

PREMIER REFERENCE SOURCE

Pharmacoinformatics and Drug Discovery Technologies

Theories and Applications



Tagelsir Mohamed Gasmelseid

Pharmacoinformatics and Drug Discovery Technologies: Theories and Applications

Tagelsir Mohamed Gasmelseid
King Faisal University, Saudi Arabia



Managing Director:	Lindsay Johnston
Senior Editorial Director:	Heather A. Probst
Book Production Manager:	Sean Woznicki
Development Manager:	Joel Gamon
Development Editor:	Myla Harty
Acquisitions Editor:	Erika Gallagher
Typesetter:	Jennifer Romanchak
Cover Design:	Nick Newcomer, Lisandro Gonzalez

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

Copyright © 2012 by IGI Global. All rights reserved. No part of this publication may be reproduced, stored or distributed in any form or by any means, electronic or mechanical, including photocopying, without written permission from the publisher. Product or company names used in this set are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark.

Library of Congress Cataloging-in-Publication Data

Pharmacoinformatics and drug discovery technologies: theories and applications / Tagelsir Mohamed Gasmelseid, editor.
 p. cm.

Includes bibliographical references and index.

Summary: "This book offers the latest the field has to offer to practitioners and academics alike, presented through theoretical frameworks, case studies, and future directions by providing current, current edge and provocative scientific work in the three domains of pharmacoinformatics: decision making domains, knowledge utilization and representation environment, and the technological and infrastructural context"-- Provided by publisher.

ISBN 978-1-4666-0309-7 (hardcover) -- ISBN 978-1-4666-0310-3 (ebook) -- ISBN 978-1-4666-0311-0 (print & perpetual access) 1. Pharmacy informatics. 2. Pharmaceutical services. 3. Drugs. 4. Pharmacy informatics--Developing countries. 5. Pharmaceutical services--Developing countries. 6. Drugs--Developing countries. I. Gasmelseid, Tagelsir Mohamed, 1967-

RS122.2.P44 2012

362.17'82--dc23

2011045098

British Cataloguing in Publication Data

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

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

Editorial Advisory Board

Kathryn Burnett, *University of Ulster, UK*
Federico Frattini, *Politecnico di Milano, Italy*
Lyne Lalonde, *Université de Montréal, Canada*
Chad Lin, *Curtin University, Australia*
Cindy Mason, *Stanford University, USA*
Thomas Neumuth, *University Leipzig, Germany*
Steven Simoens, *Katholieke Universiteit Leuven, Belgium*
Stuart M. Speedie, *Kings College, UK*
Andy Stergachis, *University of Washington, USA*
Lee Vermeulen, *University of Wisconsin, USA*
Kevin Yap, *Institute of Digital Healthcare, WMG, University of Warwick, UK*

List of Reviewers

Walter Cazzola, *Università degli Studi di Milano, Italy*
Partha Chakraborty, *Cognizant Technologies, India*
Abdalla O. Elkhawad, *University of Medical Sciences and Technology, Sudan*
Marco Frascio, *University of Genova, Italy*
Federico Frattini, *Politecnico di Milano, Italy*
Qazi Mudassar Ilyas, *King Faisal University, Saudi Arabia*
Jimmy Jose, *University of Nizwa, Oman*
Chad Lin, *Curtin University, Australia*
Steven Simoens, *Katholieke Universiteit Leuven, Belgium*
G. R. Sridhar, *Endocrine and Diabetes Centre, India*
Kevin Y.-L. Yap, *Institute of Digital Healthcare, WMG, University of Warwick, UK*
Noor Zaman, *King Faisal University, Saudi Arabia*

