THE ECONOMICS OF IT AND DIGITIZATION: EIGHT QUESTIONS FOR RESEARCH[1]

Erik Brynjolfsson
Stanford Digital Economy Laboratory, Stanford University,
Stanford, CA 94305 U.S.A. {ErikB@stanford.edu}

Chong (Alex) Wang
Guanghua School of Management, Peking University,
Haidian District, Beijing, 100871 CHINA {alexwang@gsm.pku.edu.cn}

Xiaoquan (Michael) Zhang
Chinese University of Hong Kong,
Shatin, N.T. HONG KONG {zhang@cuhk.edu.hk}

During the past 30 years, information technology (IT) and digitization have profoundly changed the economy. The development of these technologies has not only generated challenging research questions but also provided novel tools for answering them. IT researchers now use transformative IT and ubiquitous digitization to actively contribute to other fields.

Theorists studying the economics of IT and digitization have embraced opportunities for innovative studies of the economy. We have explored basic economics-related methodologies, questions, and emerging topics such as the future of work, the changing boundaries of the firm, online auctions, and online consumer behavior. IT research now drives frontier work in finance, marketing, operations management, and even human resource management. Yet, to what extent are economics of IT researchers leading this theory advancement? Are we running out of low-hanging fruit or creating a combinatorial explosion of innovations?

In this essay, we urge IT researchers to expand economics of IT research's boundary to make it a reference discipline for other fields. New and innovative research projects must push beyond the boundaries that restrict questions and methods. We must focus on novel and interesting research questions,

adopt correct and useful methods, and achieve important and impactful research outcomes.

Table 1 presents six evaluation criteria for evaluating and advancing new economics of IT and digitization research. They are helpful for us to expand research questions, methods, and outcomes.

Such expansion requires that we embrace distruptive research and shatter our imaginary security and fictitious identity.

Opportunities for Leading Economics of IT and Digitization Research

IT has profound, broad, and multifaceted implications for economic development. Nano data from the digitization of production, market transactions, and human behavior allow rapid data-driven decision making (Brynjolfsson and McElheran 2016; Brynjolfsson et al. 2020). AI and automation technologies boost productivity in all types of businesses, but at the same time disrupt the labor economy. Products and services are merging online and offline experiences, and consumption is becoming more social. Consumers are making better choices by using search engines, recommender systems, and AI-powered decision-support tools to retrieve and process information.

Table 1. Criteria for Evaluating New Economics of IT Research
Questions: *Novel* and *Interesting*
• Is the research question relevant to the disruption caused by new IT?   • Does the research question address common, new challenges in practice?   • Will the research question offer economists and managers new insights into topics such as choice, coordination, scarcity/abundance, and human and machine rationality?
Methods: *Correct* and *Useful*
• Are the conclusions rigorously supported?   • Are the methods informative/useful for practice?   • Are the findings generalizable?
Outcomes: *Important* and *Impactful*
• Are the findings important to key stakeholders of the economy?   • Does the research offer clear guidance for strategy and policymaking?   • Does the research challenge the status quo regarding current beliefs/norms?

Markets are changing too. Digital markets are lowering prices, increasing variety and transparency, and allowing consumers and businesses to search more efficiently (Brynjolfsson and Smith 2000). New IT such as chatbots, blockchain, virtual reality, and live streaming will further lead to a more open, sharing, efficient and increasingly digital economy.

Just as IT has disrupted the economy in the digital age, researchers studying the economics of IT and digitization should go beyond narrow research silos and confront challenging theories of decision making, industrial organization, labor economics, social welfare and equality, and other subfields of economics. We should ultimately be a reference discipline for research in fields such as marketing, finance, and operations management, particularly by answering forward-looking questions and shifting attention to broadly defined topics.

Table 2 highlights eight important but under-researched questions for the next generation of economics of IT theories. These challenging and disruptive questions suggest promising research opportunities. For each question, we propose some example research topics according to the judging criteria.

Leading the Research Paradigm Shift with IT

Research on the economics of IT and digitization should fully embrace new IT-enabled research methodologies. Digitization and computation technologies have profoundly transformed social science research, particularly economics, and provided new tools for qualitative and quantitative understanding of society. Nano-data, machine-learning, and disruptive digital infrastructures are empowering a paradigm shift that features semi-automatic theory discovery, prediction-oriented research, and massive field experiments (Figure 1).

