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IFIP – The International Federation for Information Processing

IFIP was founded in 1960 under the auspices of UNESCO, following the First World Computer Congress held in Paris the previous year. An umbrella organization for societies working in information processing, IFIP's aim is two-fold: to support information processing within its member countries and to encourage technology transfer to developing nations. As its mission statement clearly states,

> IFIP's mission is to be the leading, truly international, apolitical organization which encourages and assists in the development, exploitation and application of information technology for the benefit of all people.

IFIP is a non-profitmaking organization, run almost solely by 2500 volunteers. It operates through a number of technical committees, which organize events and publications. IFIP's events range from an international congress to local seminars, but the most important are:

- The IFIP World Computer Congress, held every second year;
- Open conferences;
- Working conferences.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is small and by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

Any national society whose primary activity is about information processing may apply to become a full member of IFIP, although full membership is restricted to one society per country. Full members are entitled to vote at the annual General Assembly, National societies preferring a less committed involvement may apply for associate or corresponding membership. Associate members enjoy the same benefits as full members, but without voting rights. Corresponding members are not represented in IFIP bodies. Affiliated membership is open to non-national societies, and individual and honorary membership schemes are also offered.

Christos Emmanouilidis Marco Taisch
Dimitris Kiritsis (Eds.)

Advances in Production Management Systems

Competitive Manufacturing for Innovative Products and Services

IFIP WG 5.7 International Conference, APMS 2012
Rhodes, Greece, September 24-26, 2012
Revised Selected Papers, Part I

Springer

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Preface

Since the first conference that took place in Helsinki back in 1990, APMS is one of the major events and the official conference of the IFIP Working Group 5.7 on Advances in Production Management Systems. Recently, APMS successfully took place in Washington (USA, 2005), Wroclaw (Poland, 2006), Linköping (Sweden, 2007), Espoo (Finland, 2008), Bordeaux (France, 2009), Cernobbio (Italy, 2010), and Stavanger (Norway 2011).

APMS 2012 was sponsored by the IFIP WG 5.7 and co-sponsored by the ATHENA Research & Innovation Centre and the Hellenic Maintenance Society in Greece. In an era of increased globalization and ever-pressing needs for improved efficiency, the APMS 2012 theme was "Competitive Manufacturing for Innovative Products and Services." In this setting, among the key elements of success in modern manufacturing and production management are:

- **Resource Efficiency**: the ability to perform in a resource-efficient manner throughout the lifecycle of a production process, product use or offered services.
- **Key Enabling Technologies**: the exploitation of the latest materials, manufacturing and production control technologies to support competitive and sustainable production.
- **Networked Enterprise and Global Manufacturing and Supply Chains**: the ability to operate as a globally interconnected organization and perform at a global scale, both at an intra- and inter-organizational scale.
- **Knowledge Intensity and Exploitation**: the efficient use of enterprise and human resources tangible and intangible knowledge, including efficient knowledge lifecycle management.
- **Innovation**: the ability to efficiently port R&D results into competitive new forms of production, products or services.

The APMS 2012 conference brought together leading experts from industry, academia and governmental organizations. They presented the latest developments in production management systems and debated how to shape up the future of competitive manufacturing. It comprised seven keynote talks and 36 sessions, including a dedicated Industry Panel Session, to offer the practitioners' view on linking research to industry, thus efficiently supporting the innovation process. The keynotes offered insight into cutting-edge issues of production management and its future, comprising the following talks:

- "A Business Perspective for Manufacturing Research," Jochen Rode, SAP
- "ICT-Driven Innovation in the Factories of the Future," Rolf Riemenschneider, European Commission
- "Sustainable Manufacturing: Towards a Competitive Industrial Base in Europe," Filip Geerts, CECIMO

- "ICT Integration Challenges in Manufacturing: From the Device to the Enterprise Level," Thilo Sauter, Austrian Academy of Sciences
- "The IMS Global Platform Services for Manufacturing Research and Innovation," Dan Nagy, IMS
- "Energy Management Operations in Shipping Industry," Takis Varelas, DANAOS
- "The FoF PPP Call in WP2013 and Future Opportunities for Manufacturing R&I in Horizon2020," Andrea Gentili, European Commission

Industry and academia converged in a stimulating Industry Panel Session, organized by Prof. Hermann Loedding and Dr. Gregor Alexander von Cieminski. The session theme was "Linking Research to Industry: The Practitioner's view on Competitive Manufacturing for Innovative Products and Services." The following panellist talks introduced the session discussion:

- "Leadership in Electronics Operations @Continental," Wolfgang Menzel, Continental
- "Integrating Industrial Needs with Academic Perspectives — Concept and Realization of the RWTH Aachen High Tech Campus," Volker Stich, RWTH Aachen

Wolfgang Menzel and Volker Stich were joined in the panel by Paul Schönsleben (ETH), Dan Nagy, IMS and Filip Geerts, CECIMO and debated about the crucial linkage between research and industry in order to shed light on what constitutes successful practices in bringing forward R&D from the lab to industry-relevant innovation. The panel argued that higher education institutions should offer opportunities to students to undertake part of their studies in industry, with this being acknowledged and recognized as a formal part of education. Furthermore, industry could have more active presence within public research and educational campuses and FIR-RWTH Aachen was presented as an example of such an endeavor. Emphasis was placed on the industrial relevance of research, which would depart from theoretical solutions for "non-relevant" problems to conducting "relevant" research offering pragmatic and innovative solutions to industry.