Preface

The question of healthcare reform and the improvement of the pharmaceutical care services have gained momentum attention over the last decade in response to the expansion of drug-related problems. Such problems have been complicated by the challenges that limit the capacity of Healthcare institutions to improve the safety, accessibility and reliability of evidence-based healthcare services. Especially in developing countries, the improvement of pharmaceutical care processes has been challenged by the inability to control the development of chronic conditions, prevent life threatening conditions, develop healthcare support systems, build partnerships with stakeholders (including patients), and manage costs. Such challenges originate from internal inefficiencies and external change agents such as change in demography and disease patterns, increasing costs of technologies, workforce problems, lack of public funding, the changing context of urban planning, and its impacts on maintaining health equality. In response to such challenges healthcare institutions are investing in implementing some organizational, institutional and technological interventions. Institutionally, there have been a shift in terms of the sites that provide healthcare services by migrating from acute inpatient hospitals (providing episodic care) to outpatient configurations (providing ongoing care) in response to the change of disease patterns from acute infectious diseases to chronic conditions. In addition, there has been some emphasis on the introduction of new healthcare and pharmaceutical providers and a considerable diffusion of Pharmacoinformatics applications and technologies to improve the functionality of pharmaceutical care core processes.

Pharmacoinformatics, as an emerging discipline, has the potential of making quantum leaps in the quality of pharmaceutical care services through the deployment of information systems for provision of pharmacy related decision support tools. Such tools are essential for the improvement of drug management, use and administration processes and the solution of drug-related problems. They are also necessary for improvement of patients' knowledge about drugs administration and the consequences of adverse drug events. However, despite the successes here and there, many issues concerning the context of Pharmacoinformatics and its applications require additional analysis, experimental examination and research.

Firstly, there is still a need to theorize, crystallize and conceptualize the term itself and provide answers for questions like: "What is Pharmacoinformatics?" "What constitutes Pharmacoinformatics?" and "Is it Pharmacoinformatics or Pharmacy Informatics?" Little has been to focus of Pharmacoinformatics or "pharmacy informatics" with the aim of understanding its role in improving the efficiency and effectiveness of pharmaceutical care processes and patient-oriented outcomes and enhancing decision making at the operational, tactical and strategic levels in healthcare organizations. Over years, there have been some emphasis on the use of information systems in drug manufacturing processes such as drug analysis, testing and production. This orientation focuses more on the concepts of computer based manufacturing

that drive organization-wide “production information systems” but it provides a limited description of pharmacy management and pharmacy decision making. Considering the concept under the umbrella of biomedical and/or medical informatics moves the term closer to its decision support domain.

Secondly, there has been limited emphasis on understanding the context of Pharmacoinformatics in terms of its infrastructures, information processing environment, and the type of Pharmacoinformatics applications to be used. As a result, there has been some “selectivity” in the deployment of Pharmacoinformatics applications mainly for reporting and analyzing adverse drug events. The emphasis on the development of selected “evolutionary” pharmacy-related models has also been accompanied with a considerable failure to understand the roles and attitudes of “users” (such as physicians, pharmacists, nurses, laboratory personnel, and other healthcare professionals) and maximize the benefits from the emerging technology-driven business models.

This publication has been arranged into five parts with the aim of contributing to the abovementioned considerations. The first part is dedicated to the presentation of the contextual analysis of the domain of Pharmacoinformatics with emphasis on pharmacy management and pharmaceutical care systems and paradigms, analysis, definitions, methodologies, and interconnections. This part includes four chapters. In his work on the context of Pharmacoinformatics, Gasmelseid emphasized the centrality of the role of Pharmacoinformatics applications and technologies in the improvement of Pharmaceutical care processes. Stergachis et al used a case study approach to introduce a framework for using informatics for medicines management systems in resource-limited settings. Hugman examined communications in healthcare and proposed a number of strategies for addressing the shortcomings in areas such as information for patients and healthcare professionals, physician and pharmacist consultations, and the avoidance of medicinal and vaccination errors and crises. Postma and Hubben investigated the role of Pharmacoinformatics in enhancing the Pharmacoeconomics context of decision-making through the use of generalisable, transferable and accessible computer models for drugs management.

