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Tools and Methods of Competitive Engineering

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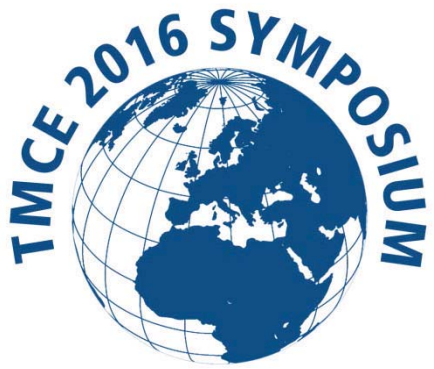

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Proceedings

Preface

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Foreword

In the last three decades, many paradigms of digital computing, such as networked personal computing, ubiquitous computing, pervasive computing, cloud computing, Internet of things, cyber-physical computing, and social computing have emerged. Others, such as biological computing and quantum computing, are just around the corner. The intervals between the emergences of the subsequent paradigms are getting shorter and shorter. The rapid space of technology development is accompanied by a lot of developments in the domains of emerging smart materials, sustainable energy provisioning, big data utilization, and organization of production facilities. Alongside with these, influential societal and conceptual changes are taking place. The age of interweaving smart socio-technical systems of systems is forming. Visionary professionals advocate that computers may one day learn how to program themselves and how to mimic biological intelligence. Product and service developers are challenged not only by the experienced pace of technology progression, but also by the perpetuated competitiveness and complicatedness of the global business ecosystem. They should simultaneously be technology-aware, socially conscious, and business driven if they want to strive after true competitiveness. Multidisciplinary knowledge and networked knowing will be even more important assets than ever before.

This Proceedings of the Eleventh International Tools and Methods of Competitive Engineering Symposium (TMCE 2016) offers a limited, but useful contribution to the knowledge of transferring and utilizing the latest digital technologies in the product, systems and service development and implementation practices. TMCE 2016 was jointly organized by the Delft University of Technology, the Netherlands and Arts et Métiers ParisTech, France and held in Aix-en-Provence, France, from 9th to 13th May, 2016. On the one hand, this Proceedings provides an excellent overview of the most important challenges systems and service designers and engineers are facing nowadays. On the other hand, it offers novel scientific knowledge, conceptual frameworks, formal methodologies, empirical know-how, and proposes supporting tools and best practices to address many concrete challenges.

Altogether 70 technical papers were presented at TMCE 2016 in three tracks of podium presentations: (1) Advancements in systems engineering, (2) Product and service engineering, and (3) Design and production enablers. The papers have been arranged in the chapters of this Proceedings according to this structure of sessions. The papers included the *Advancement of systems engineering* chapter addresses topics such as: multi-physics-based smart systems, information exploitation in engineering, modeling methodologies, approaches and tools, and application of generative models, agent technologies in engineering and agent-based systems, and dependability of engineering systems. The reader can find new concepts and research/development results in the *Product and service engineering* chapter about development of product service systems, product multi-materialization methods and techniques, methodological issues and business aspects of engineering, enhancement of performance indicators and novel principles for designing, human orientated solutions and awareness enhancement approaches. Finally, the chapter entitled *Design and production enablers* includes papers on solving some geometry-related problems of engineering and utilization of CAD knowledge, model-based development methodologies and utilization of

analytical tools, exploitation of additive manufacturing and empowering fabrication, consideration of sustainability aspects, and application of advanced learning approaches.

We are convinced that the papers included will be a useful reference for industrial product designers, engineers and managers, as well as for academic researchers, educators and students. As the above concise overview shows they cover a rather wide spectrum of challenges and offer a multitude of knowledge and solutions. We are very grateful to the contributing authors for their high quality work and submissions, and for their constructive attitude and collaboration in the peer review and paper revision processes. We also highly appreciate the work of the 144 members of the international paper review panel. Without their rigorous but helpful support the overall good quality represented by the published papers could not be achieved. Finally, but equally gratefully, we are thanking the members of the Organizing Committee, whose graphical design, lay-outing, and technical arrangements contribution supported not only the realization of the Eleventh International Tools and Methods of Competitive Engineering Symposium, but also this Proceedings.

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