Superior access, quality and value of healthcare services have become a global priority for healthcare to combat the exponentially increasing costs of healthcare expenditure. E-Health in its many forms and possibilities appears to offer a panacea for facilitating the necessary transformation for healthcare. However, while a plethora of e-health initiatives keep mushrooming both nationally and globally, healthcare is still yet to realise the full potential of e-health. This is due to a myriad of reasons including the fact that the healthcare industry is faced with many complex challenges in trying to deliver cost-effective, high-value, accessible healthcare and has traditionally been slow to embrace new business techniques and technologies.

Healthcare to date has predominantly been shaped by each nation’s own set of cultures, traditions, payment mechanisms and patient expectations. Therefore, when looking at health systems throughout the world, it is useful to position them on a continuum ranging from high (essentially 100%) government involvement (i.e. a public healthcare system) at one extreme to little (essentially 0%) government involvement (i.e., private healthcare system) at the other extreme with many variations of a two tier system (i.e. mix of private and public) in between. However, given the common problem of exponentially increasing costs facing healthcare globally, irrespective of the particular health system one examines, the future of the healthcare industry will be partially shaped by commonalities such as this key unifying problem and the common forces of change including: (1) empowered consumers, (2) e-health adoption and adaptability and (3) shift to focus on the practice of preventative versus cure driven medicine, as well as four key implications, including: (1) health insurance changes, (2) workforce changes and changes in the roles of stakeholders within the health system, (3) organizational changes and standardization and (4) the need for healthcare providers and administrators to make difficult, yet necessary choices regarding practice management.

It is for these reasons that the preceding has served to present a miscellany of chapters written by respective experts on critical issues all vital for achieving successful e-health solutions. By having four sections of Innovation and Process, Design and Organisation, People and Information Systems and Information Epilogue
Technology we hoped to emphasize the importance of considering all these aspects in formulating a particular e-health solution. Simply stated, just getting the technology right while clearly a necessary condition is not sufficient if one is to have superior e-health solutions.

The future for healthcare delivery is indeed challenging but we are confident that it is also bright. We believe that many of the key points raised throughout this book will serve to assist the realisation of the full potential of e-health so that we might all ultimately enjoy better healthcare delivery.

Nilmini, Raj, Reima & Stefan
The Editors, 2011
Index

A
ABDHIA167, 362, 363
ABDXC109, 362
ABDXC160, 363
Accident insurance, 196
Administrative and management systems, 139, 142
ADO.NET, 340
Agency theory
asymmetric information distribution, 315
e-health, 316–317
framework and selection, 317–318
hidden action, 316
hidden information, 316
hospital management, 314
ICT, 313–314
IS research, healthcare, 318–319
moral hazard, 316
principal and agent relationship, 315
screening, 316
telemedicine research
agency problems, 324–326
classification, 320–323
collaborative process, 329
definition, 320
empirical research, 328
health care delivery, 329
principal-agent relationship, 320, 324
research method, 326–328
AIDC technologies. See Automatic identification and data capture (AIDC) technologies
Ambient intelligence, 305, 309
Ambulatory care system, 274
Architectural element, 304
Asset management, 300

Automatic identification and data capture (AIDC) technologies
applications
costs and benefits assessment, 303–304
in logistics scenarios, 299–300
OPAL Health project, 300–302
description, 294
synchronizing developments, 306–308
wireless, 299
Autonomous software programs
implementation, CLEOS® (see also Clinical expert operating system)
dysfunctional health care, 360
medical knowledge formalization, 360
patients physical examination, 368–370
ownership, 370

B
Barcodes, 295
Behavior change support systems (BCSSs)
computer-mediated/human persuasion, 165
definition, 165
health information technology, 171
outcome design matrix, 166
persuasive technology, 165, 166
physical activity and dietary behavior change, 167–168
psychological theories, 165
substance abuse, 170
types of change, 166–167
weight loss and weight management, 168–170
Business intelligence (BI) application
  balanced scorecard, 11–12
  components, 12, 13
  health and wellness service line management, 11
  service line analysis and reporting, 11
  data availability, 5
  data warehouse, 10
  democratization, 5
  monitoring, 9–10
  OLAP, 5–6
  reporting and analysis tools, 10

