

# **Operations and Technology Management**

Volume 10

# Technology Assessment

## Forecasting Future Adoption of Emerging Technologies

Edited by

Tugrul Daim, Nathasit Gerdri, Nuri Basoglu

With Contributions by

Fatima Albar, Nuri Basoglu, Cesar Castilla, Sinan Cayir,  
Tugrul Daim, Nathasit Gerdri, Pisek Gerdri, Abraham Hernandez,  
Banu Kargin, Songphon Munkongsujarit, Cagla Ozen Seneler,  
Kenny Phan, Guillermo Rueda, Hanna Rosine, Ilda Tanoglu,  
Umit Topacan, Thien Tran, Jing Zhang

---

ERICH SCHMIDT VERLAG

**Bibliographic information published by Die Deutsche Nationalbibliothek**

Die Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

**For further information concerning this title please follow this link:**

[ESV.info/978 3 503 12675 0](http://ESV.info/978_3_503_12675_0)

ISBN 978 3 503 12675 0

ISSN 1863-3390

All rights reserved

© Erich Schmidt Verlag GmbH & Co. KG, Berlin 2011

[www.ESV.info](http://www.ESV.info)

This paper fulfills the requirements of the Frankfurter Forderungen of Die Deutsche Nationalbibliothek and the Gesellschaft für das Buch concerning the paper permanence and meets the tight regulations of American National Standard Ansi/Niso Z 39.48-1992 as well as ISO 9706

Printing and Binding: Hubert & Co., Göttingen

# Table of Contents

<b>Preface and Acknowledgements .....</b>	<b>XIX</b>
<b>Chapter 1 Technology Assessment.....</b>	<b>1</b>
Approaches, perspectives and definitions of TA .....	2
Classification of TA approaches, methods and tools .....	4
Previous studies in TA literature.....	6
Expert Judgment Based Decision Tools .....	6
Methods Based on Financial Metrics: .....	7
Comprehensive Models .....	7
TA for general purposes .....	9
Technology Assessment Process – Building the Model .....	10
Technology Gap Analysis .....	10
Candidate Technologies .....	10
Evaluation Criteria .....	10
TA for developing countries .....	12
Conclusions .....	13
Bibliography.....	14
<b>Chapter 2 Technology Assessment In The Energy Sector .....</b>	<b>19</b>
Background .....	20
Technology Evaluation .....	24
Short Term Technologies.....	26
Long Term Technologies .....	31
Conclusions .....	36
Bibliography.....	37
<b>Chapter 3 Assessment of Telemedical Technologies: Delivery of Health Services to Rural Thailand.....</b>	<b>39</b>
Gap Analysis .....	40
Candidate Technologies .....	41
Technology Assessment Model .....	46
Scoring the Technologies .....	47
Technology Costs.....	47

Discussion of Results .....	49
Conclusions .....	51
Bibliography.....	51
Appendices .....	53
<b>Chapter 4 Next Generation Mobile Broadband Telecommunication In China .....</b>	<b>57</b>
Introduction .....	57
Literature Review .....	58
Gap Analysis .....	59
Capabilities .....	60
Candidate Technologies .....	63
Methodology .....	64
Assessment Based on the Multiple-Perspective Model .....	66
Results and Discussion .....	68
Conclusions .....	69
Bibliography.....	69
<b>Chapter 5 Review of Technology Forecasting .....</b>	<b>73</b>
Technology forecasting techniques .....	74
Classification of technology forecasting techniques .....	76
Selection of technology forecasting techniques to match with the nature of technologies .....	79
Recent applications of various technology forecasting techniques .....	80
The use of combining technology forecasting techniques: a case example.....	81
Common errors in forecasting .....	82
Conclusions .....	83
Bibliography.....	83
<b>Chapter 6 Technology Roadmapping (TRM) .....</b>	<b>87</b>
Concept of technology roadmapping .....	87
Variation of technology roadmaps .....	88
The step-by-step analysis .....	90
TRM implementation in an organization .....	91
Three stages of TRM implementation .....	91
Key Players Involving in TRM Implementation .....	93
The Dynamics of TRM Implementation .....	95
Key Success Factors in TRM Implementation .....	96