The second part includes four chapters that provide information about Pharmacoinformatics-oriented business models. Lin and Jalleh examined the key issues and challenges for managing and evaluating B2B E-Commerce projects within the Australian Pharmaceutical supply chains and their roles in setting up an infrastructure, which supports complex, multiparty Internet-based trading and transactions. Frattini et al. conducted an exploratory analysis on the role of platform biotech firms to examine the context of collaborations for innovation in the bio-pharmaceutical industry. In his work on cost-effectiveness analysis and the value for money of health technologies, Simoens reviewed and presented different approaches about cost effectiveness that enable decision making with regards to pharmacoinformatics technologies. Lin et al. used a multi-case study approach to investigate the practices and processes of B2B e-commerce evaluation and benefits realization and their impact on B2B e-commerce benefits and user satisfaction in Taiwanese hospitals.

The third part of this publication is devoted to the description of some of the methodologies, technologies and applications of pharmacoinformatics in pursuit of improving pharmaceutical care and patient-oriented outcomes. It includes nine chapters. Kevin Yap investigated the evolving role of Pharmacoinformatics in targeting drug-related problems in clinical oncology practice. His work also sheds light on the use of Pharmacoinformatics applications by healthcare practitioners and patients. Claudia and Hilgarth examined the context of clinical pharmacists’ intervention documentation in Germany using DokuPIK databases to demonstrate the improvement of drug therapy and the applicability of alternative strategies that can be used to reduce medication errors. Gasmelseid, proposed (in two chapters) a multi agent reference Pharmacoinformatics decision support model for the improvement of hospital management. In their

work entitled the healthcare factory, Cazzola et al. proposed a highly integrated system designed with the aim of improving the overall healthcare process management and of obtaining a flexible and deeper understanding of the patient treatment mechanisms. Col described the applications and challenges associated with the use of personalized decision support tools and models for the enhancement of patient choice. Chhanabhai examined the roles, benefits and disadvantages of social network sites in sharing health information by focusing on their corresponding privacy; security and ethical considerations. Butler addressed data integrity concepts and their use in pharmacy by highlighting relational models and relational database management systems. Chakraborty analyzed and interpreted the statistical methods used for analysis of safety issues within drug event combination.

The fourth part of this publication includes three chapters which reflect on the multidisciplinary context of Pharmacoinformatics and its linkages with other sciences. Muneer, Abdullah, and Zaman proposed an optimization methodology to identify protein coding regions in Eukaryotes. Shahid et al. linked the context of Pharmacoinformatics through the analysis of Pharmaco-EcoMicrobiology concepts and their potential role in medical and environmental sciences. Sridhar et al emphasized the role of informatics in biology and drug discovery by describing in silico pharmaco-gene-informatics identification of insulin like proteins in plants. Pharmacovigilance issues and concepts are covered in the fifth part of this publication. Pharmacovigilance—basic concepts and application of pharmacoinformatics are presented by Jose. Elkhawad examined the role of Pharmacovigilance Center in Sudan in reporting adverse drug reactions by focusing on its functionalities and challenges.

