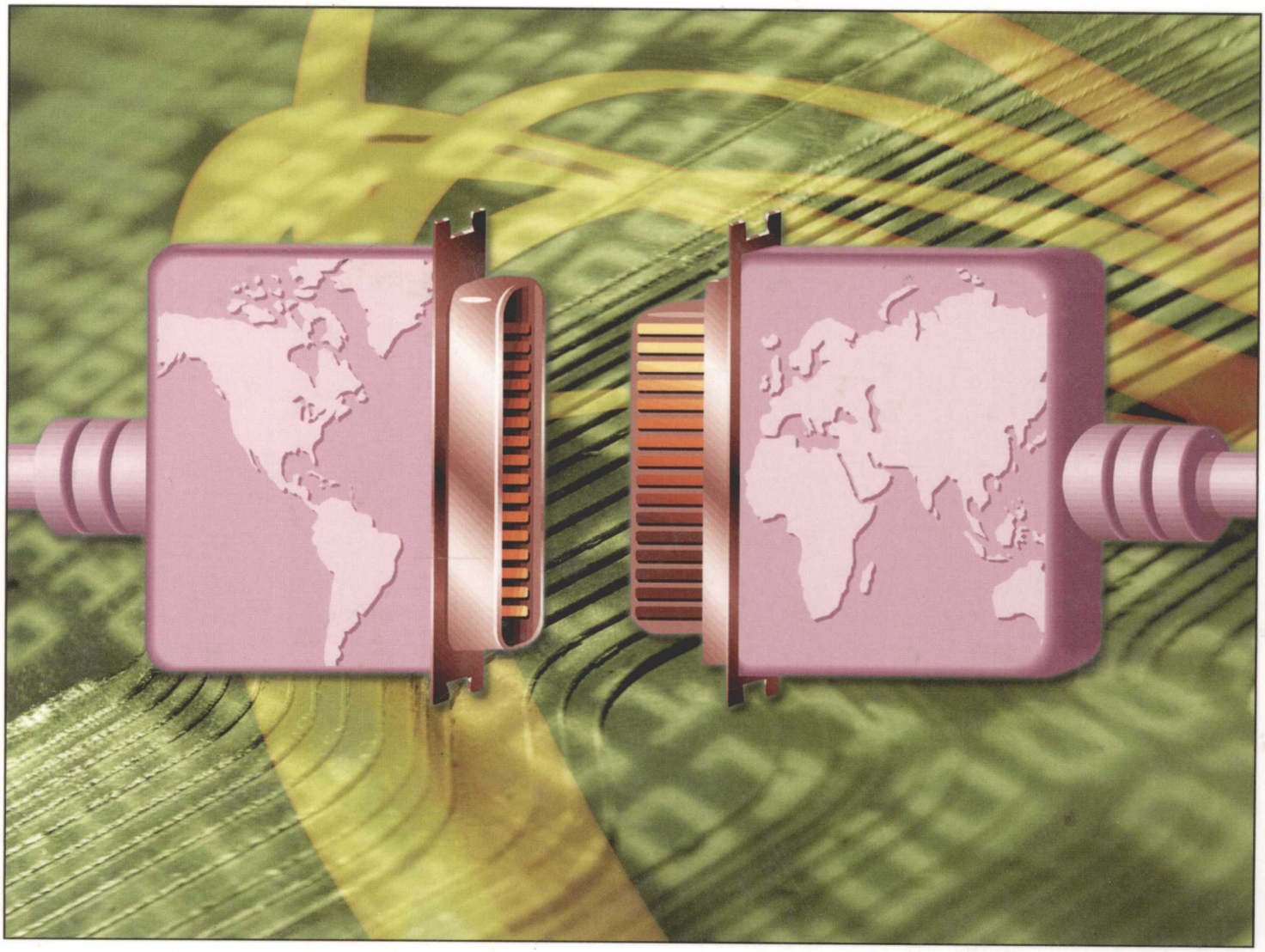
ENCYCLOPEDIA OF

NETWORKED AND VIRTUAL ORGANIZATIONS



GORAN D. PUTNIK AND MARIA MANUELA CUNHA

VOLUME II
G-Pr

30805974

Encyclopedia of Networked and Virtual Organizations

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Volume II
G–Pr

Information Science REFERENCE

INFORMATION SCIENCE REFERENCE
Hershey · New York

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Typesetters:	Jeff Ash and Jamie Snavely
Cover Design:	Lisa Tosheff
Printed at:	Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue, Suite 200
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com/reference

