Guest Editors' Introduction

Introduction to *Computing Capitalisms*

Gerardo Con Diaz
University of California, Davis

Devin Kennedy
Department of History
University of Wisconsin-Madison

We are delighted to introduce the first edition of *Computing Capitalisms*: *Business, History, and Information Technology*, a series of special issues that deploy new approaches in the study of capitalism to investigate the business history of computing. This series celebrates novel methods, questions, and dialogues within the field, and new ways of framing classic narratives.

Our inspiration for this series stems in part from ongoing developments in the business of digital information technology. Digital platform businesses—from Alibaba and Amazon, to Uber and WeChat—are not only historically large and financially influential businesses;[1] they have become economic institutions and even governing regimes unto themselves.[2] Social scientists have critically engaged the particularities of this sociotechnical and economic development, its recent history and effects.[3] Many of their analyses take "capitalism" to be adaptable, altered by technological affordances that enable, among other things, new extractive business models (what Sarah Myers West has discussed as "data capitalism"[4] or Nick Srnicek analyzes as "platform capitalism"[5]), evolutions in systems for economic coordination and exchange (Viktor Mayer-Schönberger and Thomas Ramge's "data-rich markets"[6]), the intensification of consumer data gathering and behavioral "nudging" (as in Shoshana Zuboff's account of "surveillance capitalism"[7]), mechanisms for conscripting labor from users (as in Hamid Ekbia and Bonnie Nardi's concept of "heteromation"[8]), novel organizations of highly precarious piecework labor (as in the "ghost work" described by Mary L. Gray and Siddharth Suri),[9] or, possibly, new forms of capital altogether.[10]

The history of computing has a rich tradition of business studies useful for historicizing these developments. In recent years, the history of computing has drawn special attention to interrelated issues in business and society such as the local contingency of global IT development,[11] changing business models and long-term industrial dynamics,[12] the legal and regulatory frameworks that shape technological development,[13] Silicon Valley and its mythology,[14] and the enmeshing of computer work within histories of colonialism, gender, sex, disability, race, and class.[15]

Building on this tradition, we invite systematic attention to capitalism as a historical subject to highlight how the units of analysis used in the business history of computing—markets, firms, workers, products, managers, and so on—are embedded within broader political–economic and sociocultural forces. Emphasis on capitalism involves more than writing broadly contextualized business histories. It directs our attention to the structures on which commercial institutions and practices depend; and moreover, to the mechanisms by which business, markets, and even the economy itself are distinguished as domains of social activity taken to operate under separate sets of rules.[16] A consideration of the political

Digital Object Identifier 10.1109/MAHC.2020.3011884
Date of current version 21 August 2020.

Published by the IEEE Computer Society
1058-6180 © 2020 IEEE

economy of capitalism, we believe, re-embeds business and economic history in the fullness of their political and social environment; and opens them further to critical analysis in terms of justice, equity, and social power. Recent historical studies of capitalism[17] have analyzed the political economy of capitalism as constituted in and through law,[18] economic ideas,[19] knowledge practices,[20] especially quantitative ones,[21] social visions of the business, markets and the economy itself,[22] political contests over the role of the state,[23] as well as in regimes of colonial and racialized forms of violent power, coercion, and exploitation, including in slavery in the Atlantic world.[24] In calling on the plural and active meanings of "computing capitalisms" in our title, we acknowledge both the variety of forms these structures and powers take historically and geographically; and the possibility of unveiling them through analyses of technologies and practices.

Computing Capitalisms will explore many of these themes and methods over several issues interspersed into *IEEE Annals* editorial calendar. The articles in this first issue illustrate one of the major themes for this series, namely how the study of capitalism—not as a monolithic cause, but as a provocation to engage political–economic specificity—allows inquiry into phenomena ranging in scope from the personal to the transnational. From a junk bond trader's use of spreadsheets in Los Angeles to the high-level political negotiations involved in introducing IBM computers to the Brazilian market, the stories that follow illustrate how a focus on capitalism engages business history with allied fields such as STS, economic sociology, and the history of law and economic policy.