C
Carriable object, 304
CCC. See Citizen-centered care
China, E-health
  challenges
    e-benefits, 77
    e-connectivity, 76
    e-procurement, 75–76
  definition, 72
  e-commerce development, 72–73
  goals, 73–74
  ICT development, 72
  impacts
    cultural/social dimensions, 82
    IT education, 81–82
    morbidity rate, 82
    world economic standing, 82
  Internet users, 72, 73
  preparedness grid, 83, 84
  prerequisites
    governmental regulation and control, 81
    ICT architecture/infrastructure, 78–79
    standardization policies, protocols and procedures, 79
    user access and accessibility policies and infrastructure, 80–81
  World Health Organization, 72
China Unicom/Telecom, 78
Chronic heart failure (CHF), 278–279
Citizen-centered care (CCC)
  barriers, 126–127
  citizen education, 117
  citizen empowerment, 117, 118
  collaborative environments, 127–128
  collaborative, sustainable citizen-centered health, 128, 129
  community of actors, 128–129
  Continua Health Alliance, 130
  core patient data, 116

domains
  aging population, 122
  chronic diseases, 121
  CHS, 122
  EPI-MEDICS, 122
  home care, 122
  ICT-based applications, 123
  lifestyle, behavior and wellness management, 121
  LLM project, 123
  mobile technology and broadband connections, 123
  pervasive services, 121
  WD, 122
  drivers, 124–125
  e-business and e-commerce, 128
  health care service provider’s viewpoint, 123–124
  health organization’s health space, 128
  health promotion and maintenance, 117
  interoperable information systems, 118
  interoperable network, 127
  missing information, 118

PHR
  attributes, 119
  decision support functions, 120
  ecosystem, 120
  elements, 129–130
  interconnected PHR, 119–120
  interoperability, 120
  lives and wellness management, 121
  standalone PHR, 119
  tethered approach, 119
  preventive care, 117
  secure data transfer channel, 116
  shared care management and networked services, 118
  social media, 128
  stakeholders, 127

Citizen eMPOWERment
  advanced directives and care planning, 234
  autonomous self-regulation, 232
  clinician, role of, 234
  electronic health record, 233
  evidence based patient pathways, 240
  gene therapy, 235
  health and care pathway, 232
  high quality care, 235
  informed decisions, 232
  IT-based system
    decision support tools, 238
    electronic form, 237
    Map of Medicine, 239
  patient reported outcome measures, 239
Index

SNOMED-CT, 237
telehealth, 238
legal entity, 234
local health service, 239
medical knowledge, 233
sedentary lifestyle, 231
self care, 235
social care, 240
technological advancements, 231
trustworthy sources, 232
websites, 236
Citizen health system (CHS), 122
Clinical data analysis systems, 139
Clinical decision support systems (CDSSs), 30
Clinical expert operating system (CLEOS®)
acute and chronic diseases, 361
clinical performance, 365, 367, 368
decision graphs, 361–364
diagnostic and therapeutic recommendations, 365
diagnostic tests and therapeutic interventions, 365, 366
graphic patient interface, 361, 363
history-taking, 361, 363
intended use, 368
knowledge base, 360–361, 365
rules analysis, 365
textual patient interface, 361, 362
voice recognition software, 361
wireless connection access, 361
Clinical information systems, 139, 142
Communities of practice (CoP), 245–246
Computer-based communication networks, 114
Cyberchondriacs, 215–216

D
Data mining, 4, 14
Decisions Support System for Healthcare Institutions (DSSHI)
arquitectura and implementation requirements
activities, groups and catalogs, 341, 342
cost and activity accounting tool, 340
decision support system tool, 340
extended entity-relationship-model, 341
functional separation, 340
layered object-oriented approach, 340
management of healthcare institutions, 339
model-view-controller paradigm, 341
staff and staff groups representation, 341
cost-and performance information, 339
costs and revenues reports, 346, 348–349
decision support module
data warehouse-system, 346
DRG-tables, 346
evaluation tool, 345
management levels, 345–346
storage scheme, 342, 343
processes and quality reports, 349–350
staff reports, 350
user interface
activities, activity types, categories and catalogs, 344, 345
cost and accounting module, 342, 343
cost center management, 344
data model, 343
recording patient specific data, 345, 347
staff groups, 343–344
standardized pathways, 345, 346
Design-and development-centered approach, 173
Design science research methodology (DSRM) process model, 173, 174
Design with Intent (DwI), 172–173
Distributed Electronic Health Record Systems and associated Network Services, 139, 142, 143
DSSHI. See Decisions Support System for Healthcare Institutions

