COMPETING IN THE AGE OF AI

STRATEGY AND LEADERSHIP
WHEN ALGORITHMS AND NETWORKS
RUN THE WORLD

BY MARCO IANTISI AND KARIM R. LAKHANI

Contents

FIGURE 1-1

The next Rembrandt

Source: reproduced by permission of ING and J. Walter Thompson.

FIGURE 1-2

The collision between traditional and digital operating models
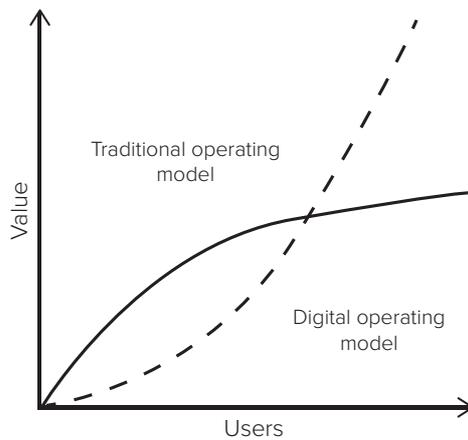
FIGURE 2-1

Alignment between a company's business model and operating model

Business model		Operating model		
Value creation	Value capture	Scale	Scope	Learning
Differentiation	Price	Volume	Variety	R&D
Cost	License	Complexity	Range	Continuous
Focus	Promotion	Customers		improvement
				IP generation
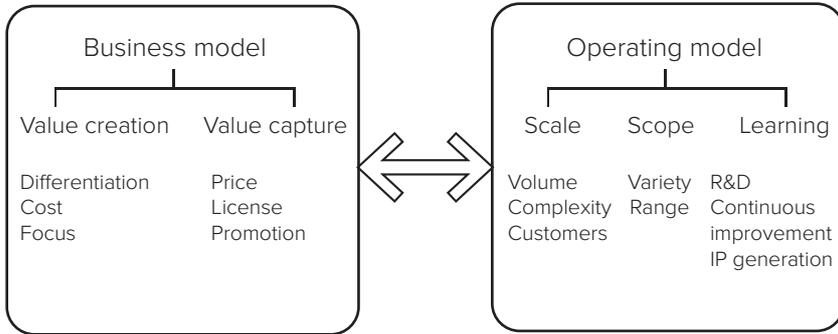
FIGURE 2-2

Value creation and capture versus value delivery

Value creation and capture		Value delivery		
Business model		Operating model		
Value creation	Value capture and sharing	Scale	Scope	Learning
Exceptional, increasing consumer value by personalization and engagement	N*E*M Across many related markets (Multisided)	"Zero" marginal cost, network effects	Aggregation and modularity across markets	Constant innovation and AI/ML-driven improvement

*Note: N*E*M = (the number of users) * (user engagement) * (monetization)*

FIGURE 3-1

The AI factory's virtuous cycle
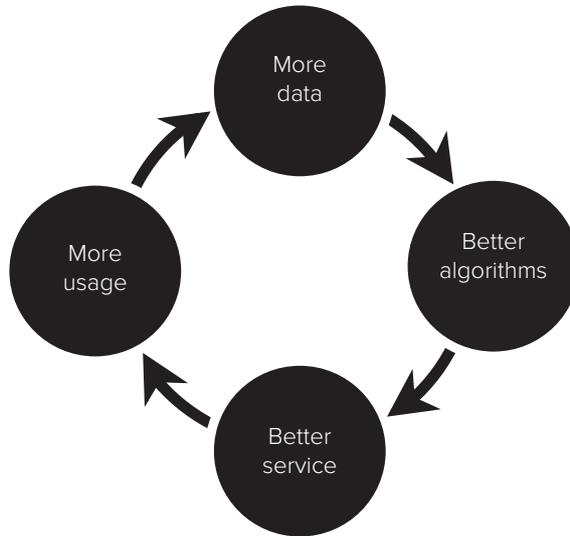
FIGURE 3-2