The first three articles showcase new and promising directions in the study of the state at the nexus of the history of computing and capitalism. These works show the importance of the state as a site for observing the coproduction of social visions and technological systems[25] and reveal the central role that historical conflicts over the character and deployment of state powers play in the political economy of IT. The articles engage with the state in three ways. They document, respectively, state knowledge-gathering processes establishing the terms on which technologies are debated as matters of public concern; political contests preceding and shaping the distribution of legal risk and social responsibility for technological systems; and the formation of political alliances that connect the private interests of an IT firm with long-term national economic policy.

In the first article, "Checks and Balances: Publics, Interests, and the Development of Electronic Fund Transfers," Gili Vidan examines the making of banking infrastructure in the U.S. She documents the 1970s work of the National Commission on Electronic Fund Transfers, a group established by the U.S. Congress to study electronic payment systems, identify their goals, and assess the public's interest in them. "At the time of the Commission's work," Vidan notes, "there was no stable thing called the electronic fund transfer. The Commission set out to articulate what potentially it could be." Her article pays special attention to the Commission's handling of numerous consumer letters. Reading against the grain of the institutional history of the Commission, Vidan recounts how the commissioners read and analyzed these letters and shows how the Commission "defined the characteristic of the public in whose interests a new electronic payment system would operate." The relevant and affected public for a technological system, Vidan shows, is constituted in a political process that precedes explicit public discussion of social effects, benefits, and harms. Analysis of this process, she demonstrates, can recover voices framed out of the discussion and the margins of the "public interest."

Next, in "Distributing Liability: The Legal and Political Battles of Y2K," Dylan Mulvin offers a history of the Y2K problem by analyzing the public debates surrounding liability protections for businesses that culminated with the passage of the 1999 Y2K Act in the United States. Y2K exposed both the systemic character of technological risk but also the knotted webs of responsibility for managing it. "Even a relatively small computer system (like one for processing payments in a grocery store)," Mulvin writes, "could expose a tangle of responsibility, as a range of intermediaries were involved in the manufacture, installation

and ongoing upkeep of both hardware and software." Under such a condition, it was uncertain that the knot of responsibilities for potential harms could be effectively untied. Mulvin traces the history of the Y2K Act as a political contest over the deployment of the state's power to mitigate legal risk: describing a "major but temporary effort at reshaping tort law" that "limited the scope and applicability of lawsuits related to liability for the Year 2000 Problem." Anticipatory concerns about legal liability, he stresses, were not technical matters but "political negotiations over responsibility" and the distribution of responsibility between consumers and private interests, as well as between technology firms and businesses that used their products.

Colette Perold's article, "IBM's World Citizens: Valentim Bouças and the Politics of IT Expansion in Authoritarian Brazil," examines the negotiations that enabled IBM to enter the Brazilian market in the 1930s. Examining the "mélange of business, diplomacy, and domestic lobbying" behind IBM's global expansion, Perold reveals how the firm's entry into Brazil occurred through "a multi-year process of turning technological power into political might, and of building business coalitions to bring the wishes of multinational corporations to bear" on Brazilian trade and economic policy. The article follows Valentim Bouças, whom Thomas Watson Sr. celebrated as an excellent salesman, political ally, and leader of IBM's Latin American Bureaus. While positioning himself as one of the most important allies to U.S. business elites, Perold shows, Bouças "was able to weave information processing so deeply into Brazilian administration," giving IBM "considerable power over Brazilian developmental policy in the decades to come." Perold's article brings together computing and capitalism within the framework of Latin American studies.

