

INDEX

- 802.11 standard 103–4
 accessibility (design principles for graphic solutions) 52–3,
 184–7, 207, 236
 accidental threats (network security) 116–17, 332
 accuracy of data 9, 158, 268
 affordance
 mobile devices 176
 user interface 236
 agriculture and information systems 147–8
 algorithms 231, 245
 alignment (design principles for graphic solutions) 53, 188–9
 alpha testing 248
 American Psychological Association (APA) 13–14
 analysis (problem-solving methodology) xii
 animations (graphic solutions) 46–7
 annotated diagrams (graphic solutions) 66,
 67–8, 198–9
 appearance (design principles for graphic solutions) 53–6,
 187–94, 198–204
 alignment 53, 188–9
 annotated diagrams and mock ups 198–9
 balance 56, 193–4
 contrast 189–92
 conventions and formats 201–4
 flowchart 182
 functionality 182–7
 layout design 198–9
 repetition 189
 space 192–3
 test data 200
 application-programming interface (API) tool 289
 apps 105
 arrays 220, 250–2, 270
 arrows (graphic solutions) 59–60
 asymmetric digital subscriber line (ADSL) 92
 audio file 203
 Australian Bureau of Statistics (ABS) 266
 Australian Privacy Principles (APPs) 22–4
 authenticity of primary data 269
 automatic numberplate recognition 342
 backups 20, 333
 balance (design principles for graphic solutions) 56, 193–4
 bandwidth 109
 battery life (mobile devices) 161
 beta testing 248
 bias (information) 9–11
 through graphic representations 11
 through sorting 10
 binary search 255
 bluetooth 113
 Boolean data type 270, 308
 bottom-driven loops 243
 brainstorming 170
 broadband routers 91–2
 bulletin boards 153
 Bureau of Meteorology 265–6
 buttons (design principles for graphic
 solutions) 205
 card skimming 149, 150
 cellular radio 114–15
 central processor unit (CPU) 220, 223
 channel 109
 character (data type) 269, 308
 charts
 as data visualisations 273
 graphic solutions 43–5
 choices (information architecture) 179–80
 classification (information architecture) 178
 client-server networks 84–5
 closed questions 7, 8
 cloud computing 21, 159–60
 cloud storage 100, 159–60
 code identification 243
 code modules 240–1
 collaboration 168
 colours (graphic solutions) 62–5, 190–2
 communication of message (graphic solutions) 69
 communications, facilitating network 125
 communications channel 109–11
 communications devices 81, 90–6, 331
 broadband routers 91–2
 network interface cards 93–4
 NBN devices 92–3
 routers 90–1
 switches 90
 wireless access point 94
 wireless adaptors 93–4
 wireless extender 95–6
 communication hardware 221
 communications satellite 115–16
 communications software 96–8
 compiler 223
 completeness testing (graphic solutions) 68
 complex instruction set computing (CICS) 220
 component testing 248
 compression 227
 consent forms 15–16
 contingency plans (project management) 168, 169
 contrast (design principles for graphic solutions) 53–4, 62–5,
 189–92
 conventions (design principles for graphic solutions) 56–65,
 201–3, 281–2

- file naming 201–2
images 202–3
index page 202
style guides 203
video and audio file 203
Copyright Act 1968 (Cth) 89–90, 141
costing (project management) 169
counted loops 243
CSV file formats 289
- data**
accuracy 9, 158, 268
acquisition 308–9
correctness 159
dummy 206
entry 309–12
gathering 5–9
and information 4–5
integrity 151, 158–9, 267–9
manipulation (design tools) 196–7
primary 5, 155–7
processing data to create solutions 70–3
qualitative 4, 155–7
quality of 9–11
quantitative 3–4, 155–7
reasonableness 159
redundancy 302
sample size 10
secondary 5, 155, 157–8
security practices 123–4
sharing (networks) 125
sources 5–9, 264–7, 308–9
structures 269–71
test (problem-solving) 200
transmission cost 161
transmission speed 161
data analysis 2–25, 263–92
Australian privacy principles 22–4
design tools 66–8, 279–80
ethical dilemmas 24–5
file formats 288–9
formats and conventions 56–66, 281–2
