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(Eds.)



ICT for Promoting Human Development and Protecting the Environment

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Foreword

The International Federation for Information Processing (IFIP) is the global federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and use of information and communication technologies. It was established in 1960 under the auspices of UNESCO as an international non-governmental organization (NGO), not-for-profit. Its members are societies, and volunteers come from all over the world to participate in its Technical Committees and Working Groups.

One of its strategic aims, among others, is to advance digital equity worldwide, by promoting accessibility of ICT, good practices, and appropriate access to knowledge and experiences. It also seeks to discover opportunities to use information and communication technologies to promote human development and protect the environment. This is done by organizing and contributing to activities aimed at achieving the UN Sustainable Development Goals (SDGs) and the plan of action of the ITU World Summit on the Information Society (WSIS).

Among the activities organized or promoted by IFIP to attain the above goals, one flagship event is the World Information Technology Forum (WITFOR), initiated by this organization in 2003. WITFOR intends to bring together members of the ICT community from governments, academia, industry, and associations, to discuss recent proposals aimed at reaching the sustainable development goals, promoted by the United Nations, to improve global conditions by: reducing poverty and hunger; achieving universal education; promoting gender equality; ensuring environmental sustainability; combating diseases and reducing mortality.

WITFOR investigates successful ICT strategies in developing countries and examines different initiatives and projects on effective, context-sensitive development and use of ICT applications. It is intended to:

- Help put ICT-enabled development initiatives on the agenda of different organizations, governmental bodies, and groups currently involved in ICT.
- Work with different groups to ensure that senior policy makers and political leaders are aware of the developmental potential of ICT and promote its diffusion and sustainable effective use.
- Assist international organizations and donor agencies to include issues of the spread of ICT and access to information into their loan and funding programs and be more proactive in using new technologies to reduce existing social tensions and conflicts.
- Encourage scholars, analysts, and researchers to put the issue of digital equity higher on their research agendas.
- Encourage industrialized nations, as individuals and groups, to listen to and learn from colleagues around the world about their unique concerns over access to ICT.
- Develop guidelines on these issues and advise governments to formulate and follow the best strategy for the use of ICT in order to achieve global ICT equity.

WITFOR has been organized by IFIP periodically since 2003 in cooperation with several stakeholders in different host countries. So far WITFOR has been held in Vilnius (Lithuania), in 2003; in Gaborone (Botswana), in 2005; in Addis Ababa (Ethiopia) in 2007; in Hanoi (Vietnam) in 2009; and in Delhi (India), in 2012. Among the topics addressed in these editions we find: preparing the ground for ICT (2003), building the infrastructure (2003, 2005, 2007, 2009), economic opportunity (2003, 2005, 2007, 2009), empowerment and participation (2003, 2005, 2007), health (2003, 2005, 2007, 2009, 2012), education (2003, 2005, 2007, 2009, 2012), environment (2003, 2005, 2007, 2009), social, ethical, and legal aspects (2003, 2005, 2007, 2009), agriculture (2005, 2007, 2009, 2012), and e-government (2009, 2012).

WITFOR 2016 was organized by IFIP in cooperation with the Costa Rican Ministry of Science, Technology and Telecommunications (MICTT) and the five Costa Rican public universities members of the National Council of Rectors (CONARE): Universidad de Costa Rica, Instituto Tecnológico de Costa Rica, Universidad Nacional, Universidad Estatal a Distancia, and Universidad Técnica Nacional. This is the first time that WITFOR was held in Latin America and we hope this conference will help to build bridges of understanding between different regions in the world, as well as to produce a fruitful exchange of experiences and opinions between academics, practitioners, and decision-makers, contributing in this way toward the creation of a more sustainable and equitable world.

We thank the financial support of IFIP and CONARE, and the collaboration of MICTT and the Costa Rican public universities. Without their contribution, it would not have been possible to organize WITFOR 2016.

July 2016

Gabriela María Raventós
Ramon Puigjaner
General Chairs

Preface

We are very pleased to introduce the proceedings of the World Information Technology Forum 2016 (WITFOR 2016), held in San Jose, Costa Rica, during September 12–14, 2016.

WITFOR 2016 was the sixth edition of the World Information Technology Forum, and the first one organized as an academic conference. Previous editions were structured as discussion forums. Similar to previous events, WITFOR 2016 pursued the presentation and discussion of ICT-related strategies and projects to promote development worldwide. Therefore, this conference was aimed at the interface between development and technology.

A call for papers was issued under the general theme of “ICT for Promoting Human Development and Protecting the Environment.” Within this theme, four major topics were included encompassing the Sustainable Development Goals (SDGs) recently adopted by the United Nations: ICT and cross-cutting development issues, ICT and environmental problems, ICT and human development problems, and ICT and economic development problems.

In all, 45 papers were submitted by authors from 25 countries, representing all continents. After a thorough peer-reviewed process—in which each paper was reviewed by at least three members from a distinguished Technical Program Committee (TPC)—24 papers were accepted; 22 of them are included in these proceedings. We would like to thank the members of the TPC for their valuable effort and contribution during the review process. Their work was of great importance to guarantee the quality of the conference.

The papers selected for WITFOR 2016 can be classified into seven broad topics: environment and sustainability; education; health; digital equity; gender; economic development and infrastructure; and e-government and smart cities. The broad range of issues dealt in these papers, and the different points of views reflected in them, make these proceedings valuable for researchers, practitioners, and decision-makers interested in using ICT for promoting human development and protecting the environment. In addition, they demonstrate that WITFOR can evolve into an academic conference to help further the objectives of IFIP to foster international cooperation; to stimulate research, development, and applications; and to encourage education, dissemination, and exchange of information on all aspects of computing and communication.

WITFOR 2016 was complemented by keynote speakers, demonstrations, and panel sessions. In addition, the Second Conference on Science, Innovation, and Information and Communication Technology of the United Nations Economic Commission for Latin America and the Caribbean was co-located with WITFOR 2016. This allowed for an exchange of opinions and discussions among participants in both events.

We would like to acknowledge the general chairs, Gabriela Marín Raventós and Ramon Puigjaner, for their huge effort in organizing this event. The same would not have been possible without their hard and enthusiastic work. We also appreciate the

work of everyone involved in the organization of the conference. Last, but not least, we also thank the authors and participants of WITFOR 2016.

We hope that the collection of papers in these proceedings assist in furthering the understanding of ICT issues and applications related to development, and also facilitate a fruitful exchange of experiences between academics, practitioners, and decision-makers.

Francisco J. Mata
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