Index

360-degree feedback 115
ACARE technology platform 207–10
context 203–7
accounting standards
generating information asymmetries 166–7, 169–70
see also IAS/IFRS adoption case study
aerospace sector see ACARE technology platform
AHP (analytical hierarchy process) 59–61, 62
AIRI (Italian Association for Industrial Research) 48
Al-Mazidi, S. 58
ambassador role 118
analytic network process (ANP) 61–2, 63
analytical hierarchy process (AHP) 59–61, 62
Anderson, K. 20
ANP (analytic network process) 61–2, 63
applied research 1, 220
project evaluation techniques 80–81
R&D policy for 223–5
see also Company ‘A’
apprenticeship stage 116
Armstrong, M. 54
Arora, A. 6
Arrow paradox 224
Azzone, G. 64, 68, 69
Baker, N.R. 54
Balachandra, R. 53
balanced managers 123
Balanced Scorecard (BSC) approach 21, 28, 35
Barsky, N.P. 17, 20, 21, 22, 23, 26, 28
basic research 1, 220
project evaluation techniques 80
R&D policy for 221–3
see also Company ‘A’; oriented basic research/strategic research
Bayh-Dole Act 244
Bayus, B.L. 2
Belton, V. 62
Bertelé, U. 68, 69
Beskese, A. 63
bibliometric indicators 18–19
Bilderbeek, J. 15, 22, 23, 26
Black and Scholes Model 76
Black, F. 68
Bourne, M. 20
Bowon, K. 23
Bozbura, F.T. 54, 65
Bradbury, F.R. 53
brain attraction 115
Brealey, R.A. 54, 65
Bremsner, W.G. 17, 20, 21, 22, 23, 26, 28
Briggs, A.H. 73
Brown, M.G. 15, 17, 19, 20, 22
Brown, W. 26
BSC (Balanced Scorecard) approach 21, 28, 35
Burch, J. 23
business process perspective 29, 35–6
Calantone, R.J. 54, 62
CAPM (capital asset pricing model) 66–7
Cardus, D.M. 58
career paths 116–18
project intensification 123
Carlsson, C. 54
Carr model 76
certainty equivalent NPV 68–9
champion role 112
Chan, S.H. 4
Chapman, D. 65, 69
Evaluation and performance measurement of R&D

Chatterji, D. 5
Chesbrough, H. 6
Chiesa, V. 5, 16, 21, 22, 23, 24, 26, 28, 30, 32, 39, 47, 53, 68, 69
Cho, E. 22, 23, 26
‘Clean Sky’ Joint Technology Initiative 209–10
Clemen, R.T. 54, 71
clusters 189–91
see also technology platforms
Coccia, M. 20, 22
Collier, D.W. 18
Company ‘A’ 27–8
available resources 41
competitive and technology strategy 39–40
context 38–9
overview 38
performance measurement system 44
control objects 43
dimensions of performance 42
indicators 42
measurement process 43, 45
objectives 41
R&D organization and management 40
type of R&D activity 40–41
competence development 123
contextual perspective, firm level 24–5
contract research organizations (CRO) 39
control objects 23
Cook, A. 4, 18, 21, 22, 23, 28, 33
Cooper, C. 65, 69
Cooper, R.G. 4, 19, 21
Cordero, R. 4
corporate governance and, stock
market valuation of R&D 160–63
cosmopolitans (R&D workers) 117
cost of capital/WACC (Weighted
Average Cost of Capital) 65–6
CRO (contract research organizations) 39
cross-functional teams 118–19
customer perspective 28
Davila, T. 21, 23, 26
Dean, B.V. 53, 56
Debackere, K. 18, 20
decision tree analysis (DTA) 71–4
Deeds, D.L. 48
demographic diversity, in R&D laboratories 120–21
Development Costs document 93, 97, 101
Di Masi, J.A. 72
dimensions, firm level 20–21, 22
disclosure paradox 224
discount rate calculation, in NPV 65–6
DMADV (Define, Measure, Analyse, Design) roadmap 96, 99
Doctor, R.N. 65, 71
documents, project approval 93
Development Costs 93, 97, 101
Project Charter 93, 94
Project Scope 93, 95
Project Submittal Form 93, 98, 102
Revenue & Margin Calculations 93, 95, 101
Risk Management Plan 93, 96
Donegan, H.A. 59
Driva, H. 15, 17, 20, 22, 23, 24, 29
drug development 71, 73–4
DTA (decision tree analysis) 71–4
dual career system 117
dual ladder 117
dual use 205–6
Duarte Silva, A.P. 65
earnings before interest, taxes,
depreciation and amortization
(EBITDA), and R&D 143
Easton, A. 54
Eisenhardt, K.M. 45
Emmanuel, C. 26
empirical analyses
methodological details
multiple case study 45–8
survey study 48–50
entrepreneurial orientation 117
European Technology Platforms (ETPs)
policy making 201–3
see also ACARE technology platform
Expectancy Model 110
experimental development 220
explicit knowledge 120
external consistency 31
external sources of technology, increased reliance upon 5
extrinsic rewards 114

