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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.

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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.

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Collaborative Networks and Digital Transformation

20th IFIP WG 5.5 Working Conference
on Virtual Enterprises, PRO-VE 2019
Turin, Italy, September 23–25, 2019
Proceedings

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Preface

Collaborative Networks and Digital Transformation

Collaboration is a main enabler for organizations striving to achieve differentiated competitive advantage. The 4th Industrial Revolution and its wide variety of emerging dimensions are characterized both by their required extensive digitalization as well as strong interconnections among their composed systems, products, services, value chains, and business models, among others.

The increasing availability of sensors and the smart and mobile devices connected to the Internet, powered by the pervasiveness of Cyber-Physical Systems and Internet of Things equipped with distributed computational power and intelligence, have boosted hyper-connected organizations. The focal points of this revolution span over: vertical integration of smart production systems, horizontal integration of organizations through global value chain networks, adoption of through-engineering across the entire value chain, acceleration in manufacturing and service provision, and digitalization of provided products and services, giving rise to new business models that support customer intimacy. Next to Industry 4.0, the same trends increasingly surface in many other areas and sectors, including: Economy 4.0, Health 4.0, Agriculture 4.0, Transportation 4.0, Water 4.0, Tourism 4.0, Logistics 4.0, etc.

These emerging trends challenge the way collaborative networks and systems are designed and operate. Previously proposed solutions for the networks' organizational structures, applied algorithms and mechanisms, governance principles and models, among others, need to be revisited and redesigned in order to comply with the speed of evolving scenarios. Furthermore, the new proposed solutions shall converge a number of relevant advanced technologies, such as CPS, IoT, Linked Data, Data Privacy, Federated Systems, Big Data, Data Mining, Sensing Technologies, and many others. They shall additionally suggest a stronger focus on system dynamics, addressing the impact of several variables, such as the time, location, and population.

PRO-VE 2019 provides a forum for sharing experiences, discussing trends, identifying challenges, and introducing innovative solutions aimed at fulfilling the vision of goal-oriented collaboration in networks that support digital transformation. Understanding, modeling, and proposing solution approaches in this area require contributions from multiple and diverse areas of research and development, including computer science, industrial and electrical engineering, social sciences, economy, organizational science, and advanced technologies, among others. Comprising these areas is well tuned to the interdisciplinary spirit of the PRO-VE Working Conferences.

PRO-VE 2019, held in Turin, Italy, was the 20th event in this series of successful conferences, including:

PRO-VE 1999 (Porto, Portugal), PRO-VE 2000 (Florianopolis, Brazil), PRO-VE 2002 (Sesimbra, Portugal), PRO-VE 2003 (Lugano, Switzerland), PRO-VE 2004 (Toulouse, France), PRO-VE 2005 (Valencia, Spain), PRO-VE 2006 (Helsinki, Finland), PRO-VE 2007 (Guimarães, Portugal), PRO-VE 2008 (Poznan, Poland), PRO-VE 2009 (Thessaloniki, Greece), PRO-VE 2010 (St. Etienne, France), PRO-VE 2011 (São Paulo, Brazil), PRO-VE 2012 (Bournemouth, UK), PRO-VE 2013 (Dresden, Germany), PRO-VE 2014 (Amsterdam, The Netherlands), PRO-VE 2015 (Albi, France), PRO-VE 2016 (Porto, Portugal), PRO-VE 2017 (Vicenza, Italy), and PRO-VE 2018 (Cardiff, UK).

This proceedings book includes selected papers from the PRO-VE 2019 Conference. It provides a comprehensive overview of major challenges that are being currently addressed, and specifically recent advances in various domains related to the digital transformation and collaborative networks and their applications. There was therefore a strong focus on the following areas related to the selected main theme for the 2019 Conference:

- Collaborative models, platforms, and systems for digital revolution
- Manufacturing ecosystem and collaboration in Industry 4.0
- Big data analytics and intelligence
- Risk, performance, and uncertainty in collaborative networked systems
- Semantic data/service discovery, retrieval, and composition in a collaborative networked world
- Trust and sustainability analysis in collaborative networks
- Value creation and social impact of collaborative networks to the digital revolution
- Technology development platforms supporting collaborative systems
- Collective intelligence and collaboration in advanced/emerging applications
- Collaborative manufacturing and factories of the future, e-health and care, food and agribusiness, and crisis/disaster management

We are thankful to all the authors from academia, research, and industry, for their contributions. We hope this collection of papers represents a valuable tool for those interested in research advances and emerging applications in collaborative networks, and in identifying future open challenges for research and development in this area. We very much appreciate the dedication, and the time and effort spent by the members of the PRO-VE international Program Committee who supported us with the selection of articles for this Conference and provided valuable and constructive comments to help authors with improving the quality of their papers.

July 2019

Luis M. Camarinha-Matos
Hamideh Afsarmanesh
Dario Antonelli

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**PRO-VE 2019 – 20th IFIP Working Conference
on VIRTUAL ENTERPRISES**
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