Tagelsir Mohamed Gasmelseid
King Faisal University, Saudi Arabia

Section 1

Contextual Analysis of the Domain of Pharmacoinformatics

List of Contributors

Abdullah, Azween /University Technology PATRONAS, Malaysia.....	281
Ahmad, Muneer /King Faisal University, Saudi Arabia.....	281
Ancona, Massimo /University of Genova, Italy	202
Apparao, Allam /Jawaharlal Nehru Technological University (JNTU), India	303
Bianchi, Mattia /Stockholm School of Economics, Sweden	72
Boscherini, Lorenzo /Politecnico di Milano, Italy.....	72
Butler, C. David /Teradata, Inc., USA	248
Cazzola, Walter /University of Milano, Italy.....	202
Chakraborty, Partha /Cognizant Technologies, India.....	268
Chhanabhai, Prajesh /University of Otago, New Zealand	236
Chiaroni, Davide /Politecnico di Milano, Italy.....	72
Chiesa, Vittorio /Politecnico di Milano, Italy	72
Col, Nananda F. /Shared Decision Making Resources, USA & University of New England, USA...	220
Elkhawad, Abdalla Omer /University of Medical Sciences and Technology, Sudan	344
Frascio, Marco /University of Genova, Italy.....	202
Frattini, Federico /Politecnico di Milano, Italy	72
Gasmelseid, Tagelsir Mohamed /King Faisal University, Saudi Arabi	1, 180
Hilgarth, Heike /University Medical Center Hamburg-Eppendorf, Germany.....	178
Hsieh, Min-Chai /National University of Tainan, Taiwan.....	110
Huang, Yu-An /National Chi Nan University, Taiwan	110
Hubben, Gijs A. A. /University of Groningen, The Netherlands	44
Hugman, Bruce /Uppsala Monitoring Centre, Sweden & Rangsit University, Thailand	24
Hung, Sheng-Hsiang /National University of Tainan, Taiwan.....	110
Jalleh, Geoffrey /Curtin University, Australia	54, 110
Jose, Jimmy /University of Nizwa, Oman.....	322
Jyothi, Koonas Saradha /Andhra University, India	303
Keene, Douglas /Management Science for Health, USA	12
Khan, Haris M. /Aligarh Muslim University, India	291
Langebrake, Claudia /University Medical Center Hamburg-Eppendorf, Germany	178
Lin, Chad /Curtin University, Australia	54, 110
Lin, Hao-Chiang Koong /National University of Tainan, Taiwan.....	110
Mishra, Hemant Kumar /All India Institute of Medical Sciences (AIIMS), India	291
Mishra, Hridayesh /All India Institute of Medical Sciences (AIIMS), India	291

Pini, Sonia / <i>Pini Solutions, Italy</i>	202
Postma, Maarten J. / <i>University of Groningen, The Netherlands</i>	44
Rao, B. Subba / <i>Andhra University, India</i>	303
Shahid, Mohd. / <i>Aligarh Muslim University, India</i>	291
Singh, Anuradha / <i>Aligarh Muslim University, India</i>	291
Sobia, Farrukh / <i>Aligarh Muslim University, India</i>	291
Somani, Shabir / <i>University of Washington, USA</i>	12
Sridhar, G. R. / <i>Endocrine and Diabetes Centre, India</i>	303
Srinivas, Kudipudi / <i>VS Siddhartha Engineering College, India</i>	303
Stergachis, Andy / <i>University of Washington, USA</i>	12
Steven Simoens / <i>Katholieke Universiteit Leuven, Belgium</i>	92
Tripathi, Trivendra / <i>Aligarh Muslim University, India & All India Institute of Medical Sciences (AIIMS), India</i>	291
Wang, Cheng-Hung /National University of Tainan, Taiwan	110
Yap, Kevin Yi-Lwern /Institute of Digital Healthcare, WMG, University of Warwick, UK.....	130
Zaman, Noor / <i>King Faisal University, Saudi Arabia</i>	281

Table of Contents

Preface	XX
----------------------	----

Section 1 **Contextual Analysis of the Domain of Pharmaco-informatics**

Chapter 1

Pharmaco-informatics: Advanced Information Systems for Improved Pharmaceutical Care	1
<i>Tagelsir Mohamed Gasmelseid, King Faisal University, Saudi Arabia</i>	

Chapter 2

Informatics for Medicines Management Systems in Resource-Limited Settings.....	12
<i>Andy Stergachis, University of Washington, USA</i>	
<i>Douglas Keene, Management Science for Health, USA</i>	
<i>Shabir Somani, University of Washington, USA</i>	

Chapter 3

The Humane Dimensions of Effective Communication	24
<i>Bruce Hugman, Uppsala Monitoring Centre, Sweden & Rangsit University, Thailand</i>	

Chapter 4

The Role of Pharmaco-informatics in Enhancing the Pharmacoeconomics Context of Decision Making	44
<i>Maarten J. Postma, University of Groningen, The Netherlands</i>	
<i>Gijs A. A. Hubben, University of Groningen, The Netherlands</i>	

Section 2 **Pharmaco-informatics-Oriented Business Models**

Chapter 5

Key Issues and Challenges for Managing and Evaluating B2B E-Commerce Projects within the Australian Pharmaceutical Supply Chain	54
<i>Chad Lin, Curtin University, Australia</i>	
<i>Geoffrey Jalleh, Curtin University, Australia</i>	

