

ReCaM

Rapid Reconfiguration of Flexible Production Systems

Welcome to the sixth issue of ReCaM newsletter!

This issue presents the latest updates within the ReCaM project, and discusses the value that can be driven from ReCaM innovations for potential customers. In addition, it highlights how the integration of the tools adds more value to users. An expert opinion on selected exploitable results is also included.

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In this issue:

Value propositions based on ReCaM's innovation

- Key benefits to customers

Bringing the ReCaM tools together

- The value out of integration
- Selected scenarios

An expert's insight

- An interview on selected exploitable results

Latest news and events of ReCaM

The current status of implementations/ integration of ReCaM tools and next steps

The software blocks and tools that are comprising the entire ReCaM solution are implemented and tested individually. Thus, the current activities are focused on the integration process of these building blocks. This is an essential phase that requires an intensely closer collaboration among our consortium members, in order to guarantee a successful integration as well as the project demonstrators. These activities consist of testing and validating the connections among different software tools as initially outlined in the overall ReCaM system architecture. Some of these interacting tools are developed by the same partner (e.g., Capability Management and Resource Management) while others (e.g., System Engineering Platform, Planning and Reconfiguration and Match-Making) involve different partners to closely solve the arising challenges to ensure that data exchange formats and protocols work seamlessly. Besides, the implementation activities for the ReCaM demonstrators are progressing. The next steps regard the verification of the ReCaM software tools to the physical demonstrator environments.

The Consortium partners

The ReCaM Consortium is composed of nine partners from industrial end users, technology providers and research institutions.



ReCaM implementation workshop Renningen



On March 7th-8th, 2018, the ReCaM project consortium has conducted a two-day workshop, at the Robert Bosch Campus in Renningen, Germany. This workshop was focused on the practical steps leading to the software integration process among ReCaM tools, and the next phases of their implementation on the demonstration environments. Among other topics, the workshop included discussions on updates on the current state of the demonstrators, technical sessions for the verification of data interfaces, runtime services and implementation prototypes, tools testing and further implementation steps outline. The consortium also discussed the current state and the next plans within the exploitation and dissemination activities. The first versions of the business plan of ReCaM exploitable results have been presented, together with the next steps and strategies in the development of the business plans are discussed. Finally, the plans for disseminating the project results have been outlined.

Upcoming!

The upcoming ReCaM workshop will focus on the application and verification of the connected ReCaM software tools on the physical demonstrators.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 680759





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Section focus:

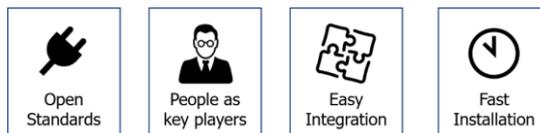
Value propositions inspired by innovations of ReCaM's tools, and highlight about potential customers and promising benefits

Value proposition based on ReCaM's innovations

After a comprehensive analysis of the exploitable results of the ReCaM project, partners have outlined the Value Propositions (VP). The analysis for each of the VP is done on the basis of the following criteria: Market Segment; Target Persona; Customer's needs; Pain/Gain of the offering. Here, we provide a short highlight of the main VPs that have been identified.

1 - New Plug and Produce technologies for highly adaptable production systems

This value proposition targets assembly industries facing the following main challenges; i.e., manufacturers who: (1) operate specialised machines that must adapt to evolving product requirements; (2) commit high investments on new products and processes, and; (3) require longer ramp up times between the definition of a product and start of production. Using plug and produce technologies in combination with other ReCaM tools that are based on standards facilitate the integration process of resources from different providers, scalable production capacity and faster reconfiguration of existing modules.



The capability to introduce new processing modules into a system in a short time significantly reduces the time between the design of a new product and the start of production. This also allows frequent changes in product types and production lot sizes. Achieving these goals boosts the competitive advantage of manufacturers in turbulent and dynamic environments, thanks to shorter reconfiguration and ramp up times, higher operational efficiency and utilisation of critical resources.

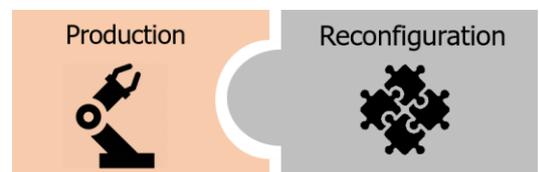
“Achieving these goals boosts the competitive advantage of manufacturers in turbulent and dynamic environments”

2 - Integrated Production and Reconfiguration Planning Tool

The planning tool in this VP offers an easy to use solution for companies dealing with the complexity of production planning under unpredictable customer demands in the context of mass customisation of products. Such conditions impact the efficiency of manufacturing systems. Existing planning tools do not consider the (1) reliability of the resources and the logistic conditions of the system and (2) the interaction of production and reconfiguration that need to be jointly evaluated for comprehensive system behaviour understanding. Moreover, the analysis should be done in short time to confirm order completion time to valuable customers.

“[...] any user with a minimal knowledge of system analysis can use the integrated planning tool.”