AI factory components
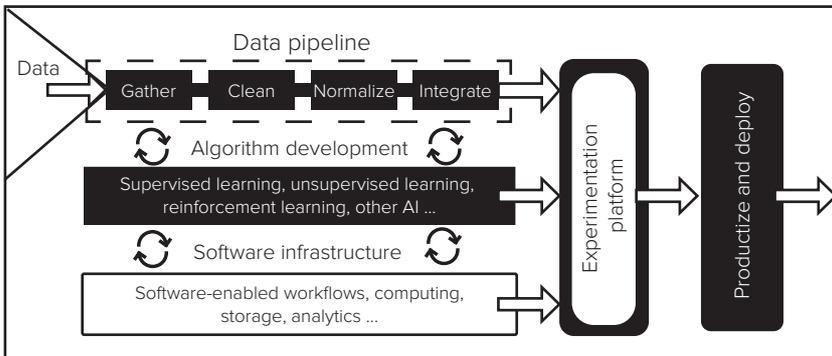
FIGURE 3-3

A state-of-the-art data platform

Applications

Subscribers

Operational models

Data science

Reporting

Self-service

Subscribe

Data platform

Refineries

Events, messages, streams

Batch

Designed data

Registry & governance

Data lake: original source data

Publish

Sources

Operational system

Third-party data sources

New edge data sources
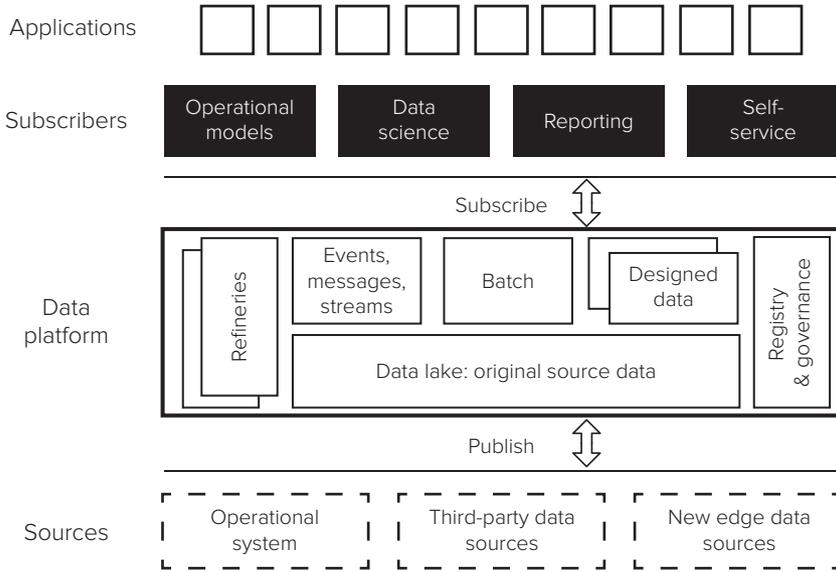
Source: Keystone Strategy

FIGURE 3-4

Results of LISH analysis contest using data from the Dana-Farber Cancer Institute

Legend: Phase 1, Phase 2, Phase 3, Phase 2 (Ensemble), Phase 3 (Ensemble)

Y-axis: Segmentation score (holdout set), mean

X-axis: Segmentation score (validation set), mean

Regions labeled: Intraobserver, Interobserver, Commercial software and expert, Commercial software
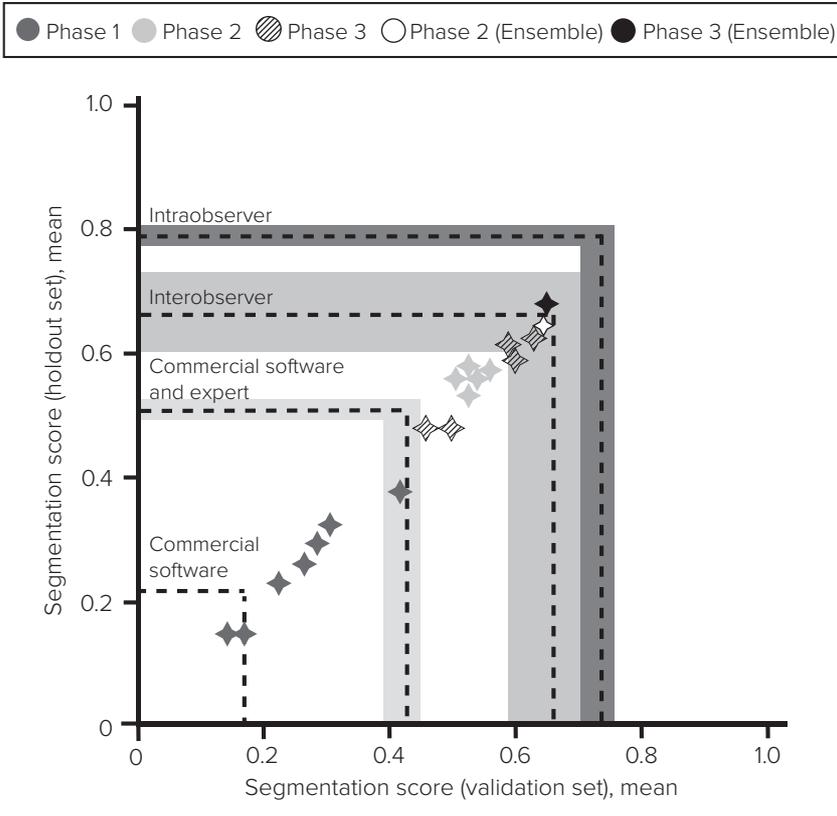
FIGURE 4-1

Siloed architecture
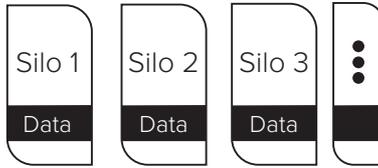
FIGURE 4-2

A traditional organization's ability to deliver value faces a curve of diminishing returns
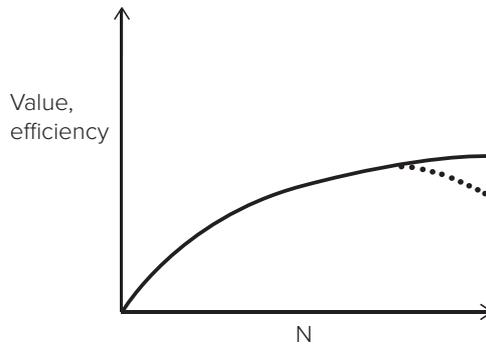
N is a parameter that stands for a variety of variables, such as the number of users or the number of complementors on a platform.