The issue's featured article, by William Deringer, delves into the malleability of information technologies as tools to organize financial systems. Titled "Michael Milken's Spreadsheets: Computation and Charisma in Finance in the Go-Go '80s," it examines the use of spreadsheet software by the infamous junk bond financier, drawing attention to the charismatic qualities of calculating technologies in financial practice. He documents two specific modes of spreadsheet use: On the one hand, Deringer shows, Milken used the affordances of the spreadsheet in ways consequential to financial decision-making as a mechanical practice—to aggregate market data, perform valuations, and model the future through various "what-if" scenarios. On the other hand, computerized spreadsheets were powerful cultural objects whose evidentiary value and cultural surplus could be used or even strategically omitted, to financial ends, as Miliken "pivoted between emphasizing the mechanical and the mystical'' in his various ventures. These two roles of the technology—as market device and symbol—worked in tandem Deringer explains, concluding that "Milken's operation was much more a social or even cultural achievement than a technical one."

The issue closes with three anecdotes about Luanne Johnson and Burt Grad's journey to preserve the business history of software as they saw it unfolding around them starting in the 1960s. Their work as participant-historians has been extraordinary. It has encompassed everything from preserving the early history of the commercialization of software to leading discussions about the future of collecting at the Computer History Museum.

The initial call for papers for *Computing Capitalisms* has passed, but we encourage you to get in touch with us if you have an idea for an article or department contribution that could fit into the series. We are especially interested in works that address critical issues in business history such as the intersectional dimensions of labor in technology, material and environmental histories, and the carceral dimensions of digital technologies. We hope you enjoy reading this issue and look forward to the next one in the series, coming in 2021.

ENDNOTES

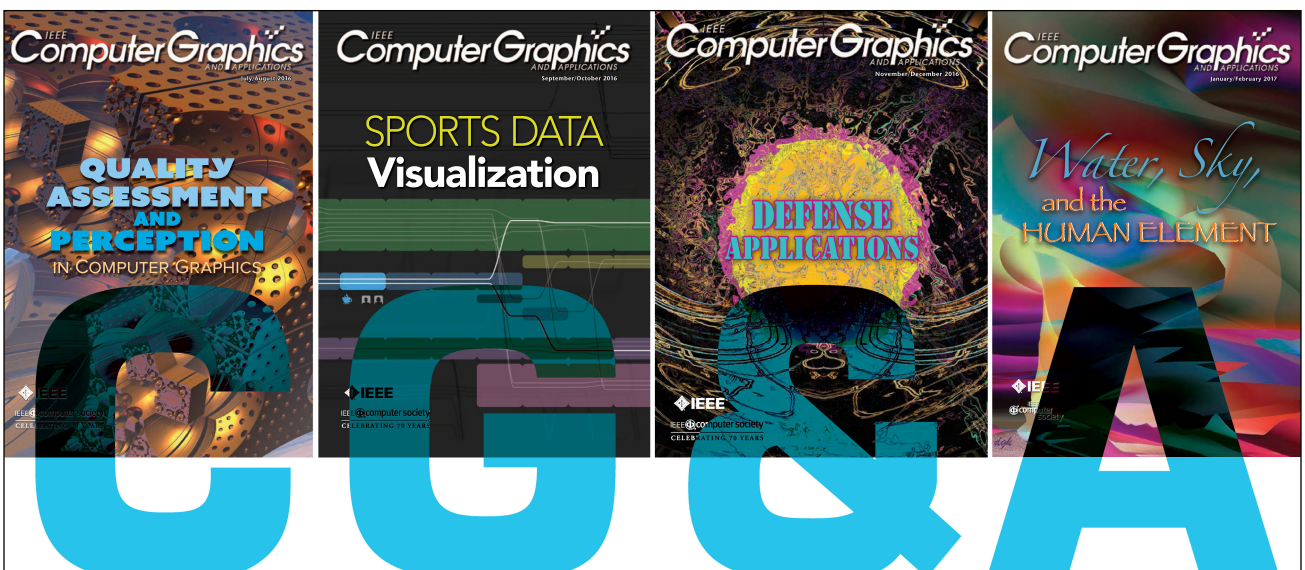
1. On the financial scale and risks of giant tech firms in particular, see Rana Foroohar, *Don't Be Evil: How Big Tech Betrayed Its Founding Principles—and All of Us.* New York, NY, USA: Currency, 2019, especially chapter 10.