gathering data 5–9
graphic solutions 42–51
graphic solutions, design principles 51–6
physical security controls 20–2
and privacy 19
problem solving 31–42
process data to create solutions 70–3
referencing primary sources 11–14
and research 3–4
seeking permission 15–18
software tools and functions 282–7
sources 5–9, 264–7
types of tests 68–70
validation 70
- data collection
quality 9–11
seeking permission 15–18
techniques and methods 5–7
timing 10
tools 310–12
data dictionaries 229–31, 302, 312–13
data management 300–35
accidental and deliberate security threats 116–17, 332
communication devices 331
hardware components 329–30
physical and software security 333–5
data structure diagrams 231
data structures 269–77
data types 225–6, 269–77, 309
array 270
Boolean 270, 308
characteristics 269, 307–8
common types 307
file 271
floating point (or decimal) 270, 307
integer 270, 307
record 270
string (or text) 270, 307
data validation (programming concepts) 241–2
data visualisations 263–4
charts 273
common types 272
definition 271
evaluating 289–92
flow 276
hierarchy 275–6
maps 274
matrix 276–7
networks 274
time series 275
types and purposes 271–7
data.gov.au 267
database design tools 312–20
and database structure 312–14
designing macros 320
designing queries 316–17
input forms to capture data 315–16
layout diagrams 312
naming conventions 312
reports for specific needs 318–19
database management systems (DBMSs) 301, 302–3, 307
benefits and risk 303
capabilities and features 302
development of 320–8
limitations 302
database software 284–5, 311
database structure 303–6
fields, records and tables 303–4
input forms 304
macros 306

- queries 305
- reports 306
- database systems 301–2
- date (data format) 308
- debugger 223
- debugging (programming concepts) 244–8
 - desk check 246–8
 - logical errors 245
 - runtime errors 246
 - syntax errors 245
- dedicated servers 84
- default action 239
- default values 239
- deliberate threats (network security) 117
- design
 - problem-solving methodology xii
 - website 171–6
- design principles for graphic solutions 52–6, 181–94
 - accessibility 52–3, 184–7, 207
 - alignment 188–9
 - appearance 53–6, 187–94
 - balance 193–4
 - contrast 189–92
 - flowchart 182
 - functionality 52–3, 182–7
 - orientation 194–5
 - proportion 194
 - repetition 189
 - space 192–3
 - specific considerations 194–5
 - usability 52, 182–4, 207
- design tools (graphic solutions) 66–8, 195–204
 - appearance 198–204
 - functionality 195–8
- design tools (problem-solving methodology)
 - 66–8, 279–81
- designing solutions and output 33–4
- designing websites 171–6
 - mobile devices 172–6
 - principles 181–94
 - specific considerations 194–5
 - tools 195–205
- designs, network physical 121–2
- desk check 246–8
- developing websites 205–7
- development (problem-solving methodology) xii
- diagrams
 - graphic solutions 45–6
 - network 121–2
- differential backup 20
- digital information systems 146
- digital signal 81
- disclosure (information architecture) 177–8
- domain name server (DNS) 98
- downlink 116
- dummy data 206
- Earth-based station 115–16
- e-commerce 148–9
- editor 223, 224
- electrical protection 334
- electronic funds transfer (EFT) 125
- electronic health records (EHR) 151
- electronic validation (graphic solutions) 68, 70
- email 99
- encryption 20, 334–5
- entertainment and information systems 140–4
- Ethernet 101–2
- ethical dilemmas
 - data analysis 24–5
 - information systems 142–4
 - programming 255
- ethical responsibilities (networks) 122–6
- evaluation (problem-solving methodology) xii
- existence checking 309
- Facebook 146
- fibre-optic cable 111
- file data structure 271
- file formats (data analysis) 288–9
- file naming 201–1
- file transfer protocol (FTP) 99
- files and records (programming concepts) 252–3
- finance and information systems 148–51
