
Index

- AAC codec, 219
- access charges, 289
- Access (software company), 156, 168
- Acclaim, 125
- Acohido, Byron, 241
- Activision, 116, 124, 141, 143
- add-ons, third-party, 310
- Adobe Acrobat, 198–199
- Adobe Flash, 48–49, 199, 224, 225, 227, 236, 237, 323
- Adobe PostScript, 309
- Adobe Premiere, 307
- ADR. *See* Applied Data Research (ADR)
- advertising
 - early, 348
 - on Google, 358–359, 361–362
 - multihoming in, 67–69
 - revenue in, 58–59
- AdWords, 359, 361
- Afuah, Allan, 17
- aggregation of demand, 53, 321
- airline industry, 278, 312
- Alcatel, 191
- Allard, J, 133
- Allen, Paul, 86
- Allen, Roy A., 94
- Altair, 82
- Altair 8800, 86, 87
- AltaVista, 356
- Amazon, 343
- Am386 chip, 103
- American Express, 67, 346
- America Online, 158, 335
- Analytical Engine, 19
- Andrews, Paul, 102
- Annund, Pamela, 200
- antitrust, 108, 126
- AOL. *See* America Online
- Apache Web server, 72, 109
- APIs. *See* application programming interfaces (APIs)
- Apple. *See also* iPod; iTunes; QuickTime
 - bundling by, 106–107
 - early microcomputers, 9, 82
 - early operating systems, 88–89
 - emergence of, 93–94
 - evangelization by, 98–99
 - features added by, 307
 - hardware, 101–102
 - iTunes, 6
 - killer apps, 97–98
 - marginal costs, 294
 - matchmaking by, 57–58
 - multimedia extensions, 220–221
 - printers, 102
 - third-party hardware and, 95, 101–102
 - two-sided platforms and, 95–97
 - USB ports, 267–268
 - vs. Microsoft, 95–109, 294
- Apple Developer Connection, 100
- Apple DOS, 86
- Apple II, 86, 97, 102
- AppleShare, 307

- application programming interfaces
 - (APIs), 27–30
 - for eBay, 353–355
 - for Google, 359–361
 - importance of, 43
 - Macintosh, 101
 - PalmPilot, 169
 - in video game consoles, 145–146, 149
 - in Windows, 32, 100–101
- Applied Data Research (ADR), 83
- Armstrong, Mark, 299
- Arthur, Brian, 61–62, 63
- Ashton-Tate dBase, 265
- assembly language, 21
- Atari, 82, 88, 116, 119, 120, 121, 124
- Atari VCS, 89, 152, 260
- ATM machines, 4, 10, 174
- AT&T, 82, 85, 115, 187, 271
- auctions, 348. *See also* eBay
- audience building, 57
- audio, streaming, 219–220, 222, 231–232
- Audiovox, 192
- Autoflow, 82, 83
- automobiles, 10–11, 174, 312, 314–315, 316, 321–322, 340–341
- Babbage, Charles, 18–19
- BackRub, 357
- Bacon, Nathaniel, 253
- Baer, Ralph, 116, 118
- Bakos, Yannis, 53, 320
- balance, pricing and, 279–281
- Baldwin, Carliss Y., 23, 252
- Barney, Doug, 94
- baseball, 292
- BASIC, 22, 86–87
- batch operating systems, 25–26
- Battelle, John, 45, 355
- Battletoads, 264
- Baxter, William, 55
- B2B exchanges. *See* business-to-business (B2B) exchanges
- Beatles, The, 52
- Bell Labs, 184, 187
- Benjamin, Blech, 81
- Berniker, Mark, 64, 221
- Bernoulli numbers, 19
- Berry, Steven, 322
- Beyard, Michael D., 323
- Bialik, Carl, 238
- binary, 21
- BIOS, 91–92, 92
- Bishop, Todd, 328
- BlackBerry, 40, 156, 176–178, 179, 180, 181
- BlackBerry Enterprise Server software, 177
- Bluetooth, 101, 175, 307, 309
- board games, 337
- Bolt, Wiko, 281, 299
- Bondreau, Kevin, 252, 258
- Borland, John, 241
- Boyd-Merritt, Rick, 160
- Bozman, Jean, 101
- Brandenburger, Adam, 131
- Bricklin, Dan, 97, 98
- Brin, Sergey, 356, 357
- broadband connections, 326–328
- Brooks, Frederick P., 23
- browsers
 - addition of, to various platforms, 308
 - Internet Explorer, 32, 310
 - Netscape, 64–65, 106
 - Opera, 198
 - Safari, 332
 - Watson, 310
- Brynjolfsson, Eric, 53, 320
- bulk discounts, 278
- bundling, 51–53, 324–334
 - by Apple, 106–107
 - convergence and, 334–336
 - cost and, 316–318
 - of customers, 322
 - demand aggregation and, 321–322
 - economics of, 312–313
 - for externalities, 323
 - extremes and, 330–331

- innovation through, 332–334
- Mac OS X Tiger and, 332–334
- by Microsoft, 106–107, 328
- in multisided platforms, 322–323
- negatives, 323
- of noncomplementary components, 319–320
- in PDAs, 178–179
- product lines and, 313–314
- technology and, 324–328
- Bungie (video game company), 264
- Burden, Kevin, 10, 157, 166, 175, 176, 179, 190, 194, 243
- Burns, George, 337
- Bushnell, Nolan, 116, 118–119
- business-to-business (B2B) exchanges, 63–64
- Butter, Andrea, 158
- byte code files, 25

- C (programming language), 24
- Caillaud, Bernard, 281
- Campbell-Kelly, Martin, 84, 85, 88, 89, 90, 92, 96, 105, 125, 126
- Canada, broadband service in, 328
- Caney, Derek, 238
- Canter, David, 264
- capitalization, market, 341–342
- Carbon (Macintosh API), 101
- Carlton, Jim, 46, 277
- cars, 10–11, 174, 312, 314–315, 316, 321–322, 340–341
- Case, Karl, 247
- Casio, 158, 173
- Cavanagh, Gerald, 291, 298
- CBS Records, 267
- CDDL. *See* Common Development and Distribution License
- CDMA mobile phone transmission standard, 191
- CD-ROMs, 103, 129, 130, 327
- cellular technology, 187. *See also* mobile phones
- Cerf, Vinton, 99
- certificates, programming, 12–13

