Session 15 Discussion Notes

Business Decision Support Systems (BDSS): from concept to implementation

Introduction

Sustaining and growing businesses require continuous product innovation. Making meaningful business strategy decisions is an ever more challenging task in a global context. The combination of materials and business modelling to explore what technical solutions are economically viable is not yet exploited to the extent it could. The sheer volume of data and information combined with its dynamic nature demands an ever better understanding of possible options. There is a need for a Business Decision Support System (BDSS) that supports the selection of the optimal material and process, taking into account the implementation costs but also the associated risks, uncertainties and costs related to the modelling and simulation; a priority, especially for SMEs.

Objectives

Session 15 will showcase the BDSS vision and developments from FORCE and COMPOSELECTOR projects which will demonstrate the combinations of open and commercial systems for integrating modelling decisions in new or existing business support systems, and a commercial system developed by Siemens. FORCE and COMPOSELECTOR provide materials modelling modules on all scales along with a suite of decision-making tools (optimization, cognitive computing, materials informatics) that can be used to build customised BDSS Apps or integrated into third party business decision tools. Siemens provides a mature/enterprise-level tool using mesoscale and continuum modelling accompanied by a suite of integrated tools for design and business decision-making.

The presentations will demonstrate:

- Reduction of company costs and increased performance and commercial impact based on effective materials models driven business decisions;
- Guidance to companies in developing their strategies with an effective, user friendly materials models driven business decision system;
- Increased industrial use of existing materials knowledge and effective materials models;
- Improved trust of industrial decision makers in materials modelling and their commercial advantage;
- Essential company savings in time and money, especially via the elimination of the need for (some) plant trials.

Background information and documents

Siemens: Siemens delivers Simcenter 3D for accurate CAE product performance prediction and has worked out a Virtual Materials Characterization (VMC) approach to achieve material predictions with minimal testing. This is combined with Teamcenter for product lifecycle management, collaboration & linking, including Integrated Materials Management (IMM), and with HEEDS for design space exploration, decision making and product optimization. The

toolset addresses continuum models, but is open to receive predictive inputs from discrete levels. Examples from industry use cases will be shown to illustrate how the various tools complement each other in simulation workflows to solve product development challenges. https://www.plm.automation.siemens.com/global/en/

FORCE: Formulations and computational engineering (FORCE) is a new project, underway within the EU program Horizon 2020. The main goal of the consortium is to bring materials modelling to the heart of business decision making by integrating materials modelling into state of the art business decision support systems (BDSS). The project will enable decision makers in industries to make more knowledgeable decisions based not only on existing legacy data, but also on new data generated by state of the art multiscale and multi-physics materials modelling. The main goals of the project are to: 1) Combine materials and business modelling to explore which technical solutions are economically viable; 2) Enable better utilisation of (the huge) dynamic data and information. https://www.the-force-project.eu/

COMPOSELECTOR: COMPOSELECTOR is an ambitious, innovative and timely project to develop, demonstrate and assess an integrated software platform based on a multi-disciplinary, multi-model and multi-field approach for decision-making in the selection, design and fabrication of micro-structured and macro-structured polymer-matrix composite materials. The project will enable greater strategic use and integration of materials and process modelling in business processes. The project combines technical and commercial expertise from academia, a Research and Technological Organisation (RTO) and industrial entities to support a new paradigm in micro-structured and macro-structured PMCs selection where it is crucial to identify concurrent material-selection factors within the value chain. The achievements of this project will improve material selection, design and process capabilities as it creates an accessible platform for the use of computational materials science and physics at the early stages of design. https://www.composelector.net/

Discussion points and questions

- **Tell us about your decision-making tool or methodology (BDSS) and how it integrates material model outcomes**. In the case of the three projects, all are striving to automate the process of setting up decision support. However, it is well acknowledged that decisions are often made in less automated ways, such as spread sheets or a discussion between key internal/external stakeholders, a project management tool, and that a single button, fully automated tool is a relatively mature process that is not currently available.
- **What models are integrated in your BDSS:** nature of the models – theory-driven (electronic, atomistic, mesoscopic, continuum) and/or data-driven.
- **How does your solution integrate into existing BDSS?**
- **Who are the main actors using the BDSS, and what types of projects do they use it for:** managers, materials engineering, modellers, etc. (exact job titles preferred)? Who is initiating discussions, who feeds the information into a business decision, etc.? What phase in the product life cycle is it used for (e.g. front/back end research, design decisions, etc.)? Is it being used with or offered to value chain partners and customers?

- **What are the main benefits, or key performance indicators, linked with integrating material model output with business decisions:** reduced cost, product improvements, reduced time-to-market, and/or other business benefit?
- **Is your BDSS working successfully** to include materials modelling outcomes? What is your vision of success?
- What are the **business objectives/requirements** in the product design process that your BDSS can support? For example, weight capacity, reliability of the product, etc.
- What is the main **value/business proposition** for your BDSS?