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: http://www.eurospanonline.com

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Library of Congress Cataloging-in-Publication Data

Encyclopedia of network and virtual organization / Goran D. Putnik and Maria Manuela Cunha, editors.
p. cm.
Summary: "This book documents the most relevant contributions to the introduction of networked, dynamic, agile, and virtual organizational models; definitions; taxonomies; opportunities; and reference models and architectures. It creates a repository of the main developments regarding the virtual organization, compiling definitions, characteristics, comparisons, advantages, practices, enabling technologies, and best practices"--Provided by publisher.
ISBN 978-1-59904-885-7 (hardcover) -- ISBN 978-1-59904-886-4 (e-book)
1. Business enterprises--Computer networks. 2. Virtual corporations. 3. Virtual reality in management. 4. Management information systems. 5. Knowledge management. I. Putnik, Goran, 1954- II. Cunha, Maria Manuela, 1964-
HD30.37.E53 2008
658.4'038--dc22
2008004512

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this encyclopedia set is original material. The views expressed in this encyclopedia set are those of the authors, but not necessarily of the publisher.

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WHAT IS THE STATE-OF-THE-ART?

Currently this field of knowledge is assisting an explosion of the research and development (R&D) effort, which is undergoing at an incredible growing rate. The conscientiousness of the new organizational paradigm is currently at such a level that it is almost assumed, by a large community, to be a leading organizational model of the future. However, this field of knowledge is highly fragmented. As a consequence, many researches and developers are not aware of the actual state-of-the-art or even of activities undertaken in academic, industrial, regional, and business environments. There is also misinterpretation between several concepts such as virtual reality, virtual teams, e-commerce, and so forth, due to the mentioned fragmentation of knowledge and to the inexistence of transfer of knowledge between regions, developers, and researchers. There is also misinterpretation among concepts and definitions originating from different research and development groups or centers due to the mentioned fragmentation of knowledge and to the inexistence of transfer of knowledge between regions, developers, researchers, and users.

As an example, there is still no consensus on the virtual enterprise (VE) definition. It is still an open question whether VE has necessarily the form of dynamically reconfigurable networked structures or not, necessarily collaborative or not, necessarily "virtual" or not, and, further, what is, or better, what are, the interpretations of "virtual"?

In the literature, several designations of organizational forms classified as VE may be found, as virtual organizations, *extended enterprise*, *agile/virtual enterprise*, *OPIM* (one product integrated manufacturing), *smart organization*, *value nets*, *concurrent enterprise*, *supply chain*, *BM_Virtual Enterprise*, and so forth, each with its characterizing nuances and all of them aiming at providing a definition which would be accepted consensually by the community.

However, unfortunately or not, this has not happened yet. There is so far no unified definition of these concepts and a variety of definitions and a broad terminology to this range of concepts exists in the literature, sharing similarities and sometimes overlapping, and yet few of them have been rigorously systematized. But, at least two are for sure: (1) all VE models have in common ICT as a prerequisite and facilitator, or even the core; (2) all these virtual enterprise models belong to the networked and virtual organizations concept, in a much or less broader sense.

Because of these reasons, the high level of fragmentation and low level of knowledge transfer in the area, as well as because of the existing volume of work, diversity of approaches, and solutions and needs, this field of knowledge, the knowledge of networked and virtual organizations, is presently in a state to justify the need of an encyclopedia.