- firewalls 21–2, 120
- first-in first-out (FIFO) 252
- first-in last-out (FILO) 252
- floating point (or decimal) (data type) 270
- flow visualisations 276
- flowcharts (graphic solutions) 45, 196–7, 280–1
- focus groups 7
- font selection (website design) 174, 189
- footnotes 12
- formal testing 248
- formats
 - data 2
 - design principles for graphic solutions 56–65, 281–2
- forums 146, 153
- full backup 20
- functional requirements (problem-solving methodology) 277
- functionality (design principles for graphic solutions) 52–3, 196–8
- functionality testing (graphic solutions) 69
- games consoles 108–9
- Gantt charts 170–1
- garbage-in equals garbage-out (GIGO) 303
- geospatial visualisations 274
- GIS file formats 289
- global positioning system (GPS) 106–7
- Google 286–7

- graphic solutions
annotated diagrams 66, 67–8, 198–9
appearance 198–204
audio file 203
contrast 53–4, 62–5
definition 43
design principles for 52–6
design tools 66–8, 195–204
flowcharts 45, 196–7
images 46, 200–3
layout designs 198–9
and processing data 70–3
purpose of 42–52
site map development 197
sources of data and legend 60–1
storyboards 197–8
test data 200
testing 68, 206–7
types of 43–51
types of tests 68–70
validation 68, 70, 206
video file 203
- graphic user interface (GUI) 224
controls and structures 253–4
- graphics processor unit (GPU) 220
- groupware 171
- growth (information architecture) 179
- hacker 117
- hand-held data-collection devices 106
- hard disk drive (HHD) 219, 220
- hardware
communication 221
components for data management 329–30
processing 220
and programming 219–21
sharing (networks) 125
storage 220–1
- Harvard referencing style 158
- hashing 334
- health and information systems 151–2
- Health Records Act 2001* (Vic) 151–2
- hierarchies (graphic solutions) 46
- hierarchy visualisations 275–6
- histograms 157
- home networks 83–4
- HTML 82
- HTTPS 334
- Hungarian notation 230
- hyperlinks 205
- hypertext transfer protocol (http) 98
- hypertext transfer protocol secured (https)–9 98
- hypothesis 3
- identity theft 149–50
- image editing 205
- images (graphic solutions) 46, 200–3
- incremental backup 20
- index page 202
- infographics (graphic solutions) 47–51
- information 4–5
quality of 9–11
- information architecture 177–80
choices 179–80
classification 178
disclosure 177–8
growth 179
navigation 178–9
- information needs 263–4
- information systems 140–61
in action 140–52
acquiring data, methods and techniques 155–8
agriculture 147–8
data integrity 158–9
digital 146
definition 140
and entertainment 140–4
expressing opinions 153–4
and finance 148–51
forums and bulletin boards 153
and health 151–2
mobile devices 160–1
primary data collection methods 155–8
in programming 219
rating systems 153–4
secondary sources 157–8
social media 153
storing shared file 159–60
and sport 145–7
web design 160–1
- informed consent 15
- input devices 219, 329
- input forms 304, 315–16, 320
- input–process–output (IPO) charts 66–7, 196, 231–2, 280
- integer (data type) 270, 307
- Integrated Development Environment (IDE) 224
- integration testing 248
- integrity of data 151, 158–9, 267–9
- interface mock-up 234
- interfaces, user 309–12
- interfaces, creating effective user 235–9
accessibility 236
affordance 236
consistency 239
legibility 238
structure 237
tolerance 239–40
useability 235–6
visibility 237–8

- internal documentation (programming concepts) 242
- internet peer-to-peer networks (P2P) 86
- internet service software 98
- internet services 98–100
 - cloud storage 100
 - email 99
 - file transfer protocol (FTP) 99
 - voice over Internet Protocol (VoIP) 100
 - web browsers 98–9
- interviews 7, 11–12, 155
- intranets 82–3
- IP addresses 103
- Kaluganga Junior Swimming Club (case study) 311–12, 313–14, 315–16, 317–18, 319–20, 321–8, 331, 335
- key concepts xiv
- keylogger 118