Several special sessions were organized and ongoing research initiatives and projects presented their progress and results. A PhD Workshop was held prior to the conference, chaired by Sergio Cavalieri (University of Bergamo) and offered the opportunity to PhD researchers to present their research plans, objectives, and results to scientific discussants and gain valuable feedback to strengthen their research plan and activities.

At the conclusion of the conference, following the APMS tradition, the conference offered the following awards:

- Burbidge award for best paper to Dimitris Mourtzis (University of Patras)
- Burbidge award for best presentation to Morten Lund (University of Aalborg)

– Best PhD workshop paper award to Elzbieta Pawlik (University of Strathclyde)

Approximately 240 academics, researchers, practitioners and scientists from 31 countries joined the APMS 2012 conference, sharing their expertise and providing insight into what constitutes the currently best practice in manufacturing and production management, while also projecting into the future of competitive manufacturing for innovative products and services. The conference involved a high-quality International Steering and a Scientific Committee of acknowledged excellence, while the review process involved 73 experts, all making key contributions to the conference success. The conference program included 196 regular presentations and 11 PhD workshop presentations. The review process involved pre-conference extended abstracts reviews and a post-conference full paper review process, followed by a final paper submission by the authors, addressing the review comments. The result of this process is the present two-volume edited proceedings, comprising 182 full papers, organized under the following sections:

– Part I, Sustainability, including Energy Efficient Manufacturing, Sustainable Value Creation, Business Models and Strategies
– Part II, Design, Manufacturing and Production Management, including Mass Customization, Products of the Future and Manufacturing Systems Design, Advanced Design, Manufacturing and Production Management, as well as Robotics in Manufacturing
– Part III, Human Factors, Learning and Innovation, including Modern Learning in Manufacturing and Production Systems, Human Factors, Quality and Knowledge Management, as well as Innovation in Products and Services in Developing Countries
– Part IV, ICT and Emerging Technologies in Production Management, including Emerging Technologies in Production and the Lifecycle Management of Products and Assets, Enterprise Integration and Interoperability, as well as ICT for Manufacturing, Services and Production Management
– Part V, Product and Asset Lifecycle Management, including Product Lifecycle Management, Asset Lifecycle Management, as well as Performance and Risk Management
– Part VI, Services, Supply Chains and Operations, including Services, Managing International Operations, Supply Networks and Supply Chain Management, as well as Production Management, Operations and Logistics

We wish to acknowledge the support of **Intelligent Manufacturing Systems (IMS)** for the USB sticks and Lanyards for badges, as well as **Prisma Electronics SA** for sponsoring the APMS 2012 Welcome Reception.

We wish to thank the active members of the IFIP WG 5.7 community for their contribution and support of the conference, their support in the papers review process and the promotion of APMS 2012 through their networks and collaborating partners. Particular thanks are due to the **ATHENA Research and Innovation Centre** and the **Hellenic Maintenance Society** in Greece

for co-sponsoring and supporting the conference and Zita Congress SA for their professional conference management services.

The conference was hosted on the island of Rhodes, Greece, a world-class destination, boasting a unique mixture of ancient and modern with holiday attractions and a continuing history of well over three millennia. According to mythology, Rhodes was created by the union of Helios, the Titan personalizing the sun, and the nymph Rhode. The ancient city of Rhodes hosted one of the ancient wonders of the world, the Colossus of Rhodes, a giant statute of Helios. Manufacturing and production management have made giant strides and continue to contribute toward a world of smart, sustainable and inclusive growth, but much more needs to be done and a global effort is needed to continue pushing toward such ends. The APMS 2012 conference constituted a focused effort and contribution in supporting such aims. We hope that the present two-volume set will be of interest to the industrial and academic communities working in the area of manufacturing and production management and the associated enabling technologies.

February 2013

Christos Emmanouilidis
Marco Taisch
Dimitris Kiritsis

Organization

The APMS 2012 conference was sponsored by the IFIP WG 5.7 Advances in Production Management Systems, co-sponsored by the ATHENA Research & Innovation Centre, in Information, Communication and Knowledge Technologies, Greece, and co-sponsored by the Hellenic Maintenance Society (HMS), Greece.

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