Farris, G. 4
Farrukh, C. 58
feedback see 360-degree feedback
Feller, I. 4
Fifth Generation Computer Systems Project 249
financial analysts, role in R&D information flows 176–7
financial markets’ perspective 4, 143–5
financial perspective 28, 29
Fink, A. 50
firm perspective 4
literature 16–25
firms
R&D policies for
financial policies 238–41
legislative policies 241–2
Foray, D. 4
Forman, E.H. 62
Frair, L.C. 59
Frascati Manual 220
Frattini, F. 5, 20, 22, 24, 26, 29, 30, 32
Freeman, C. 4, 54
Fullér, R. 54
fuzzy logic 63
applied in R&D project evaluation 63–5
Gass, S.I. 62
gatekeeper role 112
Gear, T. 62
Gee, R.E. 18
Georgiou, L.G. 55
Geske model 76
Ghosh, A.A. 58
Giardina, G. 38, 39
GlaxoSmithKline (GSK) 38
Gobel, D. 26
Godener, A. 15, 23, 24
Gordon, L.A. 24, 31
Graebner, M.E. 45
Grant-Muller, S.M. 69
Griffith, A. 21, 22, 23, 24, 26
growth, and technology 218
GSK (GlaxoSmithKline) 38
guarding role 118
Gupta, A.K. 2
Hajek, P. 64
Hall, D.L. 55
Hand, J.R.M. 4
Haour, G. 5, 39
hard objectives 32–6
Hauser, J.R. 15, 24, 26
Henriksen, A.D. 58
Henrion, M. 72
Heungshik, O. 23
heuristics models 86
hiring process 111–13
Ho, S.S.M. 69
Hodder, J.E. 65
Howard, R.A. 73
Howells, J. 5
HR-oriented managers 123
Huberman, A.M. 47
Hultink, E.J. 22
human genome project 38
human resources management
empirical analysis of projectification and open innovation impact
conflicts and stress 130–31
descriptive statistics of the sample 136–7
factor analysis 136–40
findings 129–34
incentives 133–4
issues and methodology 128–9
planning 134
skills demands 131–2
training 132–3
evaluation model for HRM practices 127–8
literature 110–21
overview 108–10, 134–6
scientists’ view
open innovation 123–7
projectification 121–3
hurdle rates 66
Hwang, C.L. 57
IAS/IFRS adoption case study 178–9, 182–5
idea generators 112
incremental R&D projects, evaluation techniques 81
Evaluation and performance measurement of R&D

independent contributor stage 116
indicators/metrics
firm level 17–20
taxonomy 20
influence diagrams 73
information flows see R&D
information flows
innovation and learning perspective 29
innovation process
in case study company 91
non-linear view 227
innovation systems’ perspective 4
input indicators 19
Integrated Technology Demonstrators (ITD) 209–10
intellectual property rights (IPR)
Mutti and Yeung (1996) study 242
rationale for 222
technological spillovers and 168
intrinsic rewards 113–14
IPR (intellectual property rights)
Mutti and Yeung (1996) study 242
rationale for 222
technological spillovers and 168
Irvine, J. 54, 65
ITD (Integrated Technology Demonstrators) 209–10

Jagannathan, P. 58
Japanese firms, use of process indicators 24–5
joint technology initiatives (JTI) 202
Jones, G. 6
JTI (joint technology initiatives) 202

Kamoda, H. 62
Kaplan, R.S. 21
Kellogg, D. 74
Kerre, E.E. 64
Kerssens-van Drongelen, I.C. 4, 15, 18, 21, 22, 23, 26, 28, 33
Kester, W.C. 65, 74
Kim, B. 21, 22, 23, 24, 26
Kim, S.H. 61
knowledge, as a public good 221, 223
knowledge dilemma 222
knowledge management 119–20
knowledge sourcing, beyond firm’s boundaries 193–6