OBJECTIVES OF THE ENCYCLOPEDIA

Two main strategic objectives, or meta-objectives, of the *Encyclopedia of Networked and Virtual Organizations*, are:

- To overcome this fragmentation of knowledge, contributing to a more qualitative development of the concept
- To incentivize and support future trends for development

The more specific objectives of the encyclopedia are:

- To document the emerging paradigm of the networked, virtual, dynamic, and agile organizations and enterprises
- To clarify of this new and emerging paradigm
- To document the most relevant contributions, from theory to applications in business, education, health, nonprofit organizations, and so forth
- To document advantages, opportunities, and future trends for this organizational model
- To constitute a comprehensive state-of-the-art documentation
- To create, and to serve as, a repository of the up-to-date main developments and characterizations and definitions of the approaches around the subject
- To serve as a manual for implementations and development
- To serve as support for higher education courses in business, management, IT technologies, industrial engineering, economy, and so forth

Regarding the networked and virtual organizations in a broad sense, definitions, characteristics, comparisons, advantages, reference models and architectures, supporting environments, practices, enabling technologies, and best practices.

This encyclopedia is expected to give incentive and guide technology solution developers, from academe, research institutions, and industry, giving them a broader perspective of networked and virtual organization requirements and rais-

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ing their awareness on which technology and how technology can serve the needs of an expanding organizational model and on potential that users should be able to exploit. The encyclopedia widens horizons for researchers interested in this emerging field, presenting the state-of-the-art background and developments.

In other words, the encyclopedia provides guidance and helps the awareness, pro-activeness, and agility of users, ranging from enterprise managers, including top level managers, to common citizens, for strategic and dynamic alignment with society requirements and opportunities on the networked and virtual organizations development and implementations as well as on the evolution of their actual organizations towards networked and virtual organizations.

The editors are expecting also that the encyclopedia will contribute to the diffusion of networked and virtual organization concept in other parts of the world, not only in the most developed countries.

And, the third meta-objective is to prepare the grounds for the future generation of networked and virtual organizations that will be widely implemented and accepted as commonplace in our global society. In other words, maybe the question is: will the networked and virtual organizations change our global society?

TARGET READERSHIP: USERS

The encyclopedia is targeted for an academic audience: teachers, researchers, and students, mainly of postgraduated studies; professionals like managers, technology solutions developers, and enterprise managers (including top level managers); and others, especially users willing to get knowledge and incentives around the concept.

THE SCHOLARLY VALUE OF THE ENCYCLOPEDIA

In terms of scholarly value and contribution to the literature in the discipline, the encyclopedia represents a very good:

- Overview and discussion of the emerging paradigm, with IT as an underlying technology, presenting contributions by internationally renowned experts
- Support to research
- Support to teaching

The presentations include both compilations of older results as well as completely new and original contributions, not submitted for publication or published elsewhere, which means that the encyclopedia addresses the area of networked and virtual organizations *diachronically* and *synchronically*.

A number of research themes, problems to be addressed in the future research, examples of analysis of applications, as well as a number of projects from the management point of view are presented, covering all levels of a *semiotic framework*: *social*, *pragmatics*, *semantics*, *syntactic*, *empirics*, and *physical world* levels, for research, development, and applications of the networked and virtual organization concept.

The encyclopedia can be an excellent support to teaching and to research planning, helping and supporting teachers of several graduate and postgraduate courses, from management to information technology, and in particular the emerging new courses on the networked and virtual organization concept itself, providing a basis for understanding a content and area for further study, research, and solutions development.

In this way, the encyclopedia represents a unique presentation of results and interpretations of the area to the widest public and the unique opportunity for readers to find in one place all proposals, approaches, and solutions by a large number of internationally renowned scholars and practitioners in order to creatively and competitively apply and improve them.

Organization of the Encyclopedia

The *Encyclopedia of Networked and Virtual Organizations* provides a compendium of terms, definitions, and explanations of concepts, processes, acronyms, and information. It consists of articles explaining concepts, definitions, models, applications, articles about research/development/implementation projects, write-ups or descriptions of applications, in-depth description of key terms, and concepts related to networked and virtual organizations.

The encyclopedia's structure follows the IGI Global organization template for encyclopedias with minor changes (see also the Table of Contents):

- **List of authors and reviewers:** A complete list of authors of articles and write-ups, and other contributors, together with their affiliations, from more than 35 countries all over the world, is presented.

- **Articles:** More than **225** explanation articles, including at the end of each article a list of, in medium, six to eight key terms.
- **Index of terms and definitions:** Pointing to more than 1,000 terms and definitions associated with each article.