- languages, compiled and interpreted (programming concepts) 240
- last-in first-out (LIFO) 252
- layout designs 199–200
- layout diagram
 - database design tools 312
 - problem-solving methodology 279–80
- leecher 88
- legal responsibilities (networks) 122–3
- legibility
 - user interface 238
 - website design 174
- linear search 255
- lines (graphic solutions) 59–60
- linker 223
- local area networks (LAN) 82, 85, 90–1
- logic (programming concepts) 244
- logic bombs 118
- logical errors 245
- loops (programming concepts) 242–4
- macros 32, 306, 320, 321
- malware 117
- malware protection 22
- manipulation (graphic solutions) 205–6
- manual validation (graphic solutions) 70
- map-based visualisations 274
- maps (graphic solutions) 47
- matrix visualisations 276–7
- Mbps 90
- media data types 226
- meta tags 205
- metadata 302
- microwaves 115
- microwave station 115
- mobile devices
 - accessibility 173–4
 - affordance 176
 - connected to networks 104–9
 - consistency 176
 - definition 104
 - games consoles 108–9
 - hand-held data-collection devices 106
 - and information systems 160–1
 - interface design 172–3
 - legibility 174
 - navigation systems 105–6
 - network-attached storage device 109
 - read tap asymmetry 173
 - smartphones 105
 - tablets 104–5
 - tolerance 174
 - touch zone 173
 - useability 173
 - visibility 175
 - wearable technology 107–8
- mobile phone 114
- mock-up 234
- modular programming 240–1
- National Broadband Network (NBN) 111–12, 168
 - devices 92–3
- navigation (information architecture) 178–9
- navigation systems 105–6
- near field communication (NFC) 113–14
- network administrator 85
- network analysis tools 97–8
- network communications standards 101–4
 - 802.11 standard 103–4
 - Ethernet 101
 - sending and receiving devices 104
 - TCP/IP 102–3
- network diagrams 121–2
- network interface cards (NIC) 93–4
- network operating system 96–7
- network protocol 101
- network security 116–21
 - accidental threats 116–17
 - deliberate threats 117–18
 - event-based threats 118
 - firewalls 120
 - measures 118–21
 - passwords 21, 119–20, 334
 - security threats 116–18
 - uninterruptible power supplies 120–1
 - usernames 21, 119–20, 334
 - wireless security 121
- network visualisations 274
- network-attached storage device (NAS) 109, 220, 221
- network(s) 81–125
 - architecture 82, 84–90

- benefits 124–5
client-server networks 84–5
communications channel 109–11
communications devices 81, 90–6
communications software 96–8
definition 81
ethical responsibilities 122–6
home networks 83–4
internet peer-to-peer networks (P2P) 86
internet services 98–100
intranets 82–3
legal responsibilities 122–6
local area networks (LAN) 82, 85
and mobile devices 104–9
National Broadband Network (NBN) 111–12
network communications standards 101–4
peer-to-peer networks (P2P) 85–6
personal security strategies 124
physical designs 121–2
risks 124, 126
responsibilities of users 124
security 116–18, 332
security measures 118–21
security practices 123–4
social 126
types of 82–4
users, responsibilities of 124
virtual private networks (VPN) 86–90
wide area networks (WAN) 84
wireless transmission media 112–16
networking software 86
node 82
non-functional requirements (problem-solving methodology) 277
non-technical constraints (problem-solving methodology) 278
numeric (data format) 270, 307
- object description 232
object naming 230
observations 9, 12, 155
one-dimensional (1D) array 251
open-ended questions 8
OpenHeatMap 287
operating system (OS) 222
orientation (website design) 194–5
output devices 219, 331
- P2P downloads: torrents 87–9
participation information statements 16–18
passwords 21, 119–20, 334
peer-to-peer networks (P2P) 85–6, 141
peers 88
permission, seeking 15–18
personal digital assistants (PDAs) 104
personal information, use and disclosure of 24
- phishing 118, 150
physical security controls (data) 20–2