Chapter 6

Collaborations for Innovation in the Bio-Pharmaceutical Industry: An Exploratory Analysis on the Role of Platform Biotech Firms 72

Mattia Bianchi, Stockholm School of Economics, Sweden

Lorenzo Boscherini, Politecnico di Milano, Italy

Davide Chiaroni, Politecnico di Milano, Italy

Federico Frattini, Politecnico di Milano, Italy

Vittorio Chiesa, Politecnico di Milano, Italy

Chapter 7

Cost-Effectiveness Analysis and the Value for Money of Health Technologies 92

Steven Simoens, Katholieke Universiteit Leuven, Belgium

Chapter 8

A Preliminary Study of the Practices and Processes of B2B E-Commerce Evaluation and Benefits Realization in Taiwanese Hospitals 110

Chad Lin, Curtin University, Australia

Hao-Chiang Koong Lin, National University of Tainan, Taiwan

Yu-An Huang, National Chi Nan University, Taiwan

Geoffrey Jalleh, Curtin University, Australia

Sheng-Hsiang Hung, National University of Tainan, Taiwan

Min-Chai Hsieh, National University of Tainan, Taiwan

Cheng-Hung Wang, National University of Tainan, Taiwan

Section 3

Methodologies, Technologies, and Applications of Pharmacoinformatics

Chapter 9

The Evolving Role of Pharmacoinformatics in Targeting Drug-Related Problems in Clinical Oncology Practice 130

Kevin Yi-Lwern Yap, Institute of Digital Healthcare, WMG, University of Warwick, UK

Chapter 10

Clinical Pharmacists' Intervention Documentation in Germany with DokuPIK 178

Claudia Langebrake, University Medical Center Hamburg-Eppendorf, Germany

Heike Hilgarth, University Medical Center Hamburg-Eppendorf, Germany

Chapter 11

A Multi Agent Pharmacoinformatics Reference Model for the Improvement of Hospital Management 187

Tagelsir Mohamed Gasmelseid, King Faisal University, Saudi Arabia

Chapter 12

The Health Care Factory 202

Massimo Ancona, University of Genova, Italy

Walter Cazzola, University of Milano, Italy

Sonia Pini, Pini Solutions, Italy

Marco Frascio, University of Genova, Italy

Chapter 13

New Technologies in Personalized Decision Support to Enhance Patient Choice: Applications and Challenges 220

Nananda F. Col, Shared Decision Making Resources, USA & University of New England, USA

Chapter 14

Social Network Sites and Their Role in the Sharing of Health Information 236

Prajesh Chhanabhai, University of Otago, New Zealand

Chapter 15

Enforcing Data Integrity in Pharmacy 248

C. David Butler, Teradata, Inc., USA

Chapter 16

Statistical Methods Applied in Drug Safety 268

Partha Chakraborty, Cognizant Technologies, India

Section 4

Multidisciplinary Context of Pharmacoinformatics

Chapter 17

An Optimization to Protein Coding Regions Identification in Eukaryotes 281

Muneer Ahmad, King Faisal University, Saudi Arabia

Azween Abdullah, University Technology PATRONAS, Malaysia

Noor Zaman, King Faisal University, Saudi Arabia

Chapter 18

Pharmaco-EcoMicrobiology and Its Potential Role in Medical and Environmental Sciences 291

Mohd. Shahid, Aligarh Muslim University, India

Hridesh Mishra, All India Institute of Medical Sciences (AIIMS), India

Hemant Kumar Mishra, All India Institute of Medical Sciences (AIIMS), India

Trivendra Tripathi, Aligarh Muslim University, India

& All India Institute of Medical Sciences (AIIMS), India

Haris M. Khan, Aligarh Muslim University, India

Farrukh Sobia, Aligarh Muslim University, India

Anuradha Singh, Aligarh Muslim University, India

Chapter 19

In Silico Pharmaco-Gene-Informatic Identification of Insulin-Like roteins in Plants.....	303
--	-----

