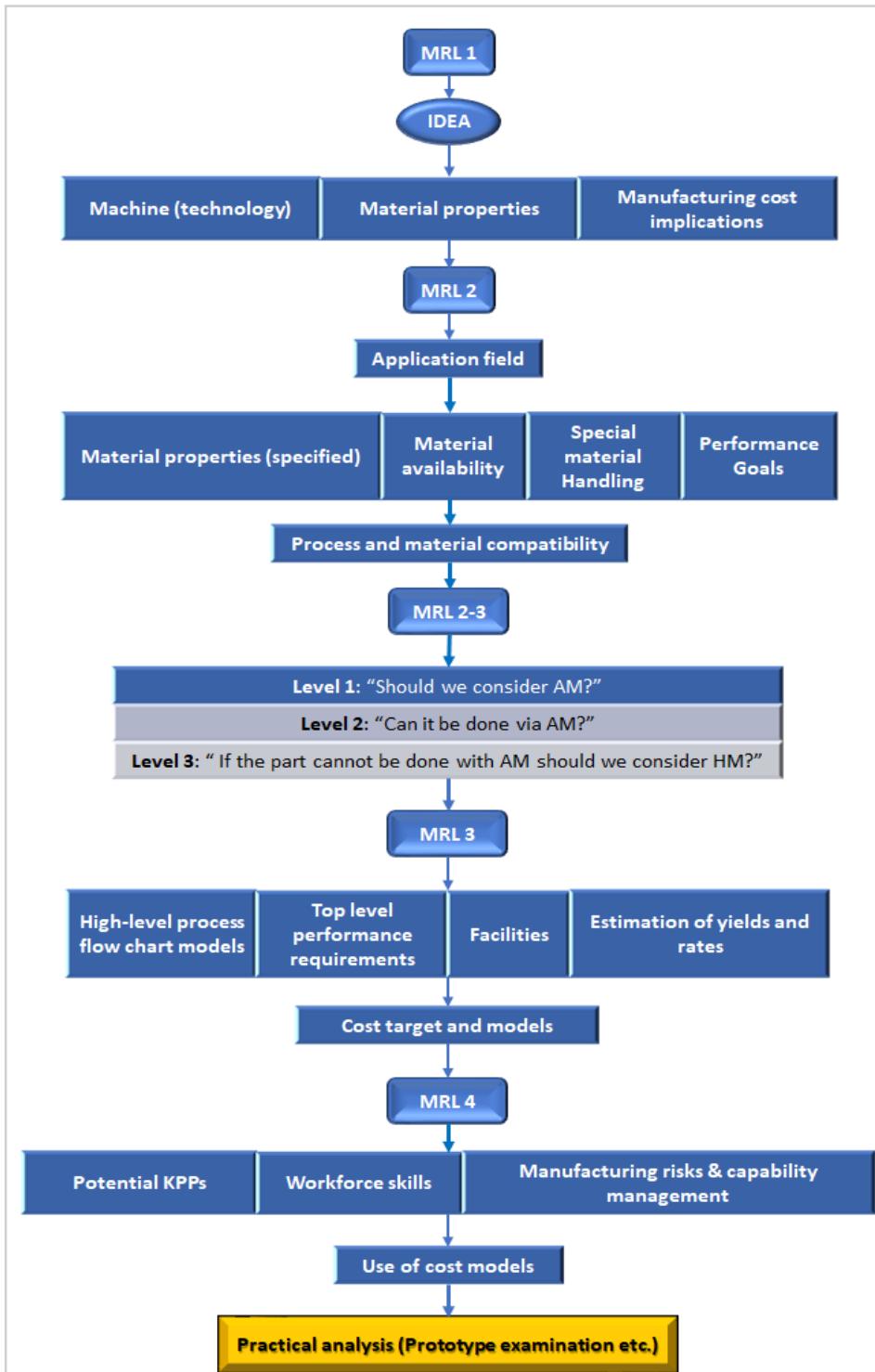
Abstract

Additive Manufacturing (AM) is still immature in most application areas. Lack of knowledge among potential users is a key barrier for AM uptake. There is therefore a significant need for methods, frameworks and tools that will enable potential users to effectively identify if AM would fit their specific case, select the right AM process for their needs and overall evaluate the Manufacturing Readiness Level, known as MRL, of their product. In this diploma thesis the presented framework comprises four discreet stages, namely MRL 1, MRL 2, MRL 2-3, MRL 3 and MRL 4.

- MRL 1 regards the identification of manufacturing research opportunities, material properties and manufacturing cost implications.
- MRL 2 describe the application field of the product. The threads of design, materials and process capability and control are evaluated through identification, paper studies and analysis of material and process approaches
- MRL 2-3 divided in three levels and each level answers a specific question.
 - ✓ Level 1: “Should we consider AM?”
 - ✓ Level 2: “Can the part be manufactured via AM?”
 - ✓ Level 3: “If the part cannot be done via AM should we consider HM?”
- MRL 3 goal is the characterization of manufacturability and producibility, the research of available materials, the identification of target cost and cost-drivers attributes, and the production of a prototype.
- MRL 4, before the practical examination of the prototype, identifies potential Key Performance Parameters (KPPs), production simulation methods, cost drivers’ uncertainties and cost mitigation attributes.

Framework presentation

This framework aim to assist potential inexperienced users through the decision making process, starting from a conceptual idea and moving step by step to selecting the appropriate type of process, materials, machines, post process (or hybrid process) and eventually evaluate the maturity of their products and their deviation from the full-rate production by using the structure of the MRLs approach.



Conclusions

- The evaluation of MRL 1 is relatively easy because the proposed framework is addressing only additively manufacturable products.
- In MRL 2 the special handling of materials was challenging because there is not enough data in this field.
- Level 2 in MRL 2-3, after the manufacturability check of the product via AM, identified the type of AM process that should be used for the production of the desired part.
- In MRL 3, there is a need for development of more high-level process flow chart models such as, orientation optimization models or support structure reduction models. Moreover, cost models data for each AM machine type would significantly optimize the estimation of the final cost of the product.
- The work has been published in a scientific paper entitled: “A decision support method for evaluation and process selection of Additive Manufacturing”.