physical transmission media 109, 110–11
platform 224
ports 221
presentation testing (graphic solutions) 68–9
primary data 5, 155–7
primary data sources 264
primary key 304
primary storage 220
privacy 19
Australian principles 22–4
Privacy Act 1988 (Cth) 22–3
Privacy and Data Protection Act 2014 (Cth) 22
problem analysis 32–3
problem solving
approaches to 31–42, 168
design principles 181–94
design tools 195–204
design websites 171–6
designing solutions and output 33–42
developing websites 205–7
four stages of 31
functions of a spreadsheet 31–2
information architecture 177–80
project management techniques 168–71
specific design consideration 194–5
team solutions 168
- problem-solving methodology (PSM) xii–xiii, 31, 196, 205–7, 219, 263
analysis 277–9
design tools 66–8, 279–81
evaluation criteria 289–91
evaluation report 291–2
evaluation strategy 291
evaluating data visualisations 289–92
formats and conventions 56–66, 281–2
graphic solutions 42–51
graphic solutions, design principles 51–6
presentation 207
problem solving 31–42
process data to create solutions 70–3
scope of solution 278–9
software development 228–35
solution constraints 278
solution requirements 277
types of tests 68–70
validation 70
- process testing (programming concepts) 248–9
processing hardware 220
programming 218–55
creating effective user interfaces 235–9
developing software 228–39
hardware 219–21
information systems 219
modular 240–1

- operating system 222
- and scripting languages 222–3
- software 222
- software development tools 223–5
- storage structures 225–8
- programming, fundamental concepts 240–55
 - arrays 250–2
 - compiled and interpreted languages 240
 - data validation 241–2
 - debugging 244–8
 - files and records 252–3
 - GUI controls and structures 253–4
 - internal documentation 242
 - logic 244
 - loops 242–4
 - modular 240–1
 - process testing 248–9
 - queues 252
 - and scripting languages 222–3
 - searching 255
 - stacks 252
- programming languages 285–6
- project management
 - definition 168
 - techniques 168–71
 - tools 170
- project table 170
- proportion (website design) 194
- protocol 87, 101
- prototypes 223
- pseudocode 232–4
 - rules of 233–4
- public key encryption 233
- qualitative data 4, 156–7
- quality control (project management) 169
- quantitative data 3–4, 156–7
- queries 305, 316–18, 321
- query criteria 317
- questionnaires 5, 7, 12
- questions
 - closed 7
 - graphic solutions 70
 - open-ended 8
- queues (programming concepts) 252
- RAID (redundant array of inexpensive disks) 330
- random-access memory (RAM) 220
- random files 253
- ratings systems 153–4
- read tap asymmetry (mobile devices) 173
- receiving device 81
- record (data type) 270
- reduced instruction set computing (RISC) 220
- redundant array of inexpensive disks (RAID) 330
- referencing
 - examples 12–14
 - primary sources 11–14
- relevance of data 9
- relevance of primary data 269
- relevance testing (graphic solutions) 69
- reliability 11
- reliability testing (graphic solutions) 68
- repetition (design principles for graphic solutions) 53
- reports (data management) 306, 318–19, 321
- research
 - types of 3–4
 - understanding 3–4
- resolution 227
- retrieval 206
- routers 90–1
- runtime errors 246
- salt value 334
- sample size 10
- screen resolution (mobile devices) 161
- scripting languages and programming 222–3
- searching (programming concepts) 255
- secondary data 5, 155, 157–8
- secondary data sources 264–5
- secondary storage 220–1
- security (networks) 116–18
 - breaches 126
 - measures 118–21
 - personal strategies 124
 - physical and software 333–5
 - practices 123–4
 - system software 334
- seeds 88
- sending and receiving devices 104
- sending device 81
- sequential files 252
- shapes (graphic solutions) 58
- skeuomorphism 176
- smartphones 105
- social media 153–4
- social networks 126–7