2. Platforms are now, among other things, marketplaces, including labor markets, payment operators, trusted third-parties in commercial transactions, and public spheres. Amazon e-commerce is illustrative of what Frank Pasquale calls "functional sovereignty" in big tech: the quasi-state powers of platform businesses. See Frank Pasquale "From Territorial to Functional Sovereignty: The Case of Amazon," *Law and Political Economy Blog*, December 6, 2017. https://lpeblog.org/2017/12/06/from-territorial-to-functional-sovereignty-the-case-of-amazon/; on the internal adjudicatory systems of e-commerce platforms, see Rory Van Loo, "The corporation as courthouse." *Yale J. Regul.*, vol. 33, pp. 547–602, 2016; on platforms in relation to regulation see for instance Veena Dubal, Ruth Collier, and Christopher Carter, "Disrupting regulation, regulating disruption: The politics of Uber in the United States," *Perspectives Politics,* vol. 16, pp. 919, Jan. 1, 2018; on platform's management of the public sphere, see for instance Tarleton Gillespie, *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions That Shape Social Media.* New Haven, CT, USA: Yale Univ. Press, 2018.
3. On the social effects of platforms, see for instance, Safiya Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism.* New York, NY, USA: New York Univ. Press, 2018.
4. Sarah Myers West, "Data Capitalism: Redefining the Logics of Surveillance and Privacy." *Business & Society*, vol. 58, no. 1, pp 20–41.
5. Nick Srnieck, *Platform Capitalism.* Belmont, CA, USA: Polity Press, 2017. Srnieck takes platform capitalism to be a business model predicated on the extraction of data. Platforms are "positioned as intermediaries" capable of profiting from "network effects," and captivating their participants into participation and providing data. (25-7)
6. Viktor Mayer-Schönberger and Thomas Ramge. *Reinventing Capitalism in the Age of Big Data.* New York, NY, USA: Basic Books, 2018. On payment systems see for instance, Lana Swartz, *New Money - How Payment Became Social Media.* New Haven, CT, USA: Yale Univ. Press, 2020, and Rachel O'Dwyer, "Cache society: Transactional records, electronic money, and cultural resistance," *J. Cultural Econ.,* vol. 12, no. 2,pp. 133–153, Mar. 4, 2019.
7. Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power.* New York, NY, USA: PublicAffairs, 2019.
8. Hamid Ekbia and Bonnie Nardi, *Heteromation: And Other Stories of Computing and Capitalism.* Cambridge, MA, USA: MIT Press, 2017.
9. Mary L. Gray and Siddharth Suri, *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass.* Boston, MA, USA: Houghton Mifflin Harcourt, 2019. See also Lilly Irani, "The cultural work of microwork," *New Media Soc.,* vol. 17, no. 5,pp. 720–739, May 1, 2015; and Sarah Roberts, *Behind the Screen: Content Moderation in the Shadows of Social Media.* New Haven, CT, USA: Yale Univ. Press, 2019.
10. Jathan Sadowski, "When data is capital: Datafication, accumulation, and extraction," *Big Data Soc.,* vol. 6, no. 1,pp. 1–13, Jan. 1, 2019.
11. See, for instance, Corinna Schlombs, *Productivity Machines: German Appropriations of American Technology from Mass Production to Computer Automation.* Cambridge, MA, USA: MIT Press, 2019; Honghong Tinn, "Modeling computers and computer models: Manufacturing economic-planning projects in cold war Taiwan, 1959–1968." *Technol. Culture,* vol. 59, no. 4S,, pp. S66–99, 2018, and "Cold war politics: Taiwanese computing in the 1950s and 1960s." *IEEE Ann. Hist. Comput.,* vol. 32, no. 1, pp. 92–95, Jan. 2010; Eden Medina, *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile.* Cambridge, MA, USA: MIT Press, 2011; Martin Campbell-Kelly and Daniel D. Garcia-Swartz, *From Mainframes to Smartphones: A History of the International Computer Industry.* Cambridge, MA, USA: Harvard Univ. Press, 2015; Dinesh C. Sharma, *The Outsourcer: The Story of India's IT Revolution.* Cambridge, MA, USA: MIT Press, 2015.
12. See, for instance, James Cortada, *IBM: The Rise and Fall and Reinvention of a Global Icon.* Cambridge, MA, USA: MIT Press, 2019; Jeffrey R. Yost, *Making IT Work: A History of the Computer Services Industry.* Cambridge, MA, USA: MIT Press, 2017; Shane Greenstein, *How the Internet Became Commercial: Innovation, Privatization, and the Birth of a New Network.* Princeton, NJ, USA: Princeton Univ. Press, 2015; and William Aspray and Paul E. Ceruzzi, Eds., *The Internet and American Business.* Cambridge, MA, USA: MIT Press, 2008.
13. See, for instance, Gerardo Con Diaz, *Software Rights: How Patent Law Transformed Software Development in America.* New Haven, CT, USA: Yale Univ. Press, 2019; and Andrew Russell, *Open Standards and the Digital Age: History, Ideology, and Networks.* New York, NY, USA: Cambridge Univ. Press, 2014.

