Editorial

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Biographical notes: Abdelaziz Bouras is currently Professor at Lumière University of Lyon, where he is leading the Supply Chain and PLM group of PRISMa laboratory and the CERRAL Development Center of Lumière Technology Institute. Abdelaziz holds a PhD and a Habilitation diploma in industrial engineering from Claude Bernard University of Lyon. His current research works cover information and data sharing, exchange standards and architectures, and collaboration strategies with a focus on supply chain and PLM applications. He is also involved in some international research projects, and editing the *International Journal of PLM* and some conferences in the PLM and Supply Chain fields

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The Product Lifecycle Management (PLM) holds the promise of seamlessly integrating all the information produced throughout all phases of a product's life cycle to everyone in an organisation at every managerial and technical level, along with key suppliers and customers. PLM systems form the apex of the corporate software hierarchy and as such depend on subsidiary systems for detailed information capture and dissemination. The tools that support PLM philosophy can be broadly categorised as:

- authoring tools that create product content
- optimisation and decision support system tools that manage and optimise the processes involved in the lifecycle of the product from its conception to retirement.

Until quite recently, computer support for product development tended to cover a narrow slice of a product's lifecycle – typically the segment from the product's engineering specification to its physical embodiment. The PLM promises to provide support for the product's entire lifecycle, from the first conceptualisation to the disposal of its last instance. The volume, diversity, and complexity of information describing the product will increase correspondingly. The PLM philosophy and systems envisage providing support to even broader range of engineering and business activities.

It is therefore important not only to take the technological but also the organisational perspective of PLM into account. Collaborating and sharing of data within a company and especially in the extended enterprise challenges existing processes and culture. For that reason, the success of PLM heavily depends on the willingness of the organisation to accept change and especially on the people that must form inter-organisational and cross-functional teams to collaboratively develop and manage products.

This special issue is organised according to the following themes:

- from PDM to PLM
- PLM concept and practice
- PLM and early design
- PLM systems
- PLM and knowledge management
- PLM and traceability
- Systems engineering.

From PDM to PLM

A critical aspect of PLM systems is their product information modelling architecture. Here, the traditional hierarchical approach to building software tools presents a serious potential pitfall: if PLM systems continue to access product information via product data management (PDM) systems that, in turn, obtain geometric descriptions from computer-aided design (CAD) systems, the information that becomes available will only be that which is supported by these latter systems. The paper by P.M. Wognum and I.C. Kerssens-van Drongelen details a survey of PDM implementations and the assessment of the feedback from this experiment. The paper confirms and establishes the interaction between organisational and technical issues in the implementation of PDM. Further it points out that decisions and uses of PDM are limited and are not across the full enterprise. These observations have important implications for the design and implementation of PLM system that have larger scope than PDM systems.

PLM concept and practice

The paper by L. Taxen and D. Svensson proposes the application of the activity domain theory as a framework of an alternative foundation for PLM. The main contribution of this study is that PLM is carried out in a socially organised setting where human ‘actors’ work together towards a certain goal. The paper has some very useful concepts and approaches PLM in a holistic way.

PLM and early design

In the detailed design stage, the information is more structured; but in the early design stage, the information is unstructured, incomplete and evolutionary in nature. A lot of research effort is required in capturing early design information including requirements (customer, functional, behaviour, etc.) and quality among other things. The paper by D. Scaravetti, J. Nadeau, J. Pailhès and P. Sebastian discusses a method to perform the analysis of the embodiment design problem. The paper draws results from function, structure, and behaviour reasoning literature and defines a four-level analysis (need, functions, organic structure, and physical behaviours) for the method.

PLM systems

A model based approach is the topic of the paper by M. Grieves. The author proposes two models, the PLM model and the mirrored spaces’ model in developing an understanding of the characteristics and boundaries of PLM.

PLM and knowledge management

The paper by M. Therani and M. Tanniru characterises PLM as a large-scale knowledge management effort in engineering. Their paper proposes what the authors call ‘knowledge partition’ of the organisational knowledge into three groups: business control and coordination knowledge; task oriented process knowledge; and knowledge about an organisational service or product. The knowledge partition approach is based on exploratory industry case studies. The paper also discusses some research issues in developing a PLM architecture to manage these types of knowledge using recent advances in process modelling, ontology development, information integration and software systems.

PLM and traceability

The paper by P. Denno and T. Thurman addresses the issue of how IT supporting PLM should provide a high degree of information cohesion and traceability. These two notions are important to establish the knowledge of interrelations among data and the basis for beliefs. The nine constituent properties of these two notions are discussed. The authors suggest that process-aware integration schemas can improve cohesion and traceability.

Systems engineering

A significant portion of PLM overlaps with systems engineering (SE). SE has existed as a discipline for several decades and has been applied successfully to a wide range of complex products. The paper by C. Bock introduces SE and recent work on defining a standard SE Modelling language as expressed in an extension to the Unified Modelling Language. It also addresses a central aspect of integrating software development into general engineering practice.

By addressing both theoretical and application-oriented problems in this special issue, we hope that readers will find the papers stimulating and will understand some of the research challenges and future research directions. The main intent is to make practitioners aware of PLM capabilities, problems and solution approaches and to promote a better understanding and collaboration between the scientists and engineers in this fast growing field.

We wish to thank the authors for their contributions to this special issue and the reviewers for their thorough reviews.