- software 222
 - database 284–5, 311
 - spreadsheet 286–7
- software development 228–35
 - data dictionaries 229–31
 - data structure diagrams 231
 - functional requirements 228
 - input–process–output (IPO) charts 231–2
 - interface mock-up 234–40
 - non-functional requirements 228–9
 - object description 232
 - pseudocode 232–4

- PSM stage: analysis 228–9
PSM stage: design 229–35
tools 223–5
software tools and functions (data analysis) 282–7
database software 284–5
extracting data 282–6
Google 286
OpenHeatMap 287
programming languages 285–6
spreadsheet software 286–7
Tableau Public 287
solid state drives (SSD) 220
solution constraints (problem-solving methodology) 278
solution requirements (problem-solving methodology) 277
source code 223
sources (data analysis) 5–9
sources of data and legend (graphic solutions) 60–1
sound editing 205
space (design principles for graphic solutions) 54–5, 190–2
sport and information systems 145–6
spreadsheet functions 31–2
spreadsheet software 286–7
storage devices (data management) 330
structure query language (SQL) 302
spyware 117
stacks (programming concepts) 252
stakeholders 5, 140, 141–2, 146–7, 148, 150–1, 152
storage 205, 220–1
storage hardware 220–1
storage structures 225–8
 data types 225–6
 definition 225
storing shared file 159–60
storyboards 197–8, 280
streaming 141
string (or text) (data type) 270, 307
Structure English 232
surveys 7, 156
switches 90
syntax errors 245
system security software 334
system testing 248
- Tableau Public 287
tablets 104–5
tagging 205
TCP/IP (transmission control protocol/internet protocol) 102–3
team solutions (problem solving) 168
technical constraints (problem-solving methodology) 278
test data 200, 248
testing
 graphic solutions 68, 206–7
 process 248–9
 tables 249
text (data type) 270, 307
text editing 205
text styles (graphic solutions) 57
time visualisations 275
timelines (graphic solutions) 47
titles (graphic solutions) 56–7
tolerance
 user interface 238–9
 website design 174
top-driven loops 243
torrents 87–9
transmission media 109
 physical 109, 110–11
 wireless 109, 112–16
trojans 118
twisted-pair cables 110
twisted-pair wire 110
typography 174
- uncounted loops 243
unencrypted data 20
uninterruptible power supplies 120–1
universal serial bus (USB) 221
uplink 116
user interphase (UI) 177
user interfaces, creating effective 235–9
 accessibility 236
 affordance 236
 consistency 239
 legibility 238
 structure 237
 tolerance 239–40
 useability 235–6
 visibility 237–8
user interfaces for data entry 309–12
useability (design principles for graphic solutions) 52, 182–4, 207, 235–6
usernames 21, 119–20, 334
- validation (graphic solutions) 68, 70, 206
validation testing 248
variables 11, 43
version control 171
vested interest 10
Victorian government data directory 265–6
video file 203
virtual private networks (VPN) 86–90
virus 117
visibility
 mobile devices 175
 user interface 237–8
visualisations *see* data visualisations
voice over Internet Protocol (VoIP) 100

- wearable technology 107–8
- web browsers 98–9
- web design and information systems 160–1
- web server 82
- web-authorising software 196
- webpage storyboards 197–8
- websites, designing 171–6
 - mobile devices 172–6
 - principles 181–94
 - proportion 194
 - specific considerations 194–5
 - tools 195–205
- websites, developing 205–7
 - manipulation 205–6
 - testing 206–7
 - validation 206
- white space 54
- wide area networks (WAN) 84, 90
- wi-fi 103
- wi-fi communication 112–13
- wi-fi protected access (WPA or WPA2) 121
- wireless access point 94
- wireless adaptors 93–4
- wireless broadband routers 92
- wireless extender 95–6
- wireless network technologies 95–6
- wireless security 121
- wireless transmission media 109, 112–16
- WMS file formats 288
- wordclouds 156
- World Wide Web Consortium (WC3) 173
- worms 117
- XLM/ELMS file formats 288