At the end, the editors will be grateful to the readers for any constructive criticism, proposals for future developments, and indication of errors: conceptual, omissions, or typographical.

The Editors

Goran D. Putnik
Maria Manuela Cunha
Guimarães, September 2007

Acknowledgment

Editing a book, especially with the characteristics of this one, is quite a hard but compensating and enriching task, as it involves an array of different activities like contacts with authors and reviewers, exchange of ideas and experiences, process management, organization and integration of content, and many others, with the permanent objective of creating a book that meets public expectations. And this task cannot be accomplished without a great deal of help and support from many sources. The authors would like to acknowledge the help, support, and belief of all who made possible this creative project.

First of all, this book would not have been possible without the ongoing professional support of the team of professionals of IGI Global. We are most grateful to Mehdi Khosrow-Pour, senior academic editor, and Jan Travers, managing director, for the opportunity. A special word of gratitude is due to Kristin Roth, development editor, and Michelle Potter, acquisition editor, for their guidance and friendly words of advice, encouragement, and prompt help.

We are grateful to all the authors of the articles herein included, most of them who simultaneously served as referees for articles written by other authors, as well as to all other reviewers, for their insights, valuable contributions, prompt collaboration, and constructive comments. The communication and exchange of views within this truly global group of recognized individualities from the scientific domain and from industry was an enriching and exciting experience for us, the editors. We wish to thank all the authors for their insights and excellent contributions to this encyclopedia, which made it the book we wanted to create.

Gratitude is due to the editorial board, for their great support, contribution with their expertise, and special involvement in this project.

The authors would like to acknowledge the support of the network of excellence I*PROMS–*Innovative Production Machines and Systems*, http://www.iproms.org/, an EU FP6 project, N° NMP2-CT-2004-500273, whose partner is University of Minho.

A special thanks to our institutions, the University of Minho and the Polytechnic Institute of Cávado and Ave, Portugal, for providing the material resources and all the necessary logistics.

Thank you.

The Editors

Goran D. Putnik
Maria Manuela Cunha
Guimarães, September 2007

About the Editors

Goran D. Putnik received his Dipl.Eng., MSci. and DrSci. from the Belgrade University, both MSci. and DrSci. in the area of Intelligent Manufacturing Systems. His current position is aggregated professor, Department of Production and Systems Engineering, University of Minho, Portugal. He teaches the subjects of CAD/CAPP, CAM, FMS and Virtual Enterprises in undergraduate studies, and CAD/CAPP/CAM Systems, Concurrent Engineering, Enterprise Organization, IMS and Design Theory in postgraduate studies. He served as director of the Centre for Production Systems Engineering (CESP) for 4 years and its deputy director for 5 years. He is director of the master and postgraduate course on CIM, and is responsible of the Laboratory for Virtual Enterprises (LABVE), the Department of Production and Systems Engineering, University of Minho. His scientific and engineering interests are production systems and enterprises design and management theory and implementations: CIM, CAD/CAPP/CAM systems, intelligent production systems and enterprises, machine learning as a design theory model, concurrent and collaborative engineering, information systems management, formal theory of production systems and enterprises, distributed, agile and virtual enterprises, and complexity management in organizations. He is supervising a number of PhD projects as well. He regularly publishes and participates on international scientific conferences. He serves as a member on several editorial boards for international journals and has served in more than fifty scientific committees of international conferences. He was also invited lecturer on a number of universities.

* * *

Maria Manuela Cunha is currently associate professor in the Higher School of Technology, Polytechnic Institute of Cávado and Ave, Portugal. She holds a Dipl.Eng. in the field of Systems and Informatics Engineering, an MSci. in the field of Information Society and a DrSci in the field of Virtual Enterprises, all from the University of Minho. She coordinates the scientific domain of Organizations and Information Systems in the Department of Information Systems and Technologies, and teaches subjects related with information systems, software engineering and organizational models, to undergraduated and postgraduated studies. She supervises several PhD projects in the domain of virtual enterprises. Her scientific and engineering interests are electronic business, agile and virtual enterprises and information systems. She regularly publishes and participates on international scientific conferences. She serves as a member on several editorial boards for several international journals and has served in several scientific committees of international conferences.

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