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IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

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 generally smaller and occasionally 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.

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Felix Nyffenegger · José Ríos ·
Louis Rivest · Abdelaziz Bouras (Eds.)

Product Lifecycle Management Enabling Smart X

17th IFIP WG 5.1 International Conference, PLM 2020
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Revised Selected Papers

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Preface

The year 2020 will go down in history as the year of the COVID-19 crisis. A global pandemic changed all our lives and restricted our freedom of movement. Eventually, industry was hit hard by lockdowns in many regions of the world. Closed factories, short-time work, and restricted border traffic led to broken supply and demand chains. Our traditional mode of operation could no longer be maintained.

But then again, crisis has always been a driver for innovation. Many parts of our society had to react extremely fast to adopt their daily work to virtual collaboration. Education on every level went online within one or two weeks. Wherever possible, work was shifted to home office. Nobody would have thought that such radical changes in our work culture would be possible in such a short time.

Yet, it was no coincidence that this was possible. Rather it was the result of continuous research and development during the last decades and particularly the efforts to foster digitalization throughout the last years. Since 2003, the IFIP WG 5.1 International Conference on Product Lifecycle Management (PLM) brought together researchers, developers, and users of PLM. This event always aimed to integrate business approaches to the collaborative creation, management, and dissemination of product and process data throughout the extended enterprises that create, manufacture, and operate engineered products and systems. In this context, approaches such as digital and virtual product development, digital twins, smart manufacturing, or artificial intelligence were discussed and developed further. While these ideas seemed vague and visionary at the beginning, the contributions of this year's edition clearly showed that these novel concepts have reached a more mature level and have successfully been implemented in industry. Virtual collaboration, agile supply chains, smart manufacturing, and working interoperability have become vital. The development of PLM systems based on cloud and Web service technologies combined with Internet of Things (IoT) platforms seem to be key enablers of such intelligent or smart solutions for products, processes, and decisions. PLM enables smart X.

The 17th edition of IFIP International Conference on PLM 2020 was organized by the University of Applied Sciences of Eastern Switzerland. Due to the global impact of COVID-19 the conference was held in a virtual edition. This was the first time in the history of PLM conferences. Around 120 delegates from research and industry, originating from 17 nations joined the event. In more than 70 online sessions, 64 papers and 3 keynotes were presented, along with several social activities. Keynotes included speeches from Konrad Wegener of ETH Zurich, Alex Simeon of HSR, and two members of our community that were recently listed among the most influential researchers to achieve the smart factory: Ramy Harik and Thorsten Wuest. Every day was completed with an open industrial webinar, freely accessible to everyone. High ranking representatives from industry such as Buehler Group, Amstein + Walthert, and the DigitalLab@HSR were presenting their experience, followed by intense podium

discussions with researchers and participants from industry. In the pre-conference program a PhD workshop was held virtually, dedicated to young researchers.

All submitted papers were reviewed in a double-blind review process by at least 2 reviewers (2.6 reviewers per paper on average). In total, 98 abstracts were submitted, followed by 80 full paper submissions from which 61 were accepted to be presented at the conference. In addition, 3 of the submitted papers that originated from industrial members were selected to be presented in a special, nonscientific track for industrial technical contributions. The proceedings include 63 revised contributions presented at the PLM 2020 conference. The papers are grouped into 14 topical sections:

1. Smart factory
2. Digital twins
3. Internet of Things (IoT, IIoT)
4. Analytics in the order fulfillment process
5. Ontologies for interoperability
6. Tools to support early design phases
7. New product development
8. Business models
9. Circular economy
10. Maturity implementation and adoption
11. Model based systems engineering
12. Artificial intelligence in CAx, MBE, and PLM
13. Building information modeling
14. Industrial technical contributions

This book is part of the IFIP Advances in Information and Communication Technology (AICT) series that publishes state-of-the-art results in the sciences and technologies of information and communication. In addition to this conference, the *International Journal of Product Lifecycle Management (IJPLM)* is the official journal of the WG 5.1. Selected papers of this conference might be published as extended versions in this journal.

It took a lot of effort from many people to organize this conference and its proceedings. We want to thank all the authors, all those listed below, and all those who are not included but contributed to make the PLM 2020 conference a success, particularly under the given circumstances.

November 2020

Felix Nyffenegger
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