---

Conclusions .....	99
Bibliography.....	99
<b>Chapter 7 Strategic Evaluation of Technologies.....</b>	<b>103</b>
Technology evaluation .....	103
Applying AHP for the evaluation of emerging technologies .....	103
Structure of AHP model.....	104
Fundamental concept of technology value (TechValue) Model.....	106
Development Process of Technology Value (TechValue) Model .....	107
Step 1: Technology characterization.....	108
Step 2: Hierarchical modeling.....	108
Step 3: Technology evaluation.....	109
Case examples: Applications of technology value model .....	111
Example I: Evaluation of digital imaging technologies in healthcare.....	111
Example II: Replication of NASA decision on selecting the 2nd generation of reusable launch vehicle (RLV) technology in 2005 .....	119
Conclusions .....	128
Bibliography.....	128
<b>Chapter 8 Technology Foresight Concept, Activities, Challenges and Limitations .....</b>	<b>131</b>
Technology foresight: Definition and overview .....	131
Objectives of Technology Foresight.....	132
Interrelation with Other Disciplines .....	133
Technology Foresight Process and Methodology.....	133
Examples of technology foresight practices .....	134
Challenges and limitations .....	139
Conclusions .....	141
Bibliography.....	141
<b>Chapter 9 Technology Intelligence from Publications and Patents .....</b>	<b>145</b>
Bibliometric and Patent Analysis.....	145
Fundamental of Bibliometric and Patent Analysis .....	146
Use of bibliometric and patent analysis to generate technological intelligence .....	146
Advantages and limitations of bibliometric and patent analysis .....	151
Conclusions .....	151
Bibliography.....	151

<b>Chapter 10 Managerial Perspective of Technology Diffusion: Case of Information Technologies .....</b>	<b>155</b>
Information Technology Diffusion .....	156
Theoretical Background of IT Diffusion .....	156
Innovation Diffusion Theory.....	156
Bass Model of Diffusion .....	160
Theory of Reasoned Action .....	162
Technology Acceptance Model.....	163
Theory of Planned Behavior .....	164
Decomposed Theory of Planned Behavior .....	164
Technology Acceptance Model-2000 .....	165
Unified Theory of Acceptance and Use of Technology (UTAUT) .....	166
IT Diffusion vs. Infusion.....	167
Determinants of IT Diffusion.....	168
Organizational Factors .....	168
Social Factors .....	168
Individual Factors .....	169
Technology Factors .....	169
The Managerial Decision Making Process .....	170
The Nature of Decision Making .....	170
Mintzberg’s Ten Managerial Roles .....	170
The Managerial Decision Making Process .....	171
Information Technology and Decision Making.....	171
Types of Information Systems .....	172
Impacts of IT on Decision Making .....	173
Bibliography.....	174
<b>Chapter 11 Mobile Technology Diffusion.....</b>	<b>179</b>
Introduction .....	179
Background .....	180
The Framework .....	182
Results and Discussions .....	185
Profile of Respondents .....	185
Descriptive Statistics .....	186
Findings.....	187
Conclusions .....	190
Bibliography.....	190

---

<b>Chapter 12 Exploring The Success Factors of Health Information Service Adoption .....</b>	<b>193</b>
Introduction .....	193
Literature Review .....	194
Research Method .....	196
Findings .....	197
Conclusions .....	202
Bibliography .....	202
Appendix .....	205
<b>Chapter 13 Awareness And Adoption Factors of Information Technology Interoperability.....</b>	<b>207</b>
Introduction .....	207
Setting the Scene .....	208
Classical Information Dimensions .....	209
Information Dimensions from Interoperability Point of View .....	210
User and Organizational Acceptance of Information Technology Solutions .....	212
Research Method .....	214
Findings .....	214
Significant Information Dimensions .....	215
Attitude to Use .....	218
Social and Organizational Motives .....	219
The Proposed Interoperability Success Taxonomy.....	220
Conclusions .....	221
Bibliography .....	222
Appendix .....	225
<b>Chapter 14 Technology Human Interaction: Case of Information System Technologies .....</b>	<b>227</b>
Introduction .....	227
Research Framework.....	231
Research Methodology.....	234
Findings and Discussions.....	234
Conclusions .....	238
Bibliography.....	240