The Integrated Production and Reconfiguration Planning Tool offers modelling and optimisation power for manufacturers to find the best ways of reorganising and reconfiguring resources very frequently. For this reason, it packages tools that (1) consider and model MOs as modular units with which to build flexible production systems, (2) use layout recognition concepts to structure modules, and exploit the Plug-and-Produce capabilities of MOs to capture the actual state and configuration of the system at any point in time. These tasks that normally require expert to perform modelling and assessment of many solutions are automated processes in the developed planning tool. Therefore, any user with a minimal knowledge of system analysis can use the integrated planning tool developed in ReCaM, to derive solutions providing detailed instructions on both the production and reconfiguration actions.



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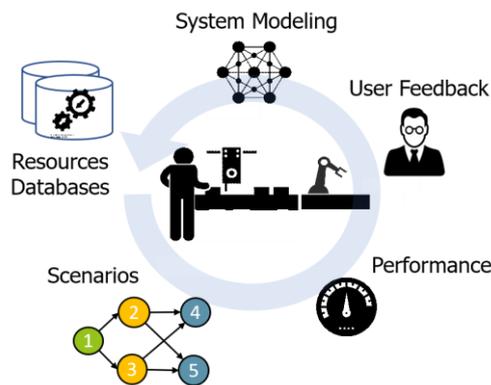
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Value proposition based on ReCaM's innovations

The Integrated Production and Reconfiguration Planning Tool mainly focuses on markets such as automotive, machine tool builders, customer electronics, and in general it targets manufacturers with a frequent need to adapt and reconfigure resources for the assembly of many product variants.

3 - Flexible System Engineering Platform

This VP addresses the needs of production systems designers who are dealing with early system design and equipment selection phase. This phase, is characterised by: (1) limited time to provide reliable system configurations (2) the challenge of taking into account multiple interrelated KPIs (3) difficulty to consider several product / variants in the system configuration design. Indeed, existing design tools do not take into consideration the need of flexible production due to market demand variability and high customisation trends.



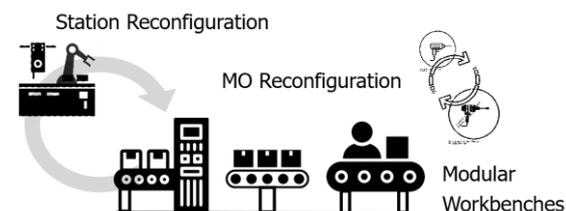
The Flexible System Engineering Platform is aimed at overcoming these gaps in the existing design tools. It supports production systems designers to generate and analyse a large number of alternative designs to obtain more reliable solutions at early design stages. It exploits a multi-objective approach with customisable KPIs. The output designs can significantly reduce the future risks related to product changes. The optimisation of KPIs related to costs also allow to achieve faster return on investments. It is a valuable tool for segments such as tier-1 automotive, white goods OEM, and packaging.

4 - Innovative mechanical solutions for reconfiguration of assembly processes

The efficiency of a system design solution strongly relies on the capability to easily integrate, convert, and scale of the individual MOs. In this VP, hardware designs concepts based on standard physical, electrical and communication interfaces are considered as key criteria for anticipated reconfiguration scenarios.

“The Flexible System Engineering Platform is aimed at overcoming gaps in the existing design tools”

The hardware design considers that flexibility, reconfiguration ease, diagnosability, maintainability, product quality are considered in advance. This is synergetic with the goals that can be achieved by the Flexible Engineering Platform, supporting the hardware side. Indeed, it is possible to consider MO designs before their actual manufacture and assess their capabilities in system design. This supports the prototype validation phase of different devices before the manufacturing of the hardware. Therefore, the solution from ReCaM's exploitable result is dedicated to provide the resources that a production planner can test with the Engineering Tools (Mechatronic Objects Modelling). This provides MO models with standardised features for a quicker and more effective design process. Having these features can directly provide a higher automation performance within the assembly process, a higher efficiency and flexibility to cover higher product variability, and a more effective reconfiguration.



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Section focus:

Highlights from integration scenarios of ReCaM tools:

- Prominent integration scenarios: design and operation phases
- Platforms communications in the two cases

Each standalone ReCaM solution is capable of solving a set of problems towards enabling an intelligent, autonomous, modular system design and management. However, the power of these tools lies in their integrated use by exchanging information among each other. Therefore, the integration of the different tools developed in ReCaM is a critical step of the project, and also one of the most important to boost value from an end-user point of view. The combination of these tools is designed to be flexible enough to cover a wide range of use cases, as well as to allow reuse them in different environments. In order to create a higher flexibility and allow the user to select the essential modules of the ReCaM tools, a service-oriented architecture has been envisioned. Such an architecture permits multiple tools (even competing ones) to join the framework of tools and utilise the same services. Hence, selected scenarios are drafted and experimented to demonstrate the versatility of these tools in diverse scenarios.

“[...] the integration of the different tools developed in ReCaM is a critical step of the project”

With the above mentioned goals in mind, two macro scenarios are defined for the integration validation. The two scenarios give a clearer contrast about the use of the tools in supporting design phase versus their use during the system management and reconfiguration phase.