- Channel F (video game system), 121, 260
- Charney, Ben, 192
- Chavreau, Jonathan, 96
- checks, 344
- chicken and egg problem, 262–263, 266
- China Mobile, 190
- China Unicom, 190
- Chinese postal service, 74
- c-HTML, 204
- Church, Jeffrey, 63
- Cicero, Marcus Tullius, 245
- Cingular, 190, 191
- circuits, invention of, 7
- Clark, Kim B., 23, 252
- class libraries, in Java, 35
- closed vs. open software platforms, 12–13
- Coase, Ronald, 250
- COBOL, 22, 82, 83
- Cocoa (Macintosh API), 101
- code
 - copyrighting of, 48–49
 - for eBay, 350
 - growth of, 303–305
 - hardware and, 305
 - malleability of, 46, 52, 338
 - in operating systems, 35
 - protection of, 48
 - purpose of, 1–2
 - safeguarding of, 4
 - useless stretches of, 6
- code-cracking, 19
- codecs, 217–218, 239, 267
- Cohen, Adam, 349, 350
- coins, 345, 348
- Coleco, 88, 125
- Colligan, Ed, 174
- Columbia Records, 267
- commercial vs. open-source, 72–74
- Commodore PET, 86
- Commodore 64, 128
- Common Development and Distribution License, 75

- Communicator (early mobile phone), 184, 193, 194
- Compaq, 92, 173
- compilers, 21
- complementarity, 47–48
- complementors, in platform ecosystems, 246–247, 253–254, 262–263
- complexity, of products, 315
- components selling, 313–314
- computer(s)
- early, 7, 25
 - growth of industry, 9–11
 - history of, 18–21
 - integration patterns with, 259–260
 - Microsoft and manufacturers of, 103–104
 - pricing of, 8
 - video games on, 128–129, 147–150
- Computer Associates, 110
- Computer Sciences Corporation, 83
- Computer Space, 119
- connections, broadband, 326–328
- Consumer Electronics Show, 145
- contactless readers, 347
- content, in platform ecosystems, 249
- convergence, 334–336
- copyleft, 74
- copyright
- of code, 48–49
 - digital music and, 218–219
 - Red Hat and, 78–79
 - ringtones and, 197–198
- cost
- bundling and, 317–318
 - demand and, 317
 - marginal, 294, 315
 - minimizing, 315–318
 - pricing and, 277
 - transactions, 250–252, 279–280, 281, 343–349
- Coughlan, Peter, 129, 130, 149, 296, 298
- CP/M (operating system), 87–88
- “cream skimming,” 277
- creative destruction, 338
- Creative Labs, 271
- credit, 344
- credit cards, 56, 279–280, 344, 346–348
- Crouch, Cameron, 306
- Crum, Rex, 9
- Cusumano, Michael A., 37, 45, 65, 90, 163, 168, 170, 174, 253
- Cuthbertson, Ian, 308
- Daly, James, 160
- Danesi, Marcel, 344
- Davis, Donald, 346
- Davis, Steven J., 325, 326
- Dearing, Michael, 350
- debit cards, 1, 11
- debugging, 36, 37–38, 73
- degree programs, in computer science, 45
- Dell, 137, 175, 253, 268
- Dell, Michael, 273
- demand
- aggregating, 53, 321
 - exploiting, 318–322
 - features and, 319
 - price and, 276, 316–317
 - variety in, 319–321
- demand aggregation, 53
- Demaria, Rusel, 118, 120, 121
- Department of Defense, 160
- design, product, 313–323
- destruction, creative, 338
- Developer Relations Group, 82, 99
- development costs, 48–49, 50–51
- Difference Engine (early computer), 18–19
- digital convergence, 334–336
- Digital Equipment Corporation (DEC), 85, 92, 356
- digital media, 218–225. *See also* music devices
- Digital Research, 88, 90
- digital rights management, 218, 219, 224, 238, 239–242
- digital video recorder, 339

- Dillon, Pat, 160, 161, 162
 Diners Club, 56, 64, 344
 Dipert, Brian, 215
 DirectX, 149
 discounts, volume, 278
 discrimination, price, 60–61, 277, 284–285, 290–293
 disintegration, 261–262, 263–265
 distribution costs, 47
 DoCoMo, 168, 189–192, 202–208, 211
 billing system, 295, 347–348
 innovation by, 255
 in platform ecosystem, 248, 263
 software, 287–288
 Dodge minivans, 316
 Donlay, Chris, 350
 DOS
 Apple, 86
 MS, 92
 PC, 90
 Q, 90
 on TRS80, 86
 Dreamcast, 131, 140, 174
 Dreamweaver, 48–49
 DRM. *See* digital rights management
 DSL (direct service line), 326–327
 Duncan, Ray, 89, 90
 Dvorak, John C., 94
 DVR. *See* digital video recorder
 eBay, 14, 66, 284, 349–355
 eBay Developers Program, 353–354
 Ebell, Mark H., 160
 economics. *See also* pricing
 of bundling, 312–313
 of Haigu, 299
 history, 344–345
 information as commodity, 44
 intellectual property and, 48–49
 of multisided platforms, 54–70
 network effects and, 61–62
 scale and, 49–50
 scope and, 52–53
 of software industry, 5
 software platforms and, 2, 3, 48–53
 ecosystems, platform
 applications in, 248–249
 competition and, 253, 273
 complementors in, 246–247, 253–254
 content in, 249
 developers and, 263–264
 disintegration in, 261–262
 end users in, 246
 hardware in, 247–248, 267–273
 innovation and, 252
 integration in, 250–255, 259–262
 leadership and, 254–255
 for mobile phones, 186, 247–248
 multisidedness and, 252–255
 peripheral equipment and, 248, 267–273
 transactions costs in, 250–252
 for video games/consoles, 147
 educated nature, of programmers, 45
 Electronic Arts, 128, 141–142, 143, 149, 284, 292
 Electronic Entertainment Expo, 145
 email, 176–178, 308
 emerging markets
 media players in, 243
 mobile phones in, 189–190
 Emotion Engine, 271
 Enea, 340
 ENIAC (early computer), 7, 20
 Enigma code, 19
 enterprise software, 341
 entry strategies, pricing and, 281–282
 Ericsson, 184, 194, 195, 199
 Estabrooks, Maurice F., 93
 European Commission, 311
 EvangeList, 99
 evangelization, 94, 98–100, 206–208, 263
 Evans, David, 11, 51, 52, 109, 308, 315, 325, 344, 347
 Evans, James, 74
 Everquest, 284

