

Fuel Cell Manufacturing: An AI Approach

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1. Introduction

Fuel cells are electrochemical devices which convert H_2 and O_2 to electricity. They are used in portable, transport and stationary power applications (Fig. 1). There are several barriers to mass production, the most commonly quoted being a lack of hydrogen infrastructure and high product cost as compared to incumbent technologies (Fig.2). This research focuses on reducing cost by better managing and using manufacturing assembly knowledge using knowledge representation (KR) which is a field of artificial intelligence (AI).

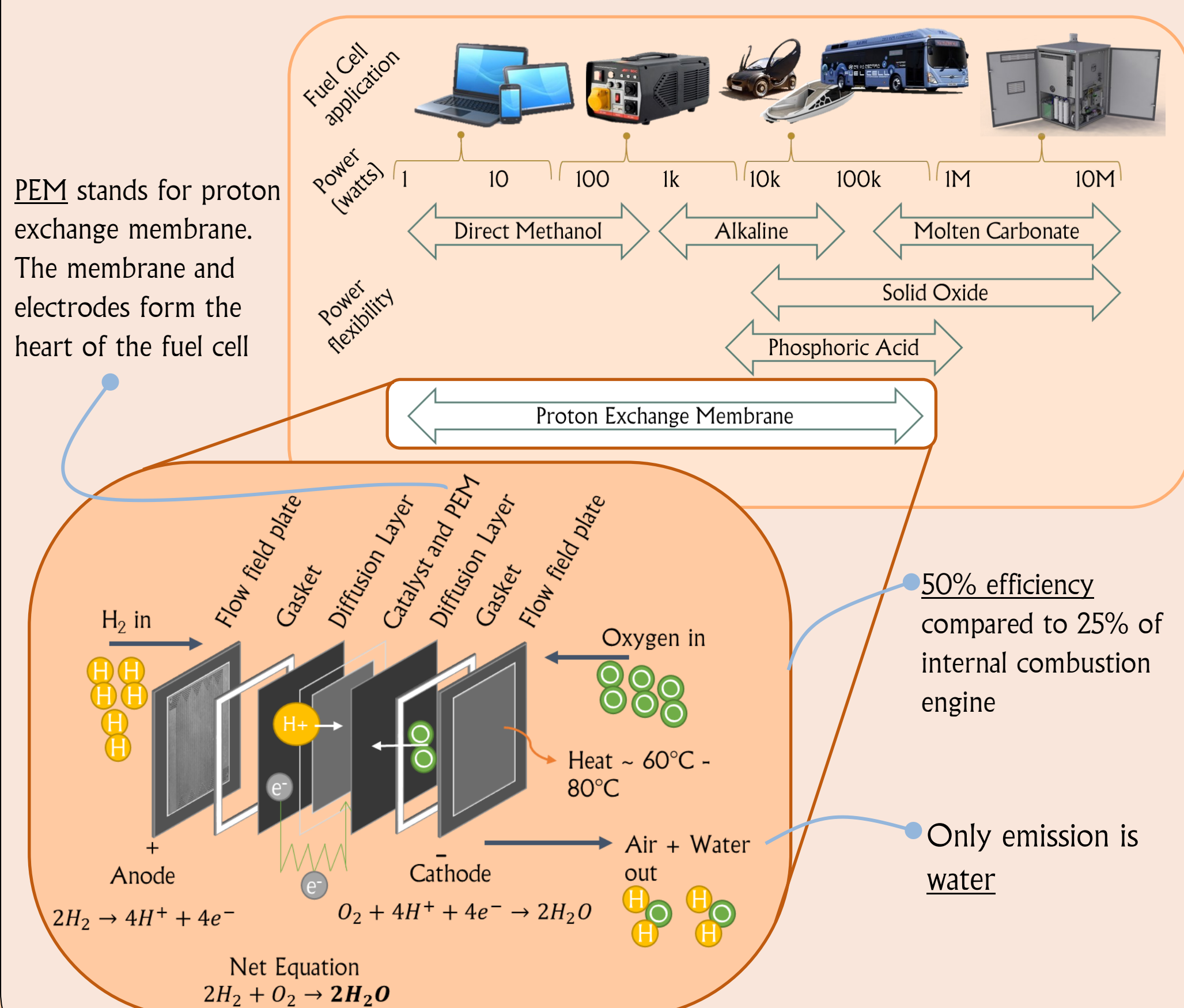


Fig 1. Fuel Cell applications and operating principle

2. Research Questions

- What fuel cell assembly knowledge should be captured?
- What can and should be done with this knowledge?
- How can you add to this knowledge base as the technology develops?