E
E-health card (eHC)
administrative functions, 101–102
advantages and disadvantages, 103–104
data protection and data security, 104–105
education of physicians and consumers through online sources, 108
efficiency, 108
EHIC front and back, 101, 102
EHR, 101, 103
e-kiosk systems (see Electronic-kiosk systems)
emergency data, 103
empowerment of consumers and patients, 108
enhancing quality of care, 108
e-prescription, 102
equity, 109, 110
ethics, 108
evaluation, 109
evidence, 108
healthcare, 100–101
HPC, 102
lifelong valid insurance number, 101
medical functions, 101, 103
eHealth solutions
administrative and management systems, 139
clinical data analysis systems, 139
clinical information systems, 139
Distributed Electronic Health Record
Systems and associated Network
Services, 139
emerging strategies, health care sector
consumers role development, 138
customer-oriented services
development, 138
evaluation process development, 137
health coaching services development,
138–139
health, social and government services
integration, 139
highly specialized structures
development, 138
incentives and deterrents development,
138
independent living possible, 139
network process improvement, 137
outpatient care, 138
patient safety enhancement, 138
preventive services, 138
primary care, 138
privacy and ethics protection, 139
health care strategies, priorities and
stakeholders, 140
eHealth payers, 142
health care professionals and patients,
143–144
policy makers, 142
researchers and academics, 143
tax-funded free health care, 144
patient relationship management
systems, 140
population ageing and top priorities,
144–145
sentiments extraction, Web, 136–137
social networking and web 2.0 systems,
139–140
strategy-solution matrix, 140, 141
teledicine systems, 140
E-intermediaries, 145
E-kiosk systems, 2
Elaboration likelihood model, 175
Electronic healthcare services. See
Telemonitoring
Electronic health record (EHR)
clinical business model, 261
HITECH, 260
immunization
national HIE, 264
provider-based immunization
program, 265
public health information system, 264
revaccination costs, 263
vaccine preventable disease, 265
incentive payments, 260
investment, 261–263
patient empowerment, 213–214
public health (PH), 261
Electronic-kiosk systems
advantages, 107
barrier-free e-kiosk terminals specification
BGG, 106
blind/visual impairment, 106–107
degree of disability, 105
restricted leg and arm functions, 106
speech recognition software, 107
definition, 105
emergency data, 105
E-performance management
business intelligence (see Business
intelligence)
controllable and uncontrollable variations, 8
data mining, 4, 14
healthcare information management, 4, 5
healthcare performance management, 7
indicators aggregation, 9
performance indicators/measures, 8
research issues, 14
standards/benchmarks, 9
web service management systems survey,
6–7
E-services, 10–12
European health insurance card (EHIC), 101
Evidence-based medicine (EBM), 196

F
Fogg Behavior Model (FBM), 172

G
German Medical Association, 279
German telematics infrastructure (TI)
architecture, 276–277
business model development
actor model, 281–282
revenue model, 283, 285–287
service model, 282–283
external framework model
legal model, 280–281
market condition, 280
technical model, 281
research framework, 274–275
for service providers, 288–289
taxonomy of value-added applications,
276, 278
Index

telemonitoring
chronic heart failure, 278–279
definition of, 278
value added service, 278
value network, 287