- Excel, 96, 98, 249, 266
- exclusion, 285–288
- expense accounts, 67
- Extended Systems, 309
- externalities, bundling for, 323

- Fair, Ray, 247
- Fairchild Camera, 121
- FairPlay, 240, 241
- Faith Inc., 197
- Famicom, 125, 150, 151
- Family Computer Communications
 - Network, 150, 151
- fax machines, 338
- feature accretion, 305–311, 328–332
- Fedora Project, 78
- FeliCa chip, 347
- FiloFax, 155
- financial innovations, in history,
 - 344–345
- Flash, 48–49, 199, 224, 225, 227,
 - 236, 237, 323
- flash memory, 326
- Flynn, David, 308
- font technology, 82, 106, 309–310
- Ford Taurus, 314
- formula, product line, 314
- FORTRAN, 22, 82, 83
 - 486 chip, 51
- France
 - broadband service in, 328
 - debit cards in, 1, 11
- Franklin, 92
- Free Software Foundation, 33, 75
- Freiberger, Paul, 8, 102
- Fried, Ian, 164, 241
- Friedman, Jon, 67
- Friedman, Milton, 276
- Fujitsu, 192, 199, 208

- Gagnon, Gabrielle, 221
- Gallo, Jennifer, 157
- Game Boy, 127
- GameCube, 131, 134, 138, 140, 143,
 - 144
- Gandal, Neil, 63

- Ganesh, Venkatesh, 49
- Garfield, Eugene, 356
- Garrity, Brian, 238
- Gasch, Arthur, 175
- Gassée, Jean-Louis, 82, 96
- Gates, Bill, 2–3, 22, 32, 82, 85, 86,
 - 96, 215, 249, 262. *See also*
 - Microsoft; Windows
- Gateway Computers, 175
- Gawer, Annabelle, 65, 163, 168, 170,
 - 174, 253
- Gee, Laura, 200
- General Instruments, 120
- General Public License, 74–76, 78
- George, Lisa, 59
- GeoWorks, 158, 193
- Germany, broadband service in, 328
- Gihás, Anthony N., 132
- Gillen, Al, 71, 77, 84, 330
- Gillen, Marilyn, 221
- Giusto, Randy, 10, 157, 166, 175,
 - 176, 179, 190, 194, 243
- Glaser, Rob, 213, 226, 230, 233
- global positioning system (GPS), in
 - cars, 340
- Goldeneye 007, 264
- Golvin, Charles S., 189–190
- Google, 14, 99, 108, 355–363
 - advertising on, 358–359,
 - 361–362
 - APIs in, 359–361
 - employment, 45
 - evolution of, 356–358
 - licensing of, 357–358
 - linking and, 356–357
 - Linux and, 70–71, 266
 - results page, 358
 - sponsored links, 359
- Google AdWords, 359, 361
- Google Desktop, 360
- Google Maps, 361
- GPL. *See* General Public License
- GPS system, in cars, 340
- Graffiti (handwriting recognition
 - system), 65, 162, 163
- Grant, Helen, 92

- graphics processor, in PlayStation, 271
- Grau, Jeffrey, 242, 243
- Graven, Matthew P., 238
- GriD, 158
- GriDPad, 158
- GSM mobile phone transmission standard, 191
- Hagiu, Andrei, 280, 282, 299
- Halfhill, Tom R., 159
- Halo, 135, 264
- Halo 2, 117
- ham sandwiches, 328
- handheld devices, 9–10
- handset subsidies, 295
- Handspring, 156, 166, 177, 255
- handwriting recognition, 65, 158–159, 161–162, 163
- Hannerman, Paul, 341
- Hansell, Sail, 66
- hard disks, 324, 326
- hardware
 - advances in, 8
 - code and, 305
 - evolution of, 20
 - feature accretion and, 329
 - IBM's mistakes over, 91–92
 - integration and, 267–273
 - licensing, 272
 - by Microsoft, 102
 - Microsoft and, 268–269
 - peripheral, 248
 - piracy, 285–286
 - in platform ecosystems, 247–248, 267–273
 - production of, 84
 - third-party, Apple and, 95, 101–102
- Harper, Stephen C., 58
- Haight, Jeb, 264
- Hawkins, Jeff, 156, 158, 159, 162, 163, 164
- Hawkins, Trip, 115, 116, 128, 141, 271
- Hayes, Frank, 25
- Heiman, Richard V., 5, 84
- Heinlein, Robert, 275
- Hendley, Andrew, 297
- Heng, Mary, 160
- Hennessy, John L., 8
- Herman, Leonard, 125, 296
- Herodotus, 348
- Hesseldahl, Arik, 297
- Hevorhian, Susan, 10
- Hewlett Packard, 110, 173
- Holden, Reed K., 122
- Hollywood model, 142
- Holt, Adam, 297
- Honda Accord, 314
- Hopper, Admiral Grace, 7
- House, Jill, 155, 173
- House of Blues, 221
- HTML, for mobile phones, 204
- HTTP, for mobile phones, 204
- Huba, Jackie, 99
- Hudson, Sally, 5
- Hwang, Diana, 155, 163, 173
- Hypertext Transfer Protocol, for mobile phones, 204
- IBM, 9, 73–74, 77, 82, 89–94, 101, 193
- IBM compatibles, 92–93
- IBM OS/360, 26
- IBM PC, 82, 86
- IBM System/360, 7, 26, 83
- Ichbiah, Daniel, 90
- I-mode, 202–209, 248, 289–290, 292–293, 294–295
- incentives, for open-source software, 76–77
- India
 - outsourcing to, 84
 - software pirating in, 48–49
- indirect network externalities, 61
- Industrial Revolution, 338, 363
- inexhaustibility, 47
- Informatics, 82, 83
- Inoue, Takuya, 326
- integration, in platform ecosystems, 250–255, 259–262