Nano-data from search engines, clickstreams, social media posts, and IoT open new frontiers for accurate predictions. Remote sensing and mobile device data provide comprehensive spatial information once difficult to obtain. Faster mobile broadband connections, higher-resolution cameras, and smarter digital machinery continue expanding full-spectrum, real-time observations of socioeconomic activities. Even better, digital platforms yield real-time quantitative data. Massive online field experiments conducted on such platforms offer invaluable opportunities for theory development (Gupta et al. 2018; Karahana et al. 2018).

Advanced machine learning algorithms may disrupt methods for discovering and testing theories by providing abundant and surprisingly effective tools for analyzing nano-data. Economics of IT research has just begun to embrace applications of machine learning algorithms to generate new variables, inspire innovative questions, suggest new theories, empirically identify causal relationships, predict counterfactuals, and simulate policy outcomes.

Nano-data, machine-learning, and digital infrastructures drive disruptive paradigm shifts in theory development. Researchers can now conduct extensive field experiments beyond previous capacities. They can analyze real-time, nonstructured data for new insights, innovative patterns, and accurate theory- and data-driven predictions. Such changes will continue challenging the current paradigm of economics of IT and digitization research.

Table 2. Challenging Questions for Investigating the Economics of Digitization and IT		
Challenging Questions	**Criteria and Examples**	
1. How does IT change organizations?	New/ Interesting	• How would IT-enabled decentralized decision-making change work and management practices?
	Correct/ Useful	• How should we collect data/conduct experiments in newly emerging organizations?
	Important/ Impactful	• How do the new forms of organizations and business models change society? • How do virtual organizations and remote work impact labor force participation and gender wage gaps?
2. How does IT create new markets?	New/ Interesting	• How should we design markets to accommodate disruptive technologies? • How should data transactions be organized?
	Correct/ Useful	• Should we revise economics theory to embrace the sharing economy and markets based on blockchain technology? If so, how?
	Important/ Impactful	• What new policies are needed to regulate market participants?
3. How do AI and big data transform decision-making?	New/ Interesting	• AI and data-driven decision making (DDD) augment mental processing. How do the changes compare with the disruptions that occurred during the Industrial Revolution? • How will AI and DDD change managerial mindsets and actions? • How do AI and DDD change rationality levels among economic agents?
	Correct/ Useful	• Will IT limit workforces to those who instruct machines and those who follow the instructions? • How do AI and DDD change previous rational and behavior models?
	Important/ Impactful	• Will AI and DDD increase market efficiency? • What ethical and legal issues are associated with the use of AI and DDD in markets and organizations?
4. How do IT and the new digital divide affect inequality?	New/ Interesting	• What roles do environmental, social, and corporate governance (ESG) play in the new economy? • When does computational power generate superior decisions?
	Correct/ Useful	• What practices will best enable IT to reduce social, economic, and informational inequalities? • Should policymakers address inequalities created by first-mover advantages in AI investments?
	Important/ Impactful	• Does IT development generate industry superpowers? • How can we limit market power but promote innovation in big IT companies? • Is IT an equalizer or polarizer? How can we ensure equal access to information and social resources?
5. What principles should be established regarding data ownership and privacy?	New/ Interesting	• Who owns the rights to individual data? • How can we measure the value of data? Are data transactions similar to the economics of goods and resources?
	Correct/ Useful	• How should economics research empirically account for data privacy? • Can first-degree price discrimination be achieved? What are the economic consequences? • When and how do people choose between privacy and convenience?
	Important/ Impactful	• Should we encourage platforms to provide privacy through rewards or punishments? • With more data being collected by various devices such as IoT, should data ownership be regulated? If so, how?