FIGURE 4-3

An Amazon time line
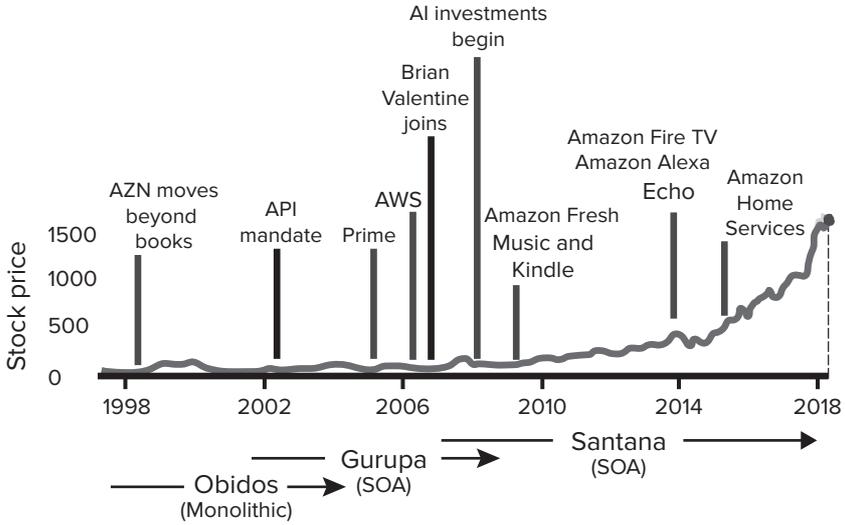
The curve depicts the Amazon stock price. Obidos, Gurupa, and Santana are the systems Amazon built to enable its operating capability and to meet its scale, scope, and learning objectives.

FIGURE 4-4

Operating architecture for an AI-powered firm
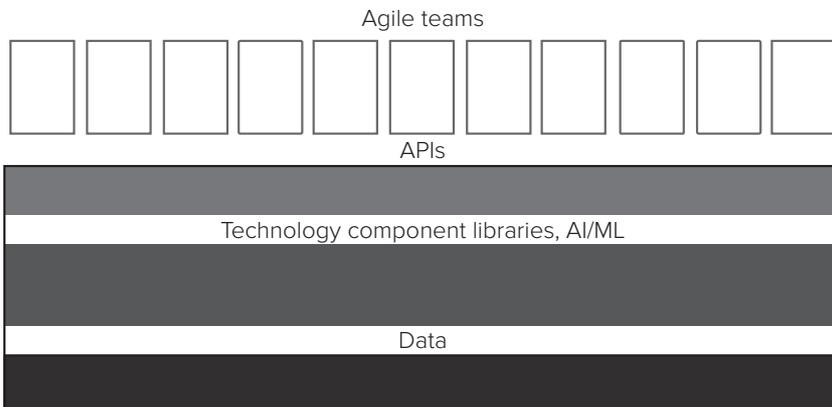
TABLE 5-1

Financial performance of AI maturity index leaders and laggards

	Laggards (bottom 25% of enterprises)	Leaders (top 25% of enterprises)
Three-year average gross margin	37%	55%
Three-year average earnings before taxes	11%	16%
Three-year average net income	7%	11%