Germany
ambulatory care system, 274
public health system, 273–274

H
Health belief model, 174
Healthcare information systems (HIS)
access, quality and value, 34
assimilation
advantages and disadvantages, 66
Alpha Hospital, 62, 66
clinical IS/IT knowledge, 67
conceptual model, 58
contractors and vendors, 66
data collection details, 63
definition, 52
diffusion innovation theory, 53–54
end-to-end hospital wide
computerization, 62
environmental context, 55, 58, 65–66
firm size and managerial obstacle, 55–56
helpdesk and troubleshooting, 67
initial acquisition, 50
IS/IT resources, resource based view, 56–58
Malaysian hospital context, 50–52
organizational context, 55, 58, 64–65
qualitative research methods, 61
routinization, 52, 62
semistructured interview method, 63
stages, 59–61
technology context, 54, 58, 65
thematic analysis, 64
theory testing and disconfirming theory, 62
bricolage, 36
disadvantage, 46
healthcare-value strategies, 34
improvisation
conceptualization, 35, 45, 46
definition, 35
pre-composed materials and designs, 34
resource-time-effort, 35
value proposition, 34
improvisation model, 1
RBV, 35–36
research methodology, 37–38
SH (see Singapore Hospital)

Singapore and US healthcare systems, 36–37
USH (see US Hospital)

Healthcare institutions
activities, 337
activity types, 337
clinical pathways
abstract treatment scheme, 335
actual costs, 335
break-even point, 334
cause-based cost distribution, 336
contribution margin, 333
cost association objects, 337
cost objects, 335–336
diversity of cases, 336
DRG, 333–334
fixed costs, 334
law of comparability, 335
medical services factors, 335
MIPP model, 336
past cost accounting model, 336
period costs, 335
personnel costs, 336
standardization, 334, 337
superfluous resources identification and analysis, 336
total costs, 334
cost and activity accounting, 332–333, 339
cost objects, 337
DSSHI (see Decisions Support System for Healthcare Institutions)
personnel cost calculation, 338

Health Information Technology for Economic and Clinical Health Act (HITECH), 260
Health maintenance organizations (HMOs), 41
Health professional card (HPC), 102
Heuristic systematic model, 175
Hidden characteristics, 317, 324, 325
HIS. See Healthcare information systems
HITECH. See Health Information Technology for Economic and Clinical Health Act (HITECH)
Human cognition, 354, 355, 357

I
ICT infrastructure. See Information and communication technology infrastructure

Immunization
national HIE, 264
provider-based immunization program, 265
public health information system, 264
revaccination costs, 263
vaccine preventable disease, 265
Information and communication technology (ICT) infrastructure
broadband development, 78–79
China Mobile and China Netcom, 78
China Unicom/Telecom, 78
efficiency, 73
3G network, 78
penetration rate, 84
Information retrieval, 199
Information technology (IT)
autonomous software programs (see Autonomous software programs)
clinical decision-making complexity, 356–357
computing, extraordinary power
clinical research consequences, 359–360
eyeveryday medical practice
consequences, 358–359
evidence-based rules, 371
expert system software, 371
memory intensive cognitive tasks, 370
poor quality health care cause, 354–355
rational, rules-based activity, everyday medical practice, 355–356
short-and long-term computer memory, 357–358
Infrared waves, 295
InnoDB-Engine, 340
Instrumental object, 304
Integration platform (IP), 297
Integrierte Wissensbasen der Medizin (InWiM), 195
Intelligence e-risk detection decision
anticipated and actual results, 29
CDSs, 30
cceptual model, 25, 26
data mining, 29
DSS, 21–22
IRD model, 20, 30
KDD, 21
KM, 17–18
knowledge discovery
data mining process, 27–28
datasets, 28
on-line/realtime outputs, 28–29
risk factors, 28
KPIs, 30
mortality, primary hip replacement, 18, 19
orthopaedic operating room issues, 20
osteoarthritis, 18
partial/total hip replacements, 18
patella/trochlear replacement, 20
primary knee replacement, 18
relevant studies, 25, 26
revision hip replacements, 18
revision knee replacement, 18
risk adjustment systems, 23–25
risk assessment, 25, 27
Intelligence risk detection (IRD) model, 1, 20
Internet, 205–207
Interoperable information systems, 118
IP. See Integration platform
IS adoption, 328
IS/IT e-health, 1–2
IS/IT resources, resource based view
elements, 56
enabled intangibles, 56, 57
expertise, 56
Glaser’s definition, 57
healthcare organization, 57, 58
identification, 58
infrastructure, 56
IT. See Information technology