Koona Saradha Jyothi, Andhra University, India

G. R. Sridhar, Endocrine and Diabetes Centre, India

Kudipudi Srinivas, V R Siddhartha Engineering College, India

B. Subba Rao, Andhra University, India

Allam Apparao, Jawaharlal Nehru Technological University (JNTU), India

Section 5

Pharmacovigilance Issues and Concepts

Chapter 20

Pharmacovigilance: Basic Concepts and Applications of Pharmacoinformatics	322
---	-----

Jimmy Jose, University of Nizwa, Oman

Chapter 21

The Role of Pharmacovigilance Center in Sudan in Reporting Adverse Drug Reactions.....	344
--	-----

Abdalla Omer Elkhawad, University of Medical Sciences and Technology, Sudan

Compilation of References	355
--	------------

About the Contributors	404
-------------------------------------	------------

Index.....	416
-------------------	------------

Detailed Table of Contents

Preface	XX
----------------------	----

Section 1 **Contextual Analysis of the Domain of Pharmaco-informatics**

Chapter 1

Pharmaco-informatics: Advanced Information Systems for Improved Pharmaceutical Care	1
<i>Tagelsir Mohamed Gasmelseid, King Faisal University, Saudi Arabia</i>	

Healthcare organizations are facing serious internal and external challenges that affect their ability to provide quality pharmaceutical care and maintain patient safety. The dynamics of such challenges are affecting pharmaceutical processes, organizational and operating efficiencies, and patient outcomes. Pharmaco-informatics has been used as a term to reflect upon the use of information system technologies in the improvement of pharmaceutical care. However, despite its growing importance, it has been deployed in a limited scale. This chapter sheds light on the context of pharmaco-informatics, its conceptualization within the domain of decision support tools, and its role in the improvement of pharmaceutical care.

Chapter 2

Informatics for Medicines Management Systems in Resource-Limited Settings.....	12
<i>Andy Stergachis, University of Washington, USA</i>	
<i>Douglas Keene, Management Science for Health, USA</i>	
<i>Shabir Somani, University of Washington, USA</i>	

Improved access to information is necessary to ensure achievement of the potential benefits of medicines in resource-limited countries. The scaling up of treatment and prevention programs involving medicines in resource-limited regions with high disease burdens requires proper and urgent attention to the development and use of information technologies. Areas of need for medicines management systems informatics include prescribing, dispensing, pharmaceutical care, administration, patient monitoring, education and training, supply chain management, and monitoring and evaluation of program performance. Such information systems should strive to collect and manage data that are a standardized, compiled, and made easily accessible for use by key stakeholders, including ministries of health, medicines regulators, pharmaceutical industry, public health programs, academic researchers, donor organizations, the health care delivery sector, and ultimately the public and patients. A framework is described for medicines management systems informatics in resource-limited settings.

Chapter 3

The Humane Dimensions of Effective Communication	24
--	----

Bruce Hugman, Uppsala Monitoring Centre, Sweden & Rangsit University, Thailand

All communications, especially those intended to influence attitudes and behaviour, depend on the empathy, creativity, and clarity of those responsible for them. Communications of all kinds, in healthcare and other sectors, can be greatly enhanced by the appropriate use of modern media and technology, but at the heart of effective communications are humane and compassionate purposes and values, which have the welfare of the recipient clearly in focus, whatever the chosen method or medium. This chapter examines ways in which communications in healthcare have often failed to meet the highest standards in protecting the welfare and safety of patients. It proposes a number of strategies for addressing the shortcomings in areas such as information for patients and healthcare professionals, physician and pharmacist consultations, and the avoidance of medicinal and vaccination errors and crises.