FIGURE 5-1

Four stages of digital operating model transformation

Use cases

APIs

Component libraries

Data

AI factory

④

Use case 1 | Use case 2 | Use case 3

Data

Data hub

③

Silo 1 | Silo 2 | Silo 3

Data

Pilot

②

Silo 1 | Silo 2 | Silo 3

Data

Siloed data

①

Performance impact

Transformation stage

Improvement | Demonstration | Optimization | Transformation

11
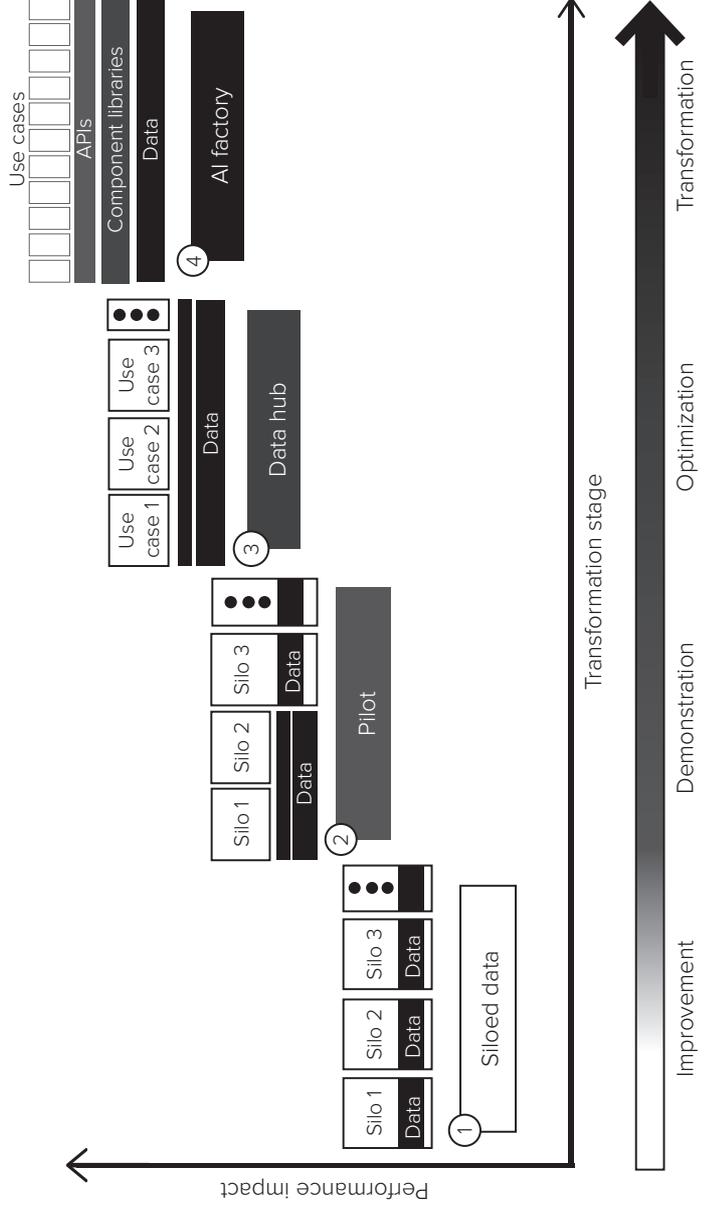
FIGURE 6-1

The value of network and learning effects

Value

D

C

Strong network and
learning effects
(market tips
toward winner)

B

A

Weak network and
learning effects
(competitors coexist)

N
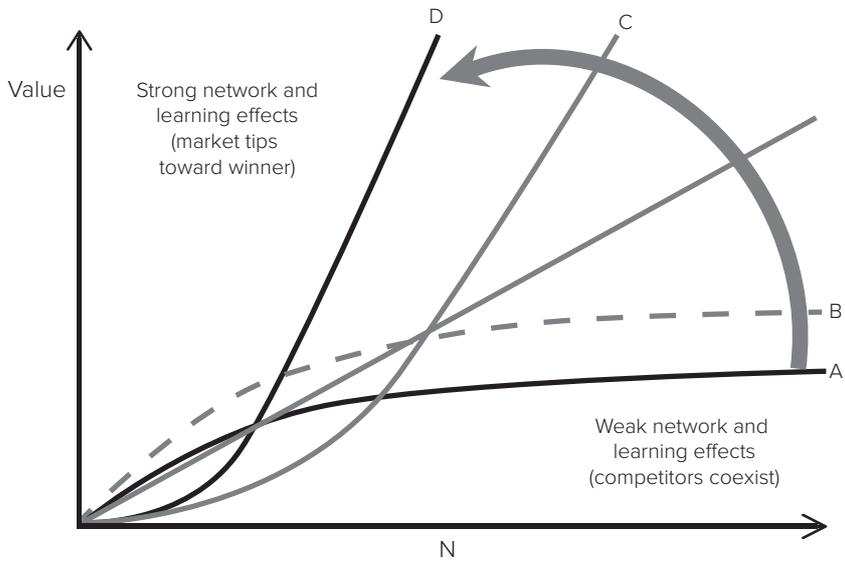
FIGURE 6-2

Network-based value creation for a disease management app

Enable new services/products to patients beyond medications and deepen customer relationships.

Reduce costs by optimizing medication delivery and minimizing acute disease incidents.

Use tool to provide better understanding of disease and connect to info and patients.

Improve MS service, performance-based contacting for payers.

Analyze data to provide service solutions.

Recruit patients for clinical trials.

Use platform to promote and sell other services to stakeholders.

Sell data to third parties for research and additional services.