- Intel, 103
- Intel 4004, 7
- Intel 8080, 86, 87–88
- intellectual property protection, 44, 48–49, 71, 74–76
- intensity of use, 288–290
- Internet. *See also* email; media players
 - added to various platforms, 308
 - broadband connections, 326–328
 - Java and, 34
 - media content on, 221–222
 - on mobile phones, 189, 202–209
 - revolutionary nature of, 363
 - software platform growth and, 5–6
- Internet Explorer, 32, 310
- Intuit, 158
- investment recovery, 50–51
- iPod, 215. *See also* Apple; Macintosh
 - debut of, 214
 - digital rights management, 241
 - dominance of, 213
 - Macintosh sales and, 108
 - mini, 9
 - as pure merchant model, 257
 - RealPlayer and, 238
- Irving, Julius, 142
- ISMAI, 88
- Italy, broadband service in, 328
- iTunes, 49, 218–219, 224
 - codec, 217
 - debut of, 229
 - digital rights management, 240
 - as pure merchant model, 257
 - RealPlayer and, 238
 - revenue from, 227
- Jacquard, Joseph, 18
- Jaffray, Piper, 143
- Japan, mobile phones in, 185–186, 188, 202–203, 208–209. *See also* DoCoMo
- Java
 - class libraries in, 35
 - history of, 34
 - limitations of, 35
 - as object-oriented, 24–25
 - overview of, 34–35
 - Symbian and, 200
 - in Web-based gaming, 148
- Java 2 Micro Edition, 18
- Java Virtual Machine, 25, 31, 34–35
- JCL. *See* job control language (JCL)
- Jerome, Marty, 308
- job control language (JCL), 26
- Jobs, Steve, 2, 81, 86, 88, 102, 215, 262
- Johns, Amy, 213, 226
- Jullien, Bruno, 281
- JVC, 175
- Kantcheva, Milla, 77
- Karelia Software, 310
- Kato, Nanako, 291, 298
- Katz, Michael, 47, 272
- Kawamoto, Dawn, 166
- Kawasaki, Guy, 98–99
- Kent, Steven L., 118, 124, 125, 126, 127, 130, 132, 142, 271, 282
- kernels, 33–34, 38
- killer apps, 97–98, 126
- Kim, Soo-Kyoun, 326
- Kindall, Gary, 87
- King, Ada, 19
- King, Ben, 195
- Kingaard, Jan, 58
- Kitao, Gozo, 132
- Knepper, Susan L., 90
- Konami, 125, 143
- Krause, Reinhardt, 185
- Kurtzman, Joel, 62
- Kusnetzky, Dan, 71, 77, 84, 101, 330
- Kyocera, 166, 192
- LaserWriter, 102
- leadership, innovation and, 254–255
- Lefebvre, Alain, 205
- Lemmings, 264
- Lenovo, 199
- Lerner, Josh, 38, 76, 109

- Leuning, Erich, 233
 Levinsohn, James, 322
 Levitt, Mark, 92
 LG (computer manufacturer), 173, 192, 199
 licensing fees, 104, 292
 licensing hardware, 272
 Liebovitch, Allen M., 190, 243, 346
 Liebowitz, Stan, 63
 Liedtke, Michael, 58
 Lineage (online game), 284
 lines, product, 313–323
 linking, Google and, 356–357
 Linsalata, David, 10, 157, 166, 175, 176, 179, 190, 194, 198, 243
 Linux
 APIs in, 28–29
 bundling by, 107
 code growth, 304
 customer demographics, 111
 desktop penetration by, 111–112
 developer support with, 100
 development of, 38–39
 early, 82
 Google and, 70–71
 IBM and, 73–74, 77
 kernel, 33–34, 38
 mobile phone operating system, 195
 as open-source, 33
 overview of, 32–34
 as platform, 40
 popularity of, 110–111
 Red Hat operating system, 5, 34, 76, 77–79
 reproducibility of, 46
 rising of, 109–112
 specialization of, 266
 versioning of, 331–332
 as Windows threat, 110
 Linzmeyer, Owen, 96
 Llamas, Ramon T., 10, 157, 176, 179, 190, 194, 243
 Loral, 118
 Lotus 1-2-3, 98, 265
 lunchmeat, 328
 Lynch, Ian, 205
 MacCriskin, Jack, 325, 326
 machine language, 21, 23
 Macintosh. *See also* Apple; iPod
 early hardware insularity by, 102
 iPod and sales of, 108
 operating system, 5, 36, 101, 265, 304, 307, 311, 332–334
 Macklin, Ben, 242, 243
 Mac OS, 5, 36, 101, 265, 304, 307, 311, 332–334
 Macromedia Flash Player, 48–49, 199, 224, 225, 227, 236, 237, 323
 magazines, 68
 Magnavox, 116, 118
 mainframes, early, 81–83, 85
 Major League Baseball, 292
 mall analogy, 53
 malleability, of code, 46, 52, 338
 malls, 323
 Manes, Stephen, 102
 Mankiw, Gregory, 277
 manufacturing, vs. software
 production, 71
 maps, on Google, 361
 Marek, Sue, 195
 marginal costs, 294, 315
 Margolis, Stephen, 63
 Mario Bros., 67, 126
 Maritz, Paul, 100
 market capitalization, 341–342
 markets, emerging
 media players in, 243
 mobile phones in, 189–190
 Markey Development Program, 286–287
 Mark IV, 82, 83
 Markoff, John, 159
 marquee customers, 66
 massive multi-player online role-playing games (MMPORPGs), 147, 284–285