3. Method

Knowledge is the ability to understand information and then make decisions. In this research we want to understand product information and make a decision on what manufacturing equipment to use. This is done using KR which is composed of two components (i) a knowledge base (ii) a set of rules or axioms from which inferences can be made (Fig. 2)

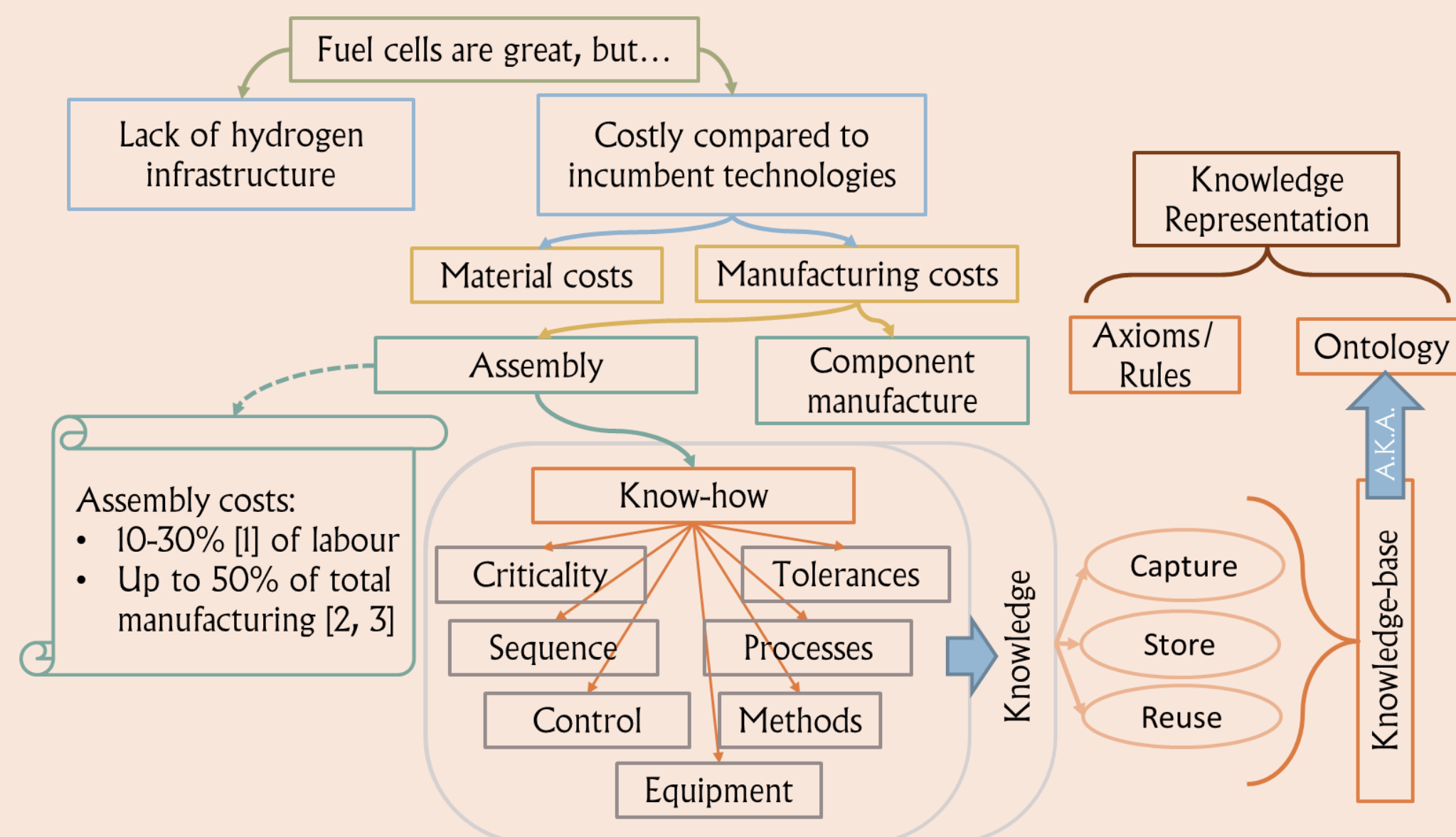


Fig 2. Fuel Cell cost reduction and knowledge focus

4. Model

E.g Move, transport, check, rotate, grip, release etc...This information is expert domain knowledge residing in the heads of process planners

The equipment required to meet the requirements of the product and process. This could be robots, grippers, conveyors and operators.