Pharmacy

Insurer

Patient

Physician

Parkinson's disease management app

Researcher

Health providers

Data analytics

Other

Source: Keystone Strategy

13

FIGURE 6-3

Impact of dataset scale on performance
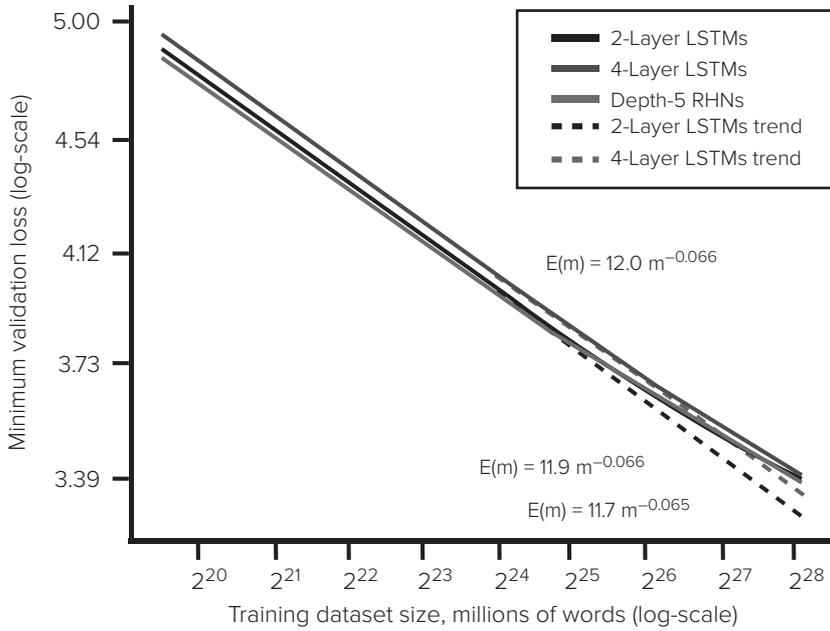
Prediction error decreases significantly with more data.

Source: Baidu Research

FIGURE 6-4

The difference between local (left) and global networks
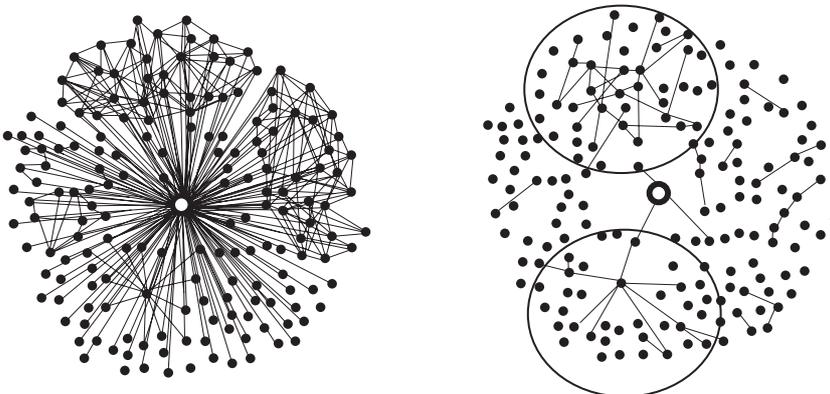
FIGURE 6-5

Networks connected to Uber's core business
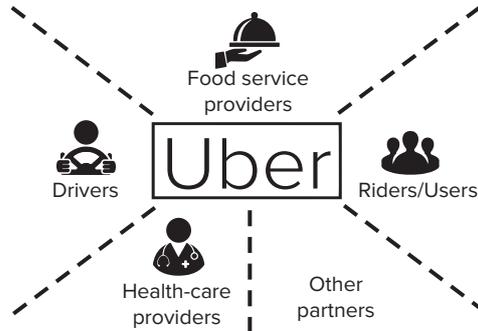
TABLE 6-1

Evaluating Uber's strategic networks

Strengthen value creation and capture	Weaken value creation and capture
• Strong network effects	• Weak network effects
• Strong learning effects	• Weak learning effects
• Strong synergies with other networks	• No synergies with other networks
• No major network clusters	• Important network clusters
• No (or single-sided) multihoming	• Extensive multihoming
• No disintermediation	• Extensive disintermediation
• Extensive network bridging opportunities	• No network bridging opportunities

FIGURE 6-6

Mapping Uber's value creation and capture opportunities
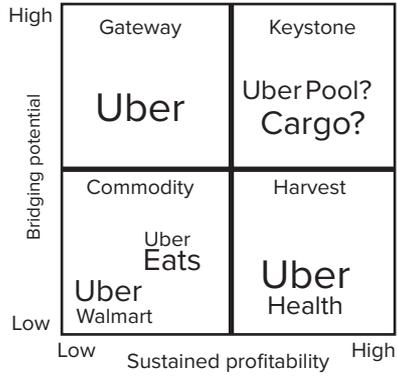
FIGURE 7-1

The collision between a digital and a traditional firm
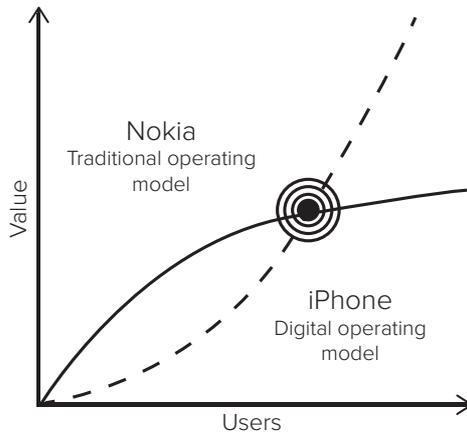
FIGURE 7-2