- matchmaking, 57–58
- Matsushita, 115
- Mattel, 125
- McConnel, Ben, 99
- McCool, Rob, 72
- McGuire, Mike, 160
- McKeehan, Julie, 169
- media players, 101
 - addition to platforms, 308
 - codecs and, 217–218, 239–240
 - digital rights management and, 239–242
 - in emerging markets, 243
 - features over time, 223–225
 - future of, 242–243
 - integration and, 266
 - Internet and, 242–243
 - interoperability, 234–235
 - multihoming among, 235–238
 - platform integration, 234–235
 - premium versions, 226
 - product differentiation among, 235–238
 - profit from, 225–234
 - as three-sided platforms, 222
- media revenue, 59
- Meehan, John, 67
- memory, 21, 324–326
- Menabrea, Luigi, 19
- merchant model, 256–257
- MGM, 267
- Michelson, Phil, 297
- microprocessors, 7–8, 9–11
- Microsoft. *See also* Gates, Bill; Windows
 - antitrust and, 108
 - BASIC and, 87
 - bundling by, 106–107, 328
 - developer assistance from, 65
 - Developer Relations Group, 82, 99
 - dominance of, 82, 84
 - early operating systems from, 89–92
 - hardware and, 268–269
 - hardware by, 102
 - hiring practices of, 45
 - IBM and, 82, 89–90
 - Intel and, 103
 - licensing fees, 104
 - marginal costs, 294
 - mobile phones and, 195–196, 270
 - mouse developed by, 248
 - multimedia extensions, 220–221
 - multisided nature of, 95
 - Nokia and, 210
 - PC manufacturers and, 103–104
 - in PDA market, 173–178
 - pricing strategy of, 104–106
 - programming language business of, 87
 - software specialization by, 102
 - as video game publisher, 144
 - vs. Apple, 95–109, 294
 - vs. Linux, 109–112
 - Windows profitability, 2
 - Xbox, 6, 29, 69, 116, 131, 132, 133–137, 138, 140, 143, 146, 272–273, 296–297
- Microsoft Developer Network (MSDN), 100
- Microsoft Office, 328, 330
- Microsoft XML Core Services, 32
- middleware, 12, 29–30, 146, 192–196, 201–202
- MIDI, 204
- Midway, 144
- Mikami, Shinji, 132
- Miles, Stephanie, 173, 174
- Miller, Rocky, 221
- minimizing costs, 315–318
- Mitsubishi, 137, 199
- Miyamoto, Shigeru, 115
- MMPORPGs. *See* massive multi-player online role-playing games (MMPORPGs)
- mobile phones
 - applications, 196–198
 - business side of, 186–202
 - cellular vs. transmitter technology, 187
 - competition with, 210–211
 - dominance in industry, 210–211

- eBay and, 354
- in emerging economies, 189–190
- feature accretion in, 335
- handset subsidies, 295
- history of, 187–188
- Internet connectivity on, 189, 202–209
- in Japan, 185–186, 208–209
- manufacturers, 190–192
- Microsoft and, 270
- middleware on, 192–196
- as multisided platform, 188
- number portability, 188
- operating systems, 29, 30, 192–196
- operators, 187–190
- as PDAs, 192
- piracy and, 287–288
- platform ecosystem for, 186, 247–248
- pricing strategies, 188
- ringtones, 183–184, 197–198, 204
- SIM cards in, 327
- as software platform, 199–202
- text messaging, 189
- third-party software for, 287–288
- timeline of, 184
- transmission standards, 191
- ubiquity of, 10
- video on, 191
- Mobile TeleSystems, 190
- modularity, 23–24, 315
- monitor (code entity), 26
- Moon, Youngme, 208
- Moore, Mark, 193
- Moore's Law, 8
- Morales, Mario, 326
- Morgan, Michael, 183
- Morgan, Timothy Prickett, 77
- Morris, Henry D., 5
- Morrow Design, 92
- Mossberg, Walter S., 158
- motivation, for open-source development, 76–77
- Motorola, 101, 166, 184, 190–191, 192, 194, 195, 222
- mouse, 248
- movies, 50, 138, 243
- movie theaters, 319
- MoviStar, 190
- Mozilla Public License, 75
- MPEG format, 217, 219
- MPL. *See* Mozilla Public License
- MP3 players. *See* digital media; iPod; music devices
- MSDN. *See* Microsoft Developer Network (MSDN)
- Mullaney, Timothy J., 58
- Multics, 27
- multihoming, 67–69, 139–140, 144, 235–238, 282–283
- Multiplayer (video game system), 115–116, 129, 271
- multisided platforms, 53–70, 256
 - Apple's understanding of, 95–97
 - bundling in, 322–323
 - business models for, 63–64
 - competition in, 69
 - customer groups in, 55–56, 60
 - economics of, 54–70
 - examples of, 54
 - externalities and, 323
 - features of, 55–56
 - interconnectedness in, 64–65
 - Microsoft as, 95
 - mobile phone networks as, 188
 - multihoming in, 67–69
 - platform ecosystems and, 252–255
 - price discrimination in, 60–61
 - price structures in, 293–300
 - pricing in, 58–60, 276–283
 - pricing strategies in, 65–66
 - revenue in, 58–59
 - scaling in, 70
 - strategy in, 70
 - subsidies in, 59
 - video games as, 124–128
 - Wal-Mart and, 258–259
- MULTOS operating system, 346
- Murphy, Kevin, 253, 325, 326
- music. *See also* media players
 - digital, 218–225
 - in ringtones, 197–198

- music devices, 10. *See also* iPod
 codecs for, 218–219
 digitization of music, 217–218
 memory in, 326
 technology, 216–220
 timeline of, 214
- music industry, advent of bundling in, 52
- MusicMatch, 237
- Mykland, Robert, 169
- Nagel, David, 167, 211, 269–270
- Nagle, Thomas T., 122
- Namco, 144
- National Center for Supercomputing Applications (NCSA), 72
- Natsuno, Takeshi, 202, 203, 205, 207, 261, 263, 295
- navigation system, in cars, 340–341
- NCSA. *See* National Center for Supercomputing Applications (NCSA)
- NCSOft, 284
- NEC, 129, 173, 192, 208
- negative bundling, 323
- Netscape, 64–65, 106
- Netweaver, 341
- network economics, 61–63
- network effects, 47–48, 55, 56, 58, 61–63, 95, 107, 141, 258
- Neumann, John von, 19, 21
- newspapers, 68, 69, 280, 320, 329, 341–342
- Newton (early PDA), 9, 156, 159, 160–161, 162, 178, 179, 180
- NewtonScript, 160
- New York Times*, 221
- Nichols, Albert, 308
- Nintendo, 67, 116, 125–128, 143, 151
- Nintendo 64, 140
- Nintendo Entertainment System, 125–128, 140, 292
- Nokia, 166, 184, 191, 193, 194, 195, 199, 201–202, 210, 255
- Norton Utilities, 310
- object-oriented programming, 24–25
 scale and, 49
- O'Brien, Ellen, 341
- Odyssey (video game system), 118
- Office, Microsoft, 328, 330
- O'Grady, Stephen, 241
- Oi, Walter, 278
- Olafsson, Olaf, 282
- Olhava, Schelley, 198, 300, 337
- O'Malley, Chris, 193
- OMAP microprocessors, 30
- Omidyar, Pierre, 349, 350
- OMTP. *See* Open Mobile Terminal Platform
- online gaming, 150–151
- Open Mobile Terminal Platform, 210–211
- open-source software
 business models based on, 77–79
 decentralized nature of, 71
 general public license and, 74–76
 history of, 5
 IBM and, 73–74
 incentives for, 76–77
 intellectual property rights and, 74–76
 Linux as, 33
 in non-desktop arenas, 112
 overview of, 37–39, 70–79
 production of, 71–74
 Red Hat, 77–79
 testing of, 73
 vs. commercial approach, 72–74
- open vs. closed software platforms, 12–13
- Opera (browser), 198
- operating systems. *See also specific operating systems*
 APIs and, 27–30
 Apple's early, 88–89
 for automobiles, 340–341
 batch, 25–26
 code in, 35
 CP/M and, 88
 development of, 36–37
 early, 83, 88