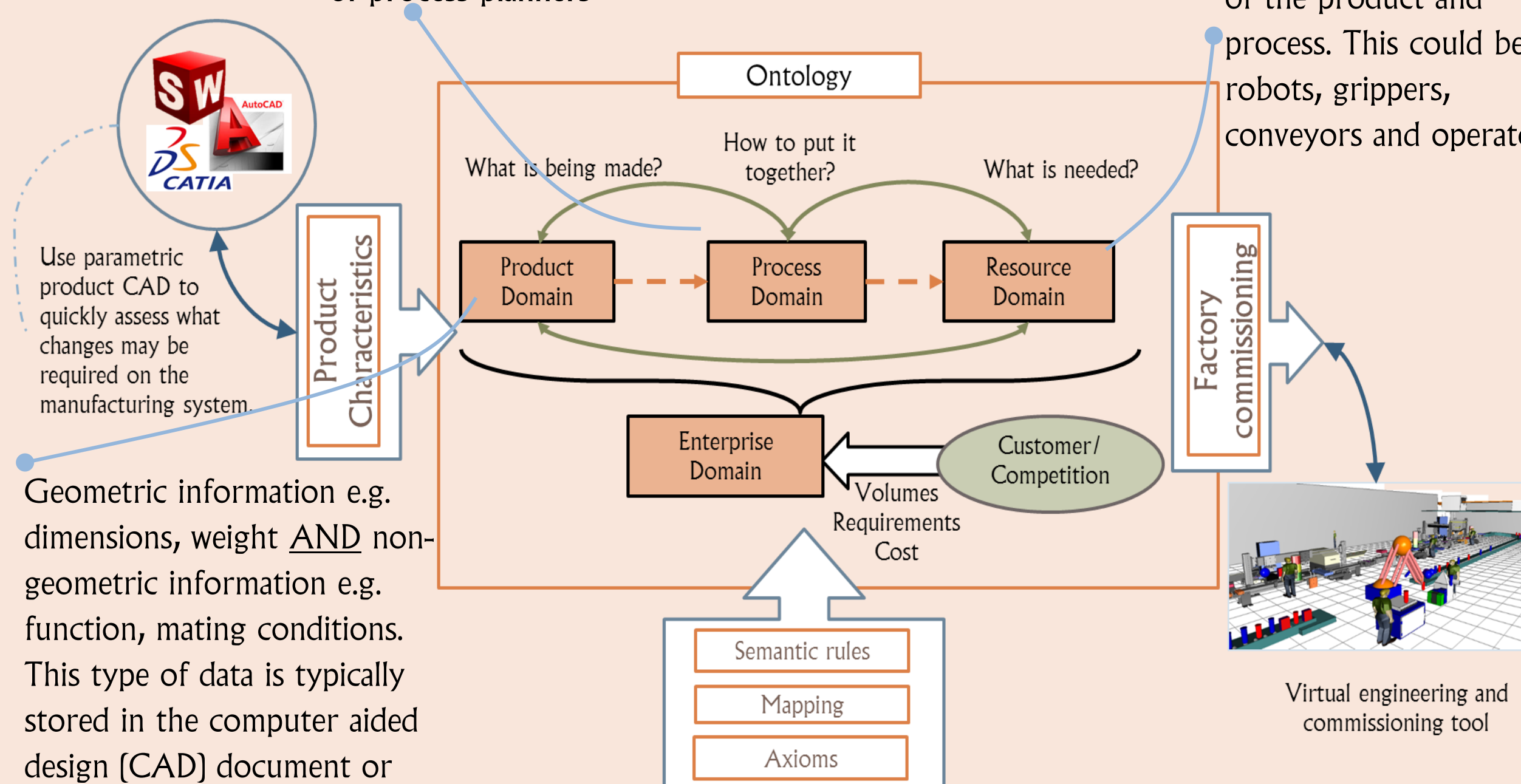
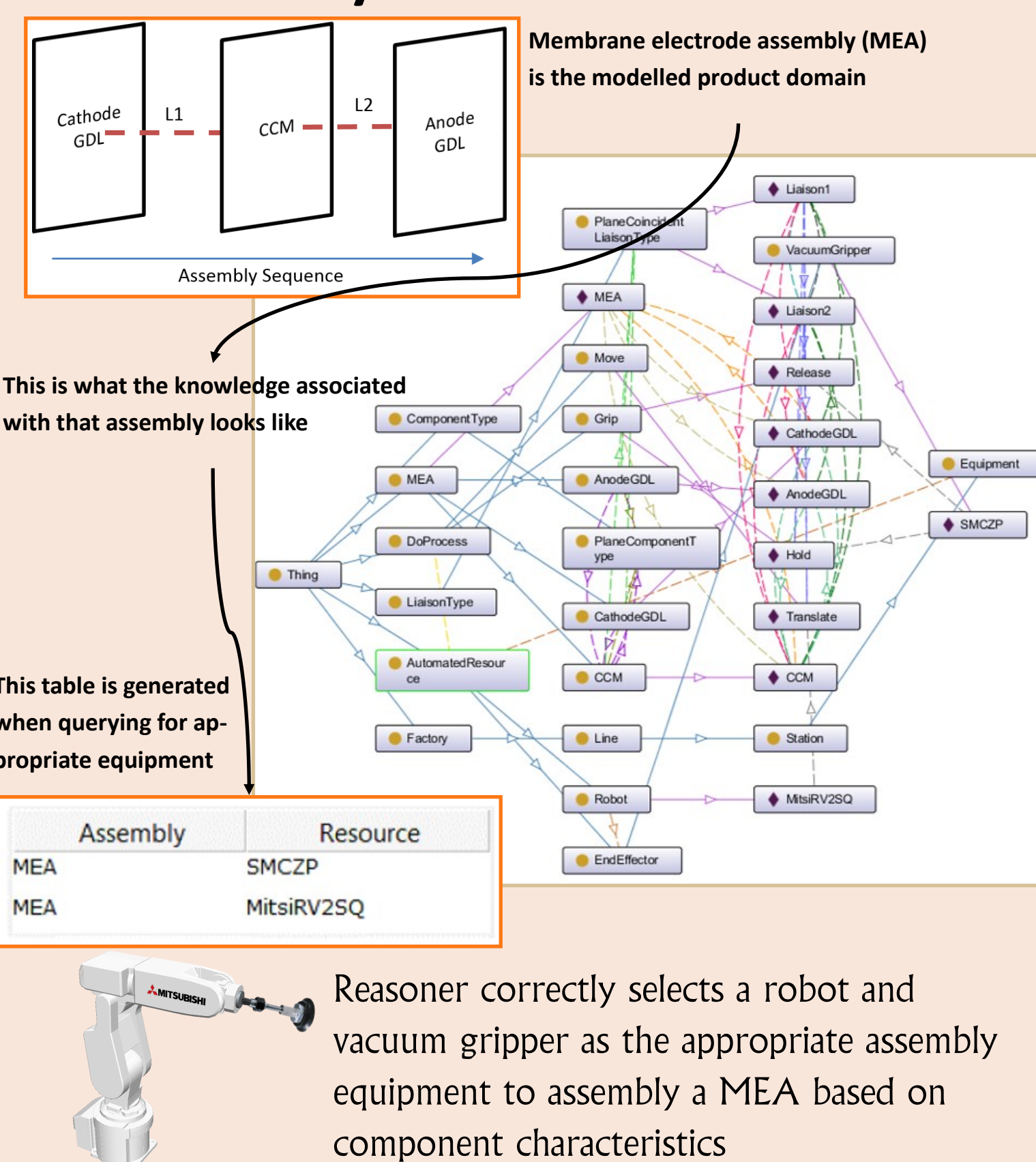


Fig 3. Model overview

5. Case Study



6. Conclusions and Further Work

- The concept has been proved—equipment can be generated and the assembly sequence model works
- As an ontology has been used, the model is extensible and scalable allowing for the addition of more information in the future
- But it is a time consuming process! Therefore the existing data sets need to be exploited to automate the process

6. References

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