The Nokia and Apple value curves
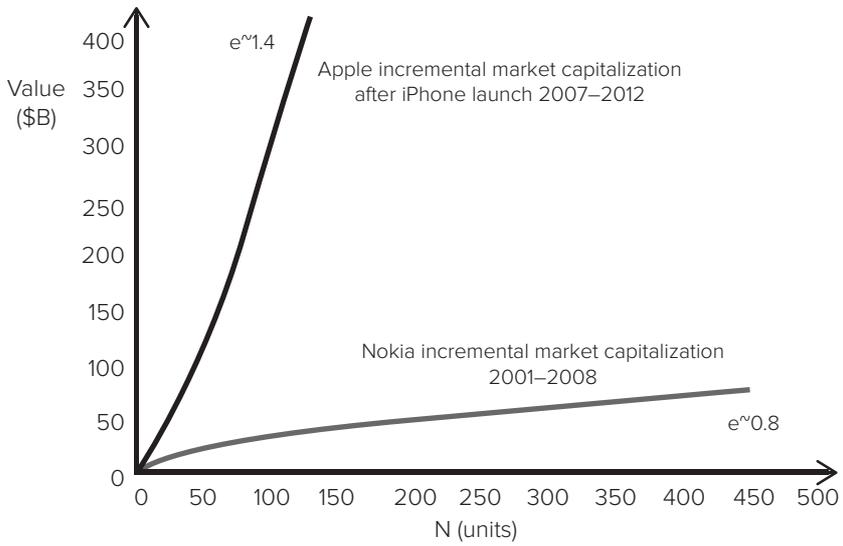
FIGURE 7-3

The evolution of the modern economy
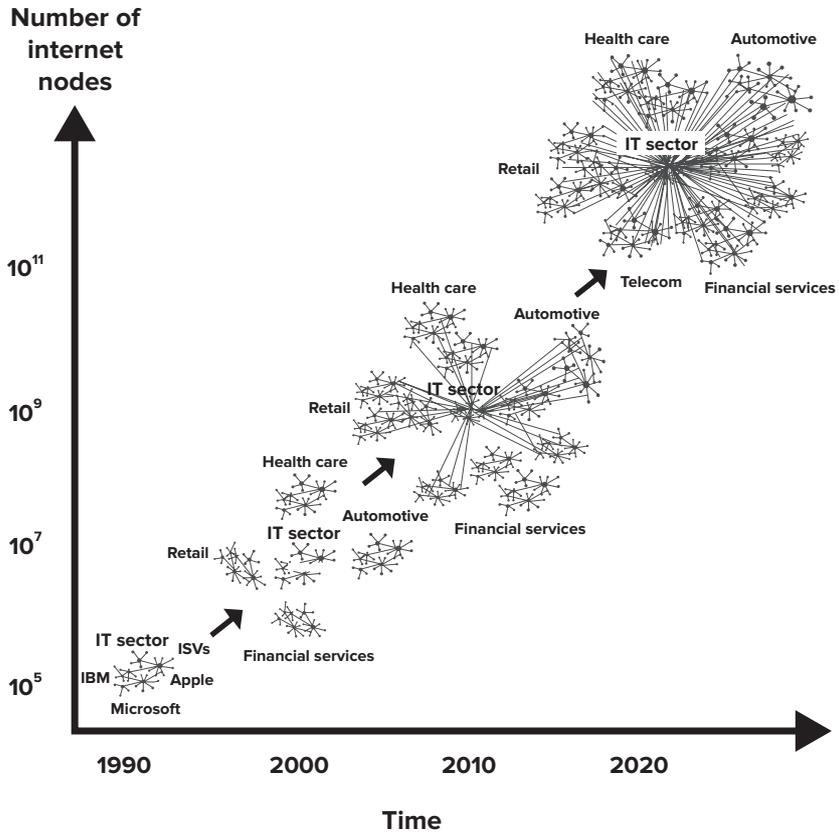
Notes

Chapter 1

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5. Bret Kinsella, "Amazon Alexa Now Has 50,000 Skills Worldwide, Works with 20,000 Devices, Used by 3,500 Brands," Voicebot.ai, September 2, 2018, https://voicebot.ai/2018/09/02/amazon-alexa-now-has-50000-skills-worldwide -is-on-20000-devices-used-by-3500-brands/.
6. The title of this section is inspired by a quote by Walmart president and CEO Doug McMillon, "We are becoming a more digital company."
7. Lauren Thomas, "Sears, Mattress Firm and More: Here Are the Retailers That Went Bankrupt in 2018," CNBC, December 31, 2018, https://www.cnbc .com/2018/12/31/here-are-the-retailers-including-sears-that-went-bankrupt-in -2018.html.
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11. Jonathan Jones, "The Digital Rembrandt: A New Way to Mock Art, Made by Fools," *Guardian*, April 6, 2016, https://www.theguardian.com/artanddesign /jonathanjonesblog/2016/apr/06/digital-rembrandt-mock-art-fools.
12. Vipin Mayar, interview with the authors, January 2019.
13. Keystone Strategy is a technology and consulting firm focused on the strategy and economics of digital transformation.
14. Carliss Y. Baldwin and Kim B. Clark, *Design Rules, Vol. 1: The Power of Modularity* (Cambridge, MA: MIT Press, 2000).
15. Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1998).