Kodama, F. 3, 34, 49, 50, 51
Krosgsgaard, C. 74
Kuwait Institute for Scientific Research 57

Lai, S.-Q. 21, 22
leadership 119
Lee, C.-L. 21, 22
Lee, J.W. 61
Lee, M. 22, 23, 26
lemons, market for 224
Liang, G.S. 64
Liang, W.Y. 62
Liles, D. 17, 20, 24
line managers’ competencies 123
Lintner, J. 66
Liu, B. 59
Liu, T.-L. 67
locals (R&D workers) 117
Loch, C. 23, 24, 26
Loch, C.H. 15, 23, 24, 26, 33
Locke, S. 54, 66
Magee, J.F. 71
Mahajan, V. 2
management-by-objectives (MBO) reward system 41
management of R&D, change in 5–6
‘mapping measurement impact’ methodology 239
Margrabe model 76
Marshall, K.T. 62
Martin, B.R. 18
Masella, C. 21, 22, 23, 26
mathematical optimization models 85–6
matrix structure 40
MBO (management-by-objectives) reward system 41
McAdam, R. 20
McClellan, D.C. 36
Meade, L.M. 61, 62
measurement frequency 23–4
measurement process 23, 30
mentor stage 116
Merchant, K.A. 23, 24, 31
Merton, R.C. 68
Metheson, J.E. 73
Miles, M.B. 47
Miller, D.A. 24, 31
MIUR (Italian Ministry for Education, University and Research) 11
Moed, H.F. 18
Mohapatra, P.K.J. 22, 24, 26
Mohr, J. 2, 5
Moizer, P. 36
Monte Carlo Simulation 78–9
moral hazard, writing contracts 224
Mordeson, J.N. 64
Morgan, G.A. 50
Morgan, M.G. 72
Morris, P.A. 54
Mossin, J. 5
motivational objectives 33, 34–5
Muffatto, M. 38, 39
Muller, E. 6
Munari, F. 4
Murakami, M. 58
Myers, S.C. 54, 65, 68
Narayanan, V.K. 24, 31
Natta, Giulio 226
Nauda, A. 55
Nayak, P.R. 24, 26
Net Present Value (NPV) 65
criticisms 65–6
see also certainty equivalent NPV; risk-adjusted NPV; stochastic NPV
networking
R&D policies for financial policies 245–9
legislative policies 249–50
Networks of Centres of Excellence program 247
Nevens, T.M. 2
new product development (NPD) 1
and hard objectives 33
and motivational objectives 34
project evaluation techniques 81
Nishry, M.J. 53, 56
Nixon, B. 17, 20, 24, 26
Noci, G. 64
Norton, D.P. 21
Noyons, E.C.M. 18
NPD (new product development) 1
and hard objectives 33
and motivational objectives 34
project evaluation techniques 81
NPV (Net Present Value) 65
criticisms 65–6
see also certainty equivalent NPV; risk-adjusted NPV; stochastic NPV
O’Brien, T.J. 67
Oh, H. 21, 22, 23, 24, 26
Ojanen, V. 15, 22, 23
Oliver, R.M. 62
open innovation 6, 124–5
conflicts and stress 130
and human resources management 123–7
incentives 133–4
motivations 197–9
planning 134
skills demands 131–2
training 132–3
Open Source software 196
options (financial) 74
see also ROV
oriented basic research/strategic research 226–7
see also use-inspired basic research
Ormala, E. 54
Ortt, J.R. 5, 6
Osawa, Y. 58
Ouchi, W. 34
outcomes as indicators 19
output indicators 19
Page, A.L. 21, 22, 23, 24, 26
Pappas, R.A. 15, 18, 20, 24, 26, 29
Pasteur, Louis 226
patent revenues, attribution to inventors 114
path dependence, knowledge sources and 194–5
Pawar, K.S. 15, 17, 20, 22, 23, 24
Pearson, A.W. 23
performance evaluation, people 115–16
performance measurement system (PMS)
archetypal models 32–6
assessment dimensions 35
objectives 32–5
Company ‘A’ study 44
control objects 43
dimensions of performance 42
Evaluation and performance measurement of R&D