Chapter 4

The Role of Pharmaco-informatics in Enhancing the Pharmacoeconomics Context of Decision Making	44
--	----

Maarten J. Postma, University of Groningen, The Netherlands
Gijs A. A. Hubben, University of Groningen, The Netherlands

This chapter addresses the increasing role of pharmaco-informatics in enhancing the pharmacoeconomics context of decision-making. Notably, the role of pharmacoeconomics—i.e. cost per QALY calculations—is growing rapidly for decisions on reimbursement of new drugs. These pharmacoeconomic analyses often involve complex mathematical computer models requiring specific informatics techniques such as probabilistic simulations, bootstrapping, and discrete-event approaches. Transparency of these complex models is crucial for decision makers to accept the model and its results. The authors argue that Web technology, Web-based access to models, international transferability of analyses, and decision-support systems may help in this respect. In particular, to allow decision makers and researchers to directly interact with transferable economic models and adapt a model to their region, efficient solutions have to be found to disseminate technically complex models to decision makers and researchers outside of the original setting. One such solution is through the use of Web technology and other pharmaco-informatics' techniques as explored in this chapter.

Section 2

Pharmaco-informatics-Oriented Business Models

Chapter 5

Key Issues and Challenges for Managing and Evaluating B2B E-Commerce Projects within the Australian Pharmaceutical Supply Chain	54
---	----

Chad Lin, Curtin University, Australia

Geoffrey Jalleh, Curtin University, Australia

The use of Business-to-Business (B2B) e-commerce within the Australian pharmaceutical supply chain can potentially assist in setting up an infrastructure which supports complex, multiparty Internet-based trading and transactions among pharmaceutical manufacturers, wholesalers, hospitals, pharmacies, medical supply importers and exporters, and other players in the healthcare system. Effective use of B2B e-commerce can help these organizations reduce costs in supplying and distributing medicines and other medical-related products to the general public. However, despite high expectations for realizing

the benefits of B2B e-commerce in the pharmaceutical supply chain, issues surrounding its evaluation and management remain poorly understood and relatively under-researched. This chapter presents case study findings on key management and evaluation issues and challenges in adopting and utilizing B2B e-commerce systems on eight pharmaceutical organizations in Australia. The key objectives of this study are: (1) to establish current practices and norms in evaluating B2B e-commerce investments and projects in the pharmaceutical industry; and (2) to identify key B2B e-commerce management issues and challenges within the Australian pharmaceutical supply chain. A key contribution of this chapter is the identification and examination of key issues and challenges faced by the pharmaceutical organizations undertaking B2B e-commerce activities within their supply chain. The findings will guide senior executives in these organizations to develop their own approaches or strategies to manage the opportunities and threats that exist in the Australian pharmaceutical supply chain.

Chapter 6

Collaborations for Innovation in the Bio-Pharmaceutical Industry: An Exploratory Analysis on the Role of Platform Biotech Firms 72

Mattia Bianchi, Stockholm School of Economics, Sweden

Lorenzo Boscherini, Politecnico di Milano, Italy

Davide Chiaroni, Politecnico di Milano, Italy

Federico Frattini, Politecnico di Milano, Italy

Vittorio Chiesa, Politecnico di Milano, Italy

The advent of biotechnology in the late '80s revolutionized the pharmaceutical industry and, in particular, caused a strong division of labour in the innovation process. As a result, the capability to master technological collaborations with external organizations has become a critical success factor for incumbent pharmaceutical firms as well as product biotech firms. This chapter investigates the phenomenon by using a rich and purposively collected empirical basis about the organisational forms (e.g., partnerships, in- and out-licensing, outsourcing, technology purchasing) through which inter-organizational collaborations are put into practice along the phases of the bio-pharmaceutical innovation process, and about the specific role played in these collaborations by platform biotech firms. Results are interpreted by drawing into two relatively novel streams of research in the innovation management literature, dealing with the Open Innovation paradigm and the role of Technical and Scientific Services (TSS).

Chapter 7

Cost-Effectiveness Analysis and the Value for Money of Health Technologies 92

Steven Simoens, Katholieke Universiteit Leuven, Belgium

Cost-effectiveness analysis serves as a tool to assess the value for money of a health technology. This chapter aims to review different approaches to assessing value for money of health technologies. First, the chapter discusses the methodological basis of the incremental cost-effectiveness ratio approach. Second, the chapter reviews alternative approaches such as the replacement approach, program budgeting and marginal analysis, the generalised optimisation framework, and multi-criteria decision analysis. This information will aid health care decision makers and researchers to interpret cost-effectiveness analyses and their results for the purpose of decision making.