16. See Jean-Charles Rochet and Jean Tirole, "Platform Competition in Two-Sided Markets," *Journal of the European Economic Association* 1, no. 4 (2003): 990–1029; Annabelle Gawer and Michael A. Cusumano, *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation* (Boston: Harvard Business School Press, 2001); Geoffrey G. Parker, Marshall W. Van Alstyne, and Sangeet Paul Chaudhuri, *Platform Revolution: How Networked Markets Are Transforming the Economy—and How to Make Them Work for You* (New York: W. W. Norton and Co., 2016); Michael A. Cusumano, Annabelle Gawer, and David B. Yoffie, *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power* (New York: Harper Business, 2019); F. Zhu and M. Iansiti, "Entry into Platform-Based Markets," *Strategic Management Journal* 33, no. 1 (2012); M. Rysman, "Competition between Networks: A Study of the Market for Yellow Pages," *Review of Economic Studies* 71 (2004); A. Hagiu, "Pricing and Commitment by Two-Sided Platforms," *RAND Journal of Economics* 37, no. 3 (2006); K. Boudreau and A. Hagiu, "Platform Rules: Multi-sided Platforms as Regulators" in A. Gawer, ed., *Platforms, Markets, and Innovation* (London: Edward Elgar, 2009); Eric von Hippel, *Democratizing Innovation* (Cambridge, MA: MIT Press, 2005); Shane Greenstein, *How the Internet Became Commercial: Innovation, Privatization, and the Birth of a New Network* (Princeton, NJ: Princeton University Press, 2015).

17. Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (New York: W. W. Norton and Co., 2016); Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (New York: Houghton Mifflin, 2018); Ming Zeng, *Smart Business: What Alibaba's Success Reveals about the Future of Strategy* (Boston: Harvard Business Review Press, 2018); Ajay Agrawal, Joshua Gans, and Avi Goldfarb, *Prediction Machines: The Simple Economics of Artificial Intelligence* (Boston: Harvard Business Review Press, 2018).

Chapter 2

1. We are extremely grateful to both Feng Zhu and Krishna Palepu, who originally wrote about Ant Financial and introduced us to its remarkable business and operating model. This chapter draws heavily from their case study series: Feng Zhu, Ying Zhang, Krishna G. Palepu, Anthony K. Woo, and Nancy Hua Dai, "Ant Financial (A), (B), (C)," Case 9-617-060 (Boston: Harvard Business Publishing, 2018).

2. Lulu Yilun Chen, "Ant Financial Raises $14 Billion as Round Closes," *Bloomberg*, June 7, 2018, https://www.bloomberg.com/news/articles/2018-06-08/ant-financial-raises-14-billion-as-latest-funding-round-closes.

3. According to *Forbes*, in June 2018 the market cap of American Express was $87 billion, and Goldman Sachs was $92 billion. Ant Financial raised almost as much money in 2018 as did all the fintech startups in the United States and Europe.

4. Alfred D. Chandler, *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge, MA: Belknap Press, 1990).

5. See, for example, David J. Teece, Gary Pisano, and Amy Shuen, "Dynamic Capabilities and Strategic Management," *Strategic Management Journal* 18, no. 7 (1997): 509–533.

6. Robert H. Hayes, Steven C. Wheelwright, and Kim B. Clark, *Dynamic Manufacturing: Creating the Learning Organization* (New York: Free Press, 1998).

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8. Eric Mu, "Yu'ebao: A Brief History of the Chinese Internet Financing Startup," *Forbes*, May 18, 2014, https://www.forbes.com/sites/ericxlmu/2014/05/18/yuebao-a-brief-history-of-the-chinese-internet-financing-upstart/#68523023c0e1.

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10. Ming Zeng, "Alibaba and the Future of Business," *Harvard Business Review*, September–October 2018, https://hbr.org/2018/09/alibaba-and-the-future-of-business.

11. Ibid.

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15. James Vincent, "Welcome to the Automated Warehouse of the Future," *The Verge*, May 8, 2018, https://www.theverge.com/2018/5/8/17331250/automated-warehouses-jobs-ocado-andover-amazon.

16. Stephanie Condon, "Google I/O: From 'AI First' to AI Working for Everyone," ZDNet.com, May 7, 2019, https://www.zdnet.com/article/google-io-from-ai-first-to-ai-working-for-everyone/.