14. See, for instance, Margaret O'Mara, *The Code: Silicon Valley and the Remaking of America.* New York, NY, USA: Penguin Press, 2019; Joy Rankin, *A People's History of Computing in the United States.* Cambridge, MA, USA: Harvard Univ. Press, 2018, describing the myth, an alternative social history told through users, and the utility model of IT; and Christophe Lécuyer, *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970.* Cambridge, MA, USA: MIT Press, 2007.
15. See for instance, Lisa Nakamura, "Indigenous circuits: Navajo women and the racialization of early electronic manufacture." *Amer. Quart.,* vol. 66, no. 4, pp. 919–941, 2014; Charlton D McIlwain, *Black Software: The Internet & Racial Justice, from the AfroNet to Black Lives Matter.* New York, NY, USA: Oxford Univ. Press, 2019; Mar Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing.* Cambridge, MA, USA: MIT Press, 2017; Elizabeth Petrick, *Making Computers Accessible: Disability Rights & Digital Technology.* Baltimore, MD, USA: Johns Hopkins Univ. Press, 2015; Janet Abbate, *Recoding Gender: Women's Changing Participation in Computing.* Cambridge, MA, USA: MIT Press, 2012; Nathan Ensmenger, *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise.* Cambridge, MA, USA: MIT Press, 2010.
16. See Michel Callon ed., *The Laws of the Markets.* Malden, MA, USA: Blackwell Publishers, The Sociological Review, 1998; Timothy Mitchell, "Fixing the economy." *Cultural Stud.,* vol. 12, no. 1, pp. 82–101, Jan. 1, 1998.
17. For an introduction to the history of capitalism in the United States, its themes and debates, see the conversation in Sven Beckert et als., "Interchange: The History of Capitalism," *J. Amer. Hist.,* vol. 101, no. 2, pp. 503–536, 2014. For an introduction to the history of capitalism centering the analysis of "racial capitalism" including through the work of Cedric Robinson, and its opening to a "history of global political economy" see Walter Johnson with Robin D. G. Kelley, Eds., *Race Capitalism Justice.* Cambridge, MA, USA: MIT Press, 2018. See also, generally, Sven Beckert and Christine Desan, Eds., *American Capitalism: New Histories.* New York, NY, USA: Columbia Univ. Press, 2018.
18. See for instance, Katharina Pistor, *The Code of Capital: How the Law Creates Wealth and Inequality.* Princeton, NJ, USA: Princeton Univ. Press, 2019 and Christine Desan, *Making Money: Coin, Currency, and the Coming of Capitalism.* New York, NY, USA: Oxford Univ. Press, 2014.
19. See for instance, Angus Burgin, *The Great Persuasion: Reinventing Free Markets since the Depression.* Cambridge, MA, USA: Harvard Univ. Press, 2012.
20. For an historical introduction to the "science-capitalism nexus" see Lukas Rieppel, Eugenia Lean, and William Deringer, "Introduction: The entangled histories of science and capitalism," *Osiris,* vol. 33, no. 1, pp. 1–24, Oct. 2018.
21. See recent works including Jamie L. Pietruska, *Looking Forward: Prediction and Uncertainty in Modern America.* Chicago, IL, USA: Univ. Chicago Press, 2017; Eli Cook, *The Pricing of Progress: Economic Indicators and the Capitalization of American Life.* Cambridge, MA, USA: Harvard Univ. Press, 2017; Josh Lauer, *Creditworthy: A History of Consumer Surveillance and Financial Identity in America.* New York, NY, USA: Columbia Univ. Press, 2017; and Dan Bouk, *How Our Days Became Numbered: Risk and the Rise of the Statistical Individual.* Chicago, IL, USA: Univ. Chicago Press, 2015.
22. See for instance, Susan Buck-Morss, "Envisioning Capital: Political Economy on Display," *Critical Inquiry,* vol. 21, no. 2, pp. 434–467, 1995; Julia C. Ott, *When Wall Street Met Main Street.* Cambridge, MA, USA: Harvard Univ. Press, 2011; and Janet Traflet, *A Nation of Small Shareholders: Marketing Wall Street After World War II.* Baltimore, MD, USA: Johns Hopkins Univ. Press, 2013.
23. See for instance, Kim Phillips-Fein, *Invisible Hands: The Making of the Conservative Movement from the New Deal to Reagan.* New York, NY, USA: Norton, 2009; and Manuel Tironi and Javiera Barandiaran, "Neoliberalism as political technology: Expertise, energy and democracy in Chile" *in Beyond Imported Magic: Studying Science and Technology in Latin America.* Eden Medina, Christina Holmes, and Ivan da Costa Marques, Eds. Cambridge, MA, USA: MIT Press, 2014.