K
Key performance indicators (KPIs), 30
Knowledge discovery in data bases (KDD), 21
Knowledge management (KM)
annotations, 199
cross-links, 198
evidence-based medicine, 197
high quality health care delivery, 196
ICT, 192
information theory, 197
insurance medicine, 196
InWiM project, 196–197
knowledge gap, 199
knowledge solutions, 200
MeSH Index, 199
meta-information, 199
NLM, 199
organizational culture, 191
telehealth and telemedicine, 192

L
LDL-cholesterol, 367, 368
Long Lasting Memories (LLM) project, 123

M
Malaysian hospital context
adoption and routinization, 50
Alpha Hospital, 51
clinical and non-clinical information
systems, 50
doctor in-charge, 52
investigation procedures, 52
MRN, 51
patient registration system, 51
planning and implementation stage, 50–51
THIS, 50
Medical assistant (MA), 91
Medical Record Number (MRN), 51
Medical Subject Headings (MeSH), 199
Motivation, 272–273
MySQL, 340

N
National Breast Screening Programme (NBSP), 250
National Cholesterol Education Panel (NCEP) guidelines, 367
National Library of Medicine (NLM), 199
National Programme for Information and Technology (NPfIT), 251
Network-based services, 113
Networked healthcare, 270
Networked medical devices, 305
Normal markets, 273–274

O
Objective-centered solution, 173
Observations of daily living (ODLs), 219–220
On-Line Analytical Processing (OLAP), 5–6
Online discussion forum, peer support content analysis, 154–155
empirical material, 159
generalisation, 153
influenza H1N1, 158
lack of cues, 159
nonverbal cues, 159
qualitative research, 154
research results, 155–157
sympathy and emotional expression, 158
virtual communities
computer-mediated communication vs. face-to-face communication, 152
computer networks and telecommunications, 153
definition, 151
emotional support/education, 152
information-giving support, 152
Internet support groups, 152
non-professional-led support groups, 153
passive and active participation, 152
quasi-nonverbal cues, 153
self-help groups, 152, 153
social media diversity, 151
virtual reality, 150
web-aided peer support group, 153
OPAL Health project, 300–302
OPAL smart tag, 300
Organisation development (OD), 246–247
Outpatient urology department, 2
clinical and professional variability, 88
clinical findings
duplicate lab orders, 92
inaexplicit division of labour, 93
inflexible scheduling, 92
poor communication, 92
shared mode functionality system, 92
unreliable patients, 91–92
improvement suggestions
communication improvement, 95
concrete division of labour, 95
Epic system features, 94
healthcare delivery, 95
inflexible scheduling elimination, 94
online appointment, 93
return visit appointment, 94
scheduled appointment time, 93
success circle, 95, 96
team member’s own account, 95
kind of patients, 89
patients ebb and flow, 88
preparations, 89
process quality, 88
recommendations list, 95–96
result quality, 87
structural quality, 87–88
workflow
with anew patient, 89, 90
demographic data, 90
insurance card, 91
medical assistant, 91
new-patient-front-desk, 90
pager, 91
patient appointment, 89–90
registration department, 90

P
Patient empowerment
digital homecare
cure and care process, 208
mHealth, 209–210
sensors, 209
telemmedicine, 208–209
e-health, 204–205
EHR, 213–214
health decision making, 205
health information
Cyberchondriacs, 215–216
information therapy, 218–219
MedScape, 218
ODL, 219–220
Patient empowerment (cont.) partnership on equal terms, 215 patient-doctor relationship, 216 Web 2.0, 214

Internet classical consumer, 206 health and medicine, 206 ICT, 205
Web 2.0, 207 social media, 212–213
social networks, 210–211
Patient registration system, 51
Patient relationship management systems, 140, 145

People-centric dimensions breast screening human interaction, 250 mammography, 249 NBSP, 250

tissue biopsy, 249 Crohn’s disease clinical knowledge summaries service (CKS), 255 Google, 254
HONCode symbol, 254 NHS Choices, 256
online patient information and support, 253 Silberg’s criteria, 253

social networks, 244–245
maternity services
national database, 251
NHS Plan, 252
NPfIT, 251
patient expectations, 252–253
PSA targets, 252

populomics disease causation, 248 healthcare disparities, 247
National Institutes of Health, 248 sociocultural realities, 247 therapeutic efficacy, 247