- in early mainframes, 81
 - evolution of, 25–27
 - IBM, 89–92
 - innovations in, 27
 - mobile phone, 192–196
 - multihoming in, 68
 - multiple, 91–92
 - open-source, 37–39
 - for payment cards, 346
 - for PDAs, 165, 167–168
 - piracy of, 286–287
 - profits from, 293–294
 - proprietary, 36–37
 - software platforms as, 12
 - versions, 311
 - Window’s emergence as dominant, 93–94
- Oracle, 222, 341
- Orange (mobile carrier), 190, 195, 287
- O’Rear, Bob, 89
- Osborne, 92
- OS/2 (operating system), 93–94, 105
- Ostad, Tom, 155
- Outlook Express, 106

- Page, Larry, 356, 357
- Pajitnov, Aleksey, 127
- Pakes, Ariel, 322
- Palm OS, 40, 156, 166–168, 170–172
 - decline of, 196
 - feature accretion, 306
 - Handspring and, 255
 - license fees, 290
 - market share, 194
 - Windows CE and, 269
- PalmPilot, 9
 - APIs for, 169
 - applications, 170–172
 - birth of, 158–161
 - debut of, 163
 - developer assistance with, 168–172
 - development of, 161–162
 - features added to, 179, 306
 - growth and decline of, 155
 - handwriting recognition, 158–159, 161–162, 163
 - PC connectivity in, 178
 - platform strategy, 168–173
 - timeline of, 156
- PalmPrint, 158–159
- PalmSource, 167, 246
- Panasonic, 137, 192, 195, 199, 208, 271
- Pang, Albert, 5
- Passages from the Life of a Philosopher* (Babbage), 18
- patents, 37, 49
- Pathak, Parag, 38
- Patterson, David A., 8
- Patterson, Tim, 90
- payment cards, 56, 69, 323, 346–348
- PDAs (personal digital assistants)
 - birth of, 158–161
 - bundling in, 178–179
 - disintegration, 268–269
 - email on, 176–178
 - feature accretion in, 306
 - handwriting recognition, 158–159
 - Microsoft and, 173–178
 - mobile phones as, 192
 - operating systems, 165, 167–168
 - PC connectivity in, 178
 - as platforms, 40
 - timeline of, 156
- PDP-8, 7
- penetration pricing, 277, 281
- personal computer, timeline of, 82
- Peterson, William, 101
- Phillips, 173
- Picardi, Anthony C., 5, 84
- piracy, 48–49, 127, 218–219, 239–240, 285–288
- “Platform Competition in Two-Sided Markets” (Tirole & Rochet), 55
- PlayStation, 129–133
 - debut of, 116
 - developer kit for, 146
 - Emotion Engine in, 271
 - extra capabilities of, 152
 - licensing fees, 296

- PlayStation (cont.)
 - market share, 138, 140
 - middleware, 12, 29
 - network connections, 134
 - network effects, 47
 - royalties, 69
 - third-party developers for, 143
- Plotnikoff, David, 65
- plug-and-play, 104
- PluggedIn@Palm, 170
- Pocket PC, 174–178
- PocketQuicken, 158
- Pogo.com, 141, 148
- Pogue, David, 158
- Pollack, Andrew, 87
- Pong, 116, 119, 120
- PostScript, 106
- Poultney, John, 268
- Precept Software, 222
- pre-installed software, 46–47
- price discrimination, 60–61, 277, 284–285, 290–293, 324–326
- pricing, 104–106
 - in airline industry, 278
 - for balance, 279–281
 - competition and, 280
 - of computers, 8
 - costs and, 277
 - deciding what is priced, 283–290
 - demand and, 276
 - of eBay, 351–352
 - entry strategies and, 281–282
 - exclusion and, 285–288
 - importance of, 6, 275–276
 - investment recovery and, 50–51
 - of memory, 324–326
 - of MMPORPGs, 284–285
 - multihoming and, 282–283
 - in multisided platforms, 58–60, 276–283, 293–300
 - penetration, 277, 281
 - of PlayStation, 282
 - single-homing and, 283
 - in single-sided markets, 276–277
 - usage, 288–289, 295
 - use intensity and, 288–290
 - of video game consoles, 115, 122–124, 135–136, 279, 291–292, 295–296, 298–299
- pricing methods, 105
- pricing strategies, 65–66, 122–124, 300–301
- pricing structure, 105, 295–300
- printers, 102
- print media, 68
- Prisma Coroporation, 354
- processing power
 - growth in, 305
 - price of, 327
- product design, 313–323
- product lines, 313–323
- programmers
 - as educated people, 45
 - Linux popularity among, 111
 - Microsoft assistance to, 65
 - open-source, 76–77
- programming
 - complexity of, 36–37
 - growth of, 305
 - history of, 18–21, 83
 - of open-source software, 37–39, 71–74
 - vs. manufacturing, 71
- programming languages
 - development of, 21–25
 - Microsoft and, 87
 - object-oriented, 24–25
- proprietary operating systems, 36–37.
 - See also* operating systems
- Psion, 184, 194
- Psygnosis, 264
- punch cards, 18, 26
- Q-DOS, 90
- Qualcomm, 166, 191, 211
- QuickTime, 106, 214, 223, 227, 228–229, 319, 332, 333
- Race, Steve, 282
- Radio Shack TRS-80, 86
- Ran, Shane, 103
- Rare (video game company), 264