1 - System Engineering Scenario

This scenario regards a new system design problem based on the evaluation of many designs, and their ability to guarantee target performances under changing production volume, product types and processing technology across long term time horizon.

2 - Production and Reconfiguration Planning Scenario

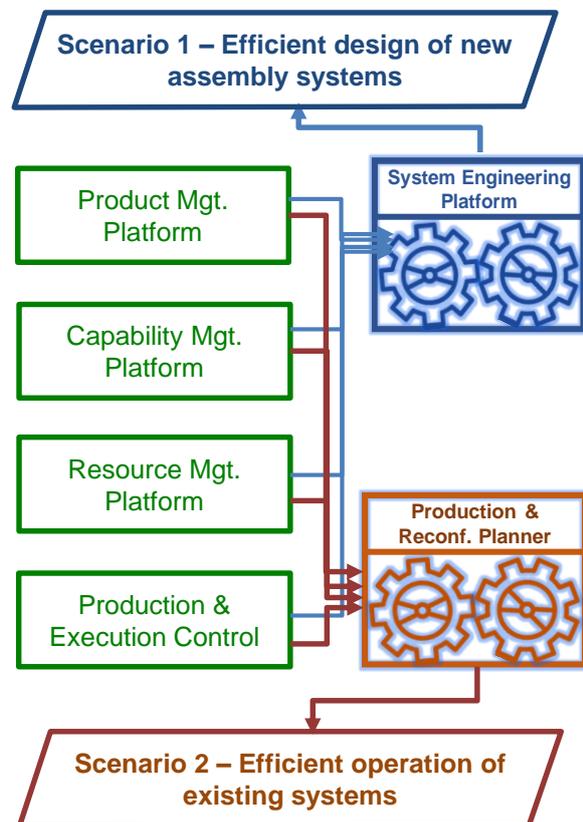
This scenario targets short term decisions making on the optimal production and reconfiguration planning under a given target service level and order completion times.

Highlights from the integration scenario

In order to accomplish the two scenarios, six major platforms are involved. Two of these platforms correspond to each scenario while the other 4 are shared in both scenarios. However, these platforms adapt their internal functions and data interfaces depending on the scenario type being considered.

- (1) System engineering platform
- (2) Production and reconfiguration planner
- (3) Product management platform
- (4) Capability management platform
- (5) Resource management platform
- (6) Production execution and control

The generalised scheme below shows the interaction of the platforms during system design (in blue lines) and reconfiguration management (in brown lines) scenarios.



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Interview about ReCaM's value propositions

Section focus:

Ing. Giovanni Borzi (Project Manager at Enginsoft) gives an expert's view on value propositions and key results:

Q1: How do the ReCaM exploitable results become value propositions to potential customers? What are the essential steps to target specific customers and understand their core needs?

In order to provide value to a potential customer it is necessary to understand the processes the customer manages. An example of such a process is production system reconfiguration planning. We started by identifying potential customers and analysing the related processes: in the first stage this analysis has been carried out within the ReCaM project consortium, discussing with the end users of project results for the different use cases. In this way, desired improvements to the existing processes have been identified. As a second step we analysed the expected exploitable results in order to describe how they will improve the existing processes. This approach allowed to identify in detail which functionalities or features contribute value to a potential end user, and how. It is the basis to create a value proposition. Finally, we extended this analysis outside the ReCaM consortium, in order to validate our value propositions assumptions.

Q2: What are the initial mechanisms/channels to increase customer interest about the potential values within the ReCaM offers?

We are preparing specific material to be used at selected dissemination and exploitation events. Indeed, those occasions are expected to provide valuable feedback and to drive the creation of dedicated marketing material. Channels will be identified in the frame of business planning activity that will involve all the market oriented exploitable results. It is expected that marketing channels will be selected based on the characteristics of each result, the existing channels and the experiences of the consortium, and also the potential of partnerships.

Q3: How can offering ReCaM tools as independent product/services versus as integrated product/service impact the value created to the potential customers?

Offering independent products is a viable option in specific situations. In this case it is simpler to identify the value proposition and also it is easier to drive product/service development at a strategic and tactical levels, as all the marketing levers are available. In case of integrated products, things are often more complicated, since it is needed to bring together the requirements from different stakeholders and it is also more difficult to exploit scale factors. In this latter case partnership is often a useful route to be considered.

Q4: Could you mention some major factors (roadmaps) determining the success of transforming the proposed value propositions into ReCaM inspired product/services within the competitive landscape?

One of the advantages of creating a precise value proposition description is that you can compare it more easily to that of competitors. For example, it is possible to position the ReCaM solution in terms of innovation level or perceived value to customer, and therefore compare it to known competition in order to derive marketing and product development strategies. Once a new product introduction strategy is defined precisely, it can be executed and measured, in a way that necessary adjustments can be made on the basis of factual market information, rather than perceptions or information derived from previous similar products or strategies. However, this does not guarantee success per se, but provides a better, faster and more efficient way to manage innovation.

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