indicators 42
measurement process 43, 45
objectives 41
constitutive elements 25–30
literature 15
measurement context 30–32
reference framework 27
see also R&D performance measurement
Pessemier, E.A. 54
Pike, R.H. 69
planning
open innovation and 134
see also Risk Management Plan
PMS (performance measurement system)
archetypal models 32–6
assessment dimensions 35
objectives 32–5
Company 'A' study 44
control objects 43
dimensions of performance 42
indicators 42
measurement process 43, 45
objectives 41
constitutive elements 25–30
literature 15
measurement context 30–32
reference framework 27
see also R&D performance measurement
Poh, K.L. 4, 15, 53, 55
policies see R&D policies
positive externalities 221
Presley, A. 17, 20, 24, 61, 62
Pritchard, R.D. 36
process indicators 19
Projan, S.J. 67
project approval documents 93
Development Costs 93, 97, 101
Project Charter 93, 94
Project Scope 93, 95
Project Submittal Form 93, 98, 102
Revenue & Margin Calculations 93, 95, 101
Risk Management Plan 93, 96
Project Charter document 93, 94
project evaluation see R&D project evaluation
project intensification 122–3
project management competencies 123
project orientation 117
Project Scope document 93, 95
Project Submittal Form 93, 98, 102
projectification
conflicts and stress 130–31
scientists' view 121–3
projects
definitions 51
see also R&D project evaluation
Proposed Standard Practice for Surveys of Research and Development (OECD) 220
qualitative indicators 29
qualitative subjective metrics 18
quantitative indicators 18–19
quantitative objective indicators 18
quantitative subjective indicators 18
R&D
definitions 219–21
new understanding of research activities and processes 225–6
non-linear view of the innovation process 227
taxonomy 1, 226–7
R&D information flows 166–7, 179–80
asymmetries 167
from accounting standards 166–7, 169–70
see also IAS/IFRS adoption case study
from economic attributes of R&D 167–9
financial analysts role 176–7
value relevance for stock market investors 170–73
table empirical models 180–82
voluntary disclosure 173–6
R&D-intensive stocks 172–3
R&D investment, growth in 3
R&D performance measurement challenges 1–2
interest in 2–4, 15
literature gaps 4–6
R&D policies for firms
financial policies 238–41
legislative policies 241–2
future developments
  evaluation methodologies 252–4
  evaluation typologies 250–52
for knowledge generating
  institutions
  financial policies 242–4
  legislative policies 244–5
for networking
  financial policies 245–9
  legislative policies 249–50
overview 218–19
scope and rationales 219–21
  ‘to devise new applications’ 223–5
  ‘to increase the stock of
knowledge’ 221–3
potential consequences of new
taxonomy 228–9
study of methodologies and
typologies 229
  framework for 234–8
  method 230
  review of main contributions to
literature 230–34
R&D project evaluation
  benefit-contribution techniques 54
  methods for decision analysis
  70–78
  methods for economic analysis
  65–70
  Monte Carlo Simulation 78–9
comparative assessment of
techniques 79–83
organizational implications case
  study 90–91
  approval of projects 92–5
  innovation process 91
  introduction 91
  projects management 95–102
  scoring method 102–5
  screening of ideas 91–2
overview 51–2, 88–9
taxonomy 53–6
weighting and ranking techniques
  53–4
  applying fuzzy logic 63–5
  comparative methods 59–63
  scoring methods 56–9
R&D project portfolio analysis 83–4
  evaluating portfolio ‘merit’ 86–8
interdependences among projects
  84–6
radical R&D projects, evaluation
  techniques 81
Raftery, J. 69
Rahaman, S. 59
Raifla, H. 71
Ramirez, P. 161
Rangone, A. 64
rank reversal problem 62
real options (RO) theory, and stock
market valuation of R&D 158–9
Real Options Valuations (ROV) 74–7, 78