Table 2. Challenging Questions for Investigating the Economics of Digitization and IT (Continued)		
Challenging Questions	**Criteria and Examples**	
6. How does technology create or mitigate cyberbalkanization, filter bubbles, and echo chambers?	New/ Interesting	• Should developers of IT systems introduce bounded rational IT to prevent cyberbalkanization? • How do collaborative filtering algorithms create social chasm?
	Correct/ Useful	• Is optimal choice an illusion despite accurate predictions from recommender systems and preference-revealing algorithms?
	Important/ Impactful	• Should filter bubbles and echo chambers be prevented? If so, how? • Who should determine optimal levels of social interactions?
7. How should we measure the digital economy?	New/ Interesting	• How do digital business models generate previously uncaptured variables?
	Correct/ Useful	• How can we correctly measure intangible social value when value creation itself is more and more digital? • How should national income accounting measure non-monetary transactions of digital goods and services?
	Important/ Impactful	• How can government regulations promote and/or discourage digitization of the economy?
8. How can we reconceptualize the Economics of IS research field?	New/ Interesting	• What alternative research methods might be used beyond analytical modeling and empirical studies of observational data and experiments? • Can AI generate theories based on access to nano-level economic data?
	Correct/ Useful	• As new technologies develop rapidly, is causal inference still important or even more so? • Should we extend the unit of analysis beyond individuals, groups, and organizations to include ideas, tasks, and algorithms?
	Important/ Impactful	• Should economics of IT research be generalized and morphed to quantitative IT or the science of IT?
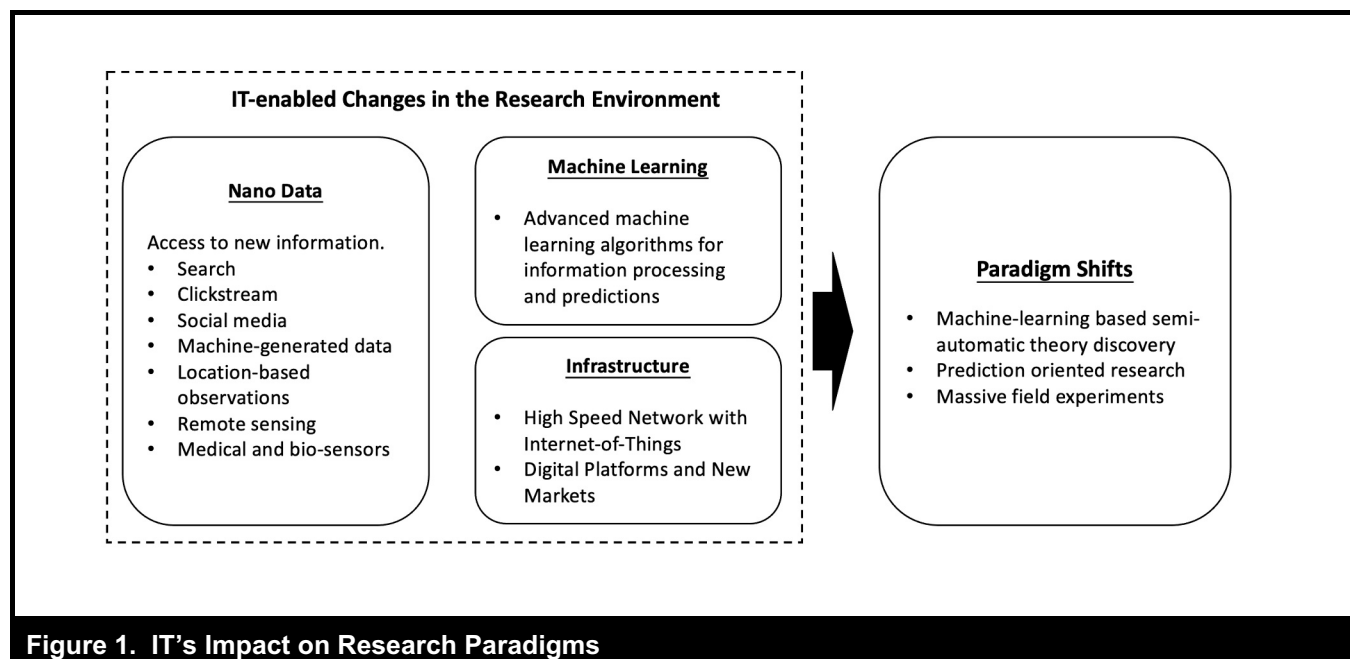
Figure 1. IT's Impact on Research Paradigms

Concluding Remarks

Next-generation innovation requires economics of IT and digitization researchers to lead in embracing new research methodologies and answering new questions.

The future requires all community members to recognize the value of interdisciplinary research, ask the right questions, accept new methodologies, and contribute to other disciplines.

To achieve our goal to be a reference discipline for other fields, we must expand our questions, methodologies, and outcomes. Our research can and should bring IS/IT knowledge or methods to management disciplines outside our domain. We must consider questions that may appear to be more relevant to marketing or finance if the questions address novel and important challenges in the digital economy. Simultaneously, we should adopt unfamiliar methodologies that appear to address economic questions in data science and machine learning. Such openness and confidence will create important interdisciplinary research opportunities that contribute to all fields.

Our doctoral programs should promote interdisciplinary training. Beyond mastering theories and econometrics, students must