Chapter 3

1. We are truly grateful to Vladimir Jacimovic, who energized us to study many of these ideas and provided invaluable help and advice.

2. "CineMatch: The Netflix Algorithm," *Lee's World of Algorithms* (blog), May 29, 2016, https://leesworldofalgorithms.wordpress.com/2016/03/29/cinematch-the-netflix-algorithm/.

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5. Todd Spangler, "Netflix Eyeing Total of About 700 Original Series in 2018," *Variety*, February 27, 2018, https://variety.com/2018/digital/news/netflix-700-original-series-2018-1202711940/.

6. Nirmal Govind, "Optimizing the Netflix Streaming Experience with Data Science," Medium, June 11, 2014, https://medium.com/netflix-techblog/optimizing-the-netflix-streaming-experience-with-data-science-725f04c3e834.

7. Xavier Amatriain and Justin Basilico, "Netflix Recommendations: Beyond the 5 Stars (Part 2)," Medium, July 20, 2012, https://medium.com/netflix-techblog/netflix-recommendations-beyond-the-5-stars-part-2-d9b96aa399f5. For more on this topic, see Josef Adalian, "Inside the Binge Factory," *Vulture*, https://www.vulture.com/2018/06/how-netflix-swallowed-tv-industry.html.

8. Ming Zeng, *Smart Business: What Alibaba's Success Reveals about the Future of Strategy* (Boston: Harvard Business Review Press, 2018).

9. To us, one of the most astonishing examples of datafication is an AI-based system that tracks student attention and learning outcomes through facial recognition cameras in classrooms, as pioneered by China's Face++— naturally a personal favorite of professors who want to ensure that every participant is fully engaged in the class session.

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12. The outcome can be a category (dog or cat), in which case a logistic regression is used. Or the outcome can be a numerical value (the score of English proficiency), in which case a linear regression is used. Other, fancier approaches—depending on the depth and breadth of data you have and the kind of problem you are trying to solve—include support vector machines, K-nearest neighbor, random forests, and neural networks.

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Chapter 4

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7. Clayton M. Christensen and R. S. Rosenbloom, "Explaining the Attacker's Advantage: Technological Paradigms, Organizational Dynamics, and the Value Network," *Research Policy* 24, no. 2 (1995): 233–257.

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9. See Marco Iansiti and Roy Levien, *Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability* (Boston: Harvard Business School Press, 2004), chapter 7.

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Chapter 5

1. Richards is Keystone Strategy's CEO and cofounder.

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3. Satya Nadella, interview with authors.

4. It is ironic (but exciting!) to us and underlines the deep transformation at Microsoft to note that it has become a leading contributor to open source software. One of us (Karim) became an academic researcher to understand the open source phenomenon, and at that time Microsoft was viewed as the nemesis of the open source community. The company's executives during the 1990s and 2000s called the open source movement "un-American" and a destroyer of intellectual property. Quite the transformation! See, for example, Charles Cooper, "Dead and Buried: Microsoft's Holy War on Open-Source Software," CNET, June 1, 2014, https://www.cnet.com/news/dead-and-buried-microsofts-holy-war-on-open-source-software/.

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Chapter 6

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3. Feng Zhu and Marco Iansiti, "Entry into Platform Based Markets," *Strategic Management Journal* 33, no. 1 (2012); Feng Zhu and Marco Iansiti, "Why Some Platforms Thrive and Others Don't," *Harvard Business Review*, January–February 2019, https://hbr.org/2019/01/why-some-platforms-thrive-and-others-dont.

4. Note that *network analysis* is a general term that is also applied to the analysis of people (social), computers, the electric grid, software modules, proteins, and the like. The essential components are nodes in the networks and the links (edges) connecting them.

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7. This section draws extensively from Zhu and Iansiti, "Why Some Platforms Thrive."

8. Sadly, the US health care system still relies heavily on fax machines for most of its interoffice and interorganizational communications.

9. This section also draws extensively from Zhu and Iansiti, "Why Some Platforms Thrive."

10. Ibid.

Chapter 7

1. As we discuss in detail in chapter 8, in doing so, these learning analytics almost inevitably introduce some sort of bias. The more the algorithms customize the content to encourage user engagement, the more they will suffer from bias. Users will inevitably click on, engage with, and watch more of what they are interested in.

2. We are grateful to our Harvard colleagues Tarun Khanna, Juan Alcacer, and Christine Snively for their excellent case on Nokia (Juan Alcacer, Tarun Khanna, and Christine Snively, "The Rise and Fall of Nokia," Case 714-428 [Harvard Business School, 2014, rev. 2017]).

3. Ming Zeng's book on Alibaba's journey, *Smart Business: What Alibaba's Success Reveals about the Future of Strategy* (Boston: Harvard Business Review Press, 2018), provides an instruction manual on how traditional retail businesses can be dismantled by competitors using a digital operating model.

4. RealNetworks has its origins in Progressive Networks, founded by Rob Glaser in 1994.

Chapter 8

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