Personal health record (PHR) attributes, 119
decision support functions, 120
ecosystem, 120
interconnected PHR, 119–120
interoperability, 120
lives and wellness management, 121 standalone PHR, 119 tethered approach, 119

Personal health systems (PHS), 119

Persuasive health behavior change interventions
advantageous interdisciplinary collaboration, 171

BCSSs computer-mediated/human persuasion, 165
definition, 165
health information technology, 171
outcome design matrix, 166
persuasive technology, 165, 166
physical activity and dietary behavior change, 167–168
psychological theories, 165
substance abuse, 170
types of change, 166–167
weight loss and weight management, 168–170
designing directions, 171
design science directions, 173–174
design strategies, 173
DwI, 172–173
FBM, 172
implementation strategies and message tailoring strategies, 173
PSD model, 172
RE-AIM, 173
underpinning theories, 174–176
Web-based intervention, 164

Persuasive systems design (PSD) model, 172

PHR. See Personal health record

Post-incident care, 114
Primary care physicians (PCPs), 41
Problem-centered approach, 173
Public health system
in Germany, 273–274
vs. normal markets, 273–274
Public Service Agreement (PSA), 252

R
Radio-frequency identification (RFID), 295
Relational database management system (RDBMS), 340
Resource-based view (RBV), 35–36
Rich internet applications (RIA), 185

S
Sensors, 209
Singapore Hospital (SH)
iconic hospital, 38
improvisation bricolage, 44
Index

deployment, 39–40
embracing, 41, 42
initiation, 38–40
patient recovery process, 44
service quality, 44
key criteria, 38, 39
Smart objects
development from applications, 305
integration platform, 297
requirements for, 295
types of, 304
wireless sensor network, 296–297
Social cognitive theory, 174
Social media
blogs, 212
Facebook and Twitter, 212
Wikipedia, 213
Social Network Analysis (SNA), 245
Social networks
patient empowerment, 210–211
Web 2.0 systems, 139–140
State immunization registries
clinical business model, 261
HITECH, 260
incentive payments, 260
investment, 261–263
national HIE, 264
patient empowerment, 213–214
provider-based immunization program, 265
public health (PH), 261
revaccination costs, 263
vaccine preventable disease, 265
Supportive and collaborative electronic health environments, 113–114
Sustainable business models, 113
Swine flu epidemics, 113

T
Technology-organization-environment (TOE) framework
environmental context, 55
firm size and managerial obstacle, 55–56
organizational context, 55
technology context, 54
Telemedicine, 208–209
Telemonitoring
chronic heart failure, 278–279
definition of, 278
value added service, 278
value network, 287
Total Hospital Information Systems (THIS), 50
Transtheoretical model, 174

U
Ultrasound tags, 295
Unimodel, 175
US Hospital (USH)
automated medical record system, 42, 44
clinical and business systems, 42
healthcare-value proposition, 45
HMOs, 41
improvisation, 42–43
institutional bricolage, 45
PCPs, 41
rationalization, 43

V
Variable-analytic and applied-research findings, 175

W
W3C standard. See World Wide Web Consortium standard
Wearable object, 304
Wearable technology, 209
Web accessibility, disabled people
ageing population, 185
barriers/obstacles, 184
European Union, 184
German Federation, 184
Java-Script, 185
RIA, 185
usability
automatic and manual tests, 187, 188
digital integration accessibility, 187
eEurope 2002 action plans, 187
German Industry Standard, 186
standardization, 187
WCAG 2 document structure, 186
W3C standard, 186–187
user-friendliness, 185
World Wide Web, 184
Web Accessibility Initiative (WAI) guidelines, 187
Web Content Accessibility Guidelines (WCAG), 186
Wellness diary (WD), 122
Wireless AIDC technologies, 298
Wireless LAN (WLAN), 295
Wireless sensor network (WSN), 295–297
Workspace object, 304
World Health Organization (WHO), 72
World Wide Web Consortium (W3C) standard, 186–187