Remer, D.S. 15, 18, 20, 24, 26, 29
Renganarajan, S. 58
return on equity (ROE), and R&D 143
Revenue & Margin Calculations
  document 93, 95, 101
reward systems 113–15
Riggs, H.E. 65
risk-adjusted NPV (RAR) 66–8
risk-free rate 66
Risk Management Plan 93, 96
risk-premium rate 66
Robben, H.S.J. 22
Roberts, E.B. 5
Robichek, A. 68
ROE (return on equity), and R&D 143
Roessner, D. 55
ROV (Real Options Valuations) 74–7, 78
Ryan, G.P. 65
Ryan, P.A. 65
Saaty, T.L. 59, 60, 61, 63
Sanchez, A. 61
Sandstrom, J. 21, 22, 28
Savage, L.J. 71
Schall, L.D. 65
Scholes, M. 68
Science and Technology Basic Law
  (Taiwan) 244
scouting role 118
SEI (Sumitomo Electric Industries) 57
semi-quantitative metrics 18
‘shadow’ value of an asset 149
Sharpe, W.F. 66
Shin, C.O. 62
Simons, R. 36
Sivathanu, P.A. 15
Smits, R. 5, 6
Soderquist, K.E. 15, 23, 24
soft objectives 33, 34, 36
Souder, W.E. 15, 17, 18, 20, 29
sponsor stage 116
SRA (strategic research agenda) 202
ACARE 207–8
Srinivasa, R.K. 15
Stam, A. 65
standards 23, 30
see also accounting standards;
Frascati Manual
star scientists 112, 130
stochastic NPV 69
stock market valuation of R&D 143–5, 147, 163–4
empirical models, Tobin’s Q 149–51
corporate governance and 160–63
decrease over time 153
empirical models 147–8
based on event studies 151–2
impact of uncertainty 158–60
literature 153–7
market efficiency 146–7
value relevance of R&D information
170–73
empirical models 180–82
strategic research see oriented basic research/strategic research
strategic research agenda (SRA) 202
ACARE 207–8
Stulz model 76
Sugawa, S. 62
Sumitomo Electric Industries (SEI) 57
Suomala, P. 24
Svenson, R.A. 15, 17, 19, 20, 22
system integrators 206
‘systemic’ perspective, firm level 21–4
Szakonyi, R. 23
tacit knowledge 120, 223
Tapper, S. 15, 23, 24, 26, 33
task coordinator role 118
task-oriented managers 123
technical transfer orientation 117
Technique for Order Preference by Similarity to Ideal Solution
(TOPSIS) 57–8
technological opportunities, knowledge sources and 195
technological spillovers and, IPR
(intellectual property rights) 168
technology markets, growth of
6
technology platforms
definitions 191, 199–201
determinants for R&D beyond firm’s
boundaries 192–3
development interdependence
196–7
knowledge sourcing 193–6
open innovation 197–9
evaluation 210–15
overview 189–92, 215–17
see also European Technology
Platforms
technometric indicators 18
Teegen, H. 6
Teknopol approach 247
Thomson, William, Lord Kelvin 226
Tiers of activities 24
Tobin’s Q, empirical models 149–51
Toivanen, J. 21, 22, 28
Toletti, G. 64
Tollgate Reviews 99–100
TOPSIS (Technique for Order Preference by Similarity to Ideal
Solution) 57–8
tragedy of the commons, non-applicability to knowledge 222
Traynor, A.J. 58
triangular membership functions 64
Triantaphyllou, E. 61
Trigeorgis, L. 54
Twiss, B. 21
Tylecote, A. 161
US, Generally Accepted Accounting Principles (GAAP) 169, 171
use-inspired basic research 226, 228
see also oriented basic research/
strategic research
value drivers 167–8
Verbeek, A. 18, 20
Viscovich, M. 74
VOC (Voice of the Customer) 96
Voice of the Customer (VOC) 96
Vuola, O. 15, 22, 23
<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>WACC (Weighted Average Cost of Capital)</td>
<td>65–6</td>
<td>Xu, S. 59</td>
</tr>
<tr>
<td>Wang, M.J.</td>
<td>64</td>
<td>Yin, R.K. 45, 47, 48</td>
</tr>
<tr>
<td>Weighted Average Cost of Capital (WACC)</td>
<td>65–6</td>
<td>Yoon, K. 57</td>
</tr>
<tr>
<td>Wen, S.-Y.</td>
<td>67</td>
<td>Zadeh, L.A. 63</td>
</tr>
<tr>
<td>Werner, B.M.</td>
<td>15, 17, 18, 20, 29</td>
<td>Zenker, A. 6</td>
</tr>
<tr>
<td>Wilemon, D.</td>
<td>2</td>
<td>Zettelmeyer, F. 24, 26</td>
</tr>
<tr>
<td>Wind, J.</td>
<td>2</td>
<td>Zimmermann, H.J. 64</td>
</tr>
</tbody>
</table>