- Raymond, Eric, 43
razors and blades model, 122
RCA (computer manufacturer), 83
RealArcade, 233
RealArcade GamePass, 233
RealAudio, 231–232
real estate, 59, 68
Real Music Store, 232
RealNetworks, 214, 222, 230–234, 289, 291
RealPlayer, 198, 202, 223–226, 227, 231, 234, 238
recorders, digital video, 339
Reddy, Brendan, 308
Red Hat (operating system), 5, 34, 76, 77–79, 304, 315. *See also* Linux
regulation, 108
releases, platform, 309
reproducibility, 46–47
Research in Motion, 176–178. *See also* BlackBerry
Rhapsody, 232, 289
Rhodes, Neil, 169
Richtel, Matt, 347
Ring, D. H., 187
ringtones, 183–184, 197–198, 204
Roberts, Dan, 206
Roberts, John, 250
Robertson, Andrew, 133
Rochet, Jean-Charles, 55, 65, 66, 280, 283, 291, 299
Rohm, W. G., 78
royalties, in video game industry, 69, 125–126, 146, 298
Rules for Revolutionaries (Kawasaki), 98
- Safari browser, 332
Said, Carolyn, 228
Salinger, Michael, 51, 52, 315
Sami, Mariagiovanna, 1
Samsung, 137, 175, 191, 192, 195, 199
Sanyo, 115, 271
SAP (software company), 341
- Saturn (video game system), 129, 130, 131, 140
Sayers, John, 221
SCEA, 265
Schiffer, Claudia, 164
Schmalensee, Richard, 11, 122, 278, 320, 344, 347
Schroeder, Erica, 221, 228
Schwartz, Barry, 303
Schwerin, Rich, 162, 163
scope, economies of, 52–53
Scotchmer, Suzanne, 48
Scuito, Donatella, 1
Sculley, John, 82, 96, 249
Sealfon, Ross, 157, 166, 175
search engines, 355–356
Sears, 116, 120
Seattle Computer Products, 89–90
securities brokerage, 68
Sega, 67, 116, 127, 129, 130, 131, 133, 140, 143, 272
segmentation, 321
Selby, Richard W., 37, 45, 90
Selling the Dream (Kawasaki), 98
Sendo, 199
Sergeant Pepper's Lonely Hearts Club Band (Beatles), 52
servers, 311, 342
Shankland, Stephen, 101
Shannon, Claude, 19, 20
Shapiro, Carl, 47, 55
shared facilities, 57
Sharp, 137, 192, 208
Sheff, David, 119
Sherlock (search engine), 307, 310
Shim, Richard, 170, 175
Short Code, 21
Siegmann, Ken, 266
Siemens, 191, 195, 199
signing programs, 287
Silvano, Cristina, 1
SIM card, 327
Simon (early mobile phone), 184, 193
Sims Online, 284
Sinclair, 88
single-homing, 283

- single-sided platforms, 256–257
- Singleton, Andrew, 221
- SK Telecom, 191
- Slawsby, Alex, 157, 166, 175, 243, 346
- smart cards, 346–348
- Smith, Adam, 260, 344
- SoftCard, 102
- SoftConnex, 309
- Softech, 90
- software libre*, 5. *See also* open-source software
- software platforms. *See also* open-source software
 - bundling features in, 51–53
 - characteristics of, 45–48
 - as commodity, 44
 - complementarity in, 47–48
 - costs associated with production, 49–50
 - definition of, 30
 - distribution costs, 47
 - as documents, 43
 - early, 83–84
 - economic power of, 2, 3
 - educated nature of producers, 45
 - feature accretion in, 305–311
 - growth of, 5–6
 - hardware platforms and, 4
 - inexhaustibility of, 47
 - list of, 40
 - malleability of code in, 46, 52
 - mobile phone, 192–196, 199–202
 - in mobile phones, 30
 - modularity in, 23–24
 - multisided nature of, 43, 53–70, 331–332
 - open vs. closed, 12–13
 - pre-installed, 46–47
 - pricing of, 50–51
 - profitability and, 2
 - reproducibility of, 46–47
 - single-sided, 256–257
 - types of, 11–13
 - uses of, 1
 - value provided by, 57–58
 - video games as, 120–129
 - vs. software, 4
 - Web-based, 342–343
- Solaris (operating system), 33, 75, 109, 111
- SonicStage, 214
- Sonic the Hedgehog, 67, 116, 127
- Sony, 12, 29, 47, 69, 116, 129–133, 143, 151, 166, 195
- Space Invaders, 116
- Spacewar, 118, 119
- Spain, broadband service in, 328
- Sperry Rand, 81
- Spider-Man 2*, 117
- Spotlight (search program), 332
- spreadsheets, 96, 97, 98
- Spring, 191
- Spyglass, 106, 310
- Stallings, William, 26
- Stallman, Richard, 71, 75
- Stein, Robert, 127
- Stephen, Bruce, 92
- Stigler, George, 260, 261, 319
- stock management, 315
- storage, computer, 21, 324–326
- strategy, in multisided platforms, 70
- streaming audio, 214, 219–220, 222, 231–232
- streaming video, 219–220, 231–232
- Stross, Randall E., 104
- Su, Weili, 157
- subsidies, in multisided markets, 59
- SuperPass program, 233, 291
- Swaine, Michael, 8, 102
- Symantec, 310
- Symbian (operating system), 3, 30, 40, 184, 194–195, 196, 199–201, 210, 270
- Symbian Signed, 287–288
- Takahashi, Dean, 131, 134, 135, 136, 273, 291
- Tam, Piu-Wing, 167
- Tandy, 88, 158
- TDMA mobile phone transmission standard, 191

- television, 68, 232, 339
- Terapeak.com, 354
- Tetris, 127
- textile industry, 18, 261
- text messaging, 189
- third-party add-ons, 310
- Thmabyrajah, Saunthra, 192
- Thomke, Stegan, 133
- Thompson, Tom, 159
- THQ, 143
- 3Com, 164, 166
- 3DO, 6, 115–116, 117, 129, 133, 136–137
- Tieman, Alexander F., 281, 299
- Tiger (Macintosh operating system), 332–334. *See also* Mac OS
- Time Warner, 335
- Timex, 88
- Tirole, Jean, 38, 55, 65, 66, 76, 109, 280, 283, 291, 299
- Titanic* (film), 266
- TiVo, 339
- T-Mobile, 189, 190, 191, 287
- Torvalds, Linus, 33, 38, 43, 91
- Toshiba, 137, 175
- Toyota Camry, 314
- trade secret law, 48
- transactions costs, 250–252, 279–280, 281, 343–349
- transistors, 8
- Treo, 180, 196
- TRS-80, 86
- TrueType, 82, 106, 310
- Turbografx, 129
- Turing, Alan, 19
- Turing machine, 19–20
- Turner, Daniel Drew, 108
- Twitchell, James, 348
- two-sided platforms, 257–259
- typewriters, 337–338

- UCSD p-System, 90
- Ultima game franchise, 142
- Ultima Online, 284
- United Kingdom, broadband service in, 328
- United States, broadband service in, 328
- United States v. Loew's Inc.*, 319
- United States v. Microsoft*, 253
- UNIVAC, 26–27
- Unix, 32–34, 82, 85, 91, 266, 331–332
- UnWiredBuyer, 354
- usage pricing, 288–289, 295
- USB, 104, 179, 267–268
- use, intensity of, 288–290
- US Robotics, 163, 164
- utilities, platform, 310

- value, 57–58
- Varian, Hal, 47, 55
- variety, 299–300, 316
- VCS. *See* Video Computer System (VCS)
- VDONet, 222
- Vendio, 354
- VeriSign Inc., 288
- Verizon Wireless, 190, 191, 192
- versions, 311, 331–332
- Vextreme, 222
- video
 - on mobile phones, 191
 - streaming, 219–220, 231–232
- Video Computer System (VCS), 121
- video games/consoles, 1, 3
 - antitrust and, 126
 - APIs with, 145–146, 149
 - attracting buyers, 282
 - backwards compatibility in, 139
 - business strategy of, 122–124
 - computer-based, 147–150
 - computer-based vs. console, 149–150
 - on computers, 128–129
 - console manufacturers, 138–141
 - costs associated with, 291
 - crash of industry, 116, 124
 - current state of industry, 137–146
 - demographics, 137
 - developer assistance with, 134–135, 145, 146

- video games/consoles (cont.)
 - developers and publishers, 141–146
 - digital convergence and, 335
 - disintegration in, 261–262, 264–265, 270–271
 - early, 9
 - game development in, 130–131
 - growth of, 9
 - history of, 116, 118–129
 - Hollywood model, 142
 - Internet connectivity in, 152
 - middleware with, 146
 - multihoming and, 67–69, 139–140, 144, 283
 - network capabilities in, 134
 - network effects with, 141
 - online gaming, 150–151
 - operating systems in, 12
 - piecemealing of, 285
 - platform ecosystem for, 147
 - platform expansion, 151–152
 - as platforms, 40, 120–129
 - pricing of, 115, 122–124, 135–136, 279, 291–292, 295–296, 298–299
 - revenues from, 138
 - royalties in, 123, 125–126, 146, 298
 - sports-themed, 142
 - timeline of, 116
 - as two-sided platform, 124–128
 - variety in, 299–300
 - vs. board games, 337
 - vs. consoles, 120
 - vs. PC model, 117
 - Web-based, 148
- Vindingo, 175
- Visa, 346
- VisiCalc, 67, 82, 97, 98, 197
- Visor (PDA), 166
- Vivendi, 205
- Vizzavi, 184, 205–206
- Vodafone, 184, 188, 189, 190, 191, 205–206
- volume discounts, 278
- Vosaic LLC, 222
- Waldfoegel, Joel, 59
- Waldmeir, Patti, 284
- Walkman, 214, 267
- Wal-Mart, 258–259
- Wang, 85
- Wang, R “Ray,” 341
- WAP. *See* Wireless Action Protocol
- Ward, Lewis, 198
- Warner Communications, 124–125
- Watson browser, 310
- WCDMA mobile phone transmission standard, 191
- Wealth of Nations* (Smith), 260
- Web-based software platforms, 342–343
- Weber, Thomas E., 58
- WiFi, 101, 175
- Wilburn, Gene, 307
- Wilcox, Joe, 73
- Williamson, Oliver, 251
- Wilson, Johnny L., 118, 120, 121
- Wilson, Warren, 230
- Windows, 98, 173. *See also* Microsoft
 - APIs in, 32, 100–101
 - CE, 133, 173–178, 184, 196, 266
 - code growth, 304
 - developer assistance with, 99–101
 - development of, 93–94
 - emergence as dominant system, 93–94
 - feature accrual in, 308
 - ham sandwiches bundled with, 328
 - lines of code in, 27
 - Linux as threat to, 110
 - NT, 31, 99, 133
 - piracy of, 286–287
 - pricing of, 105
 - profitability of, 2
 - QuickTime on, 228–229
 - 3.0 release, 82, 94
 - Vista, 32
 - XP, 31–32, 107, 311
- Windows Embedded Studio, 311

- Windows Media Player, 223–225,
227, 235, 238, 311
- Windows Smartphone, 184, 195
- wireless, 101
- Wireless Action Protocol, 204,
205–206
- Wissink, Stephanie S., 132
- Wolf, Ron, 105
- Wong, Derek, 297
- Word, 96, 249, 266
- WordPerfect, 265
- World War II, 7, 19
- Wozniak, Steve, 2, 86, 88
- Wright, Julian, 299

- Xbox, 131, 132, 133–137
 - costs associated with, 296–297
 - debut of, 116
 - Dell and, 272–273
 - evangelization of, 146
 - market share, 138
 - middleware, 29
 - royalties, 69
 - third-party developers for, 143
- Xbox Live, 151
- Xing Technology Corporation, 222,
230

- Yacowitz, Caryn, 1
- Yahoo!, 66
- Yuhara, Takao, 296

- Zaccaria, Vittorio, 1
- Zoomer, 156, 158–160, 161, 162,
178, 179, 180