24. For work on slavery and capitalism with significant overlap with the history of information technology and management information practices, see Caitlin Rosenthal, *Accounting for Slavery: Masters and Management.* Cambridge, MA, USA: Harvard Univ. Press, 2018. See also Walter Johnson, *River of Dark Dreams: Slavery And Empire In The Cotton Kingdom.* Cambridge, MA, USA: Harvard Univ. Press, 2013. For histories of colonialism and finance in the Americas see for instance, Claudio Saunt, "Financing dispossession: Stocks, bonds, and the deportation of native peoples in the antebellum United States," *J. Amer. Hist.,* vol. 106, no. 2, pp. 315–337, Sep. 1, 2019; and Peter J. Hudson, *Bankers and Empire: How Wall Street Colonized the Caribbean.* Chicago, IL, USA: Univ. Chicago Press, 2017.

25. See Sheila Jasanoff "Future imperfect: Science, technology, and the imaginations of modernity," in *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power,* Sheila Jasanoff and Sang-Hyun Kim, Eds. Chicago, IL, USA: Univ. Chicago Press, 2019, pp. 1–33.



IEEE Computer Graphics and Applications bridges the theory and practice of computer graphics. Subscribe to *CG&A* and

- stay current on the latest tools and applications and gain invaluable practical and research knowledge,
- discover cutting-edge applications and learn more about the latest techniques, and
- benefit from *CG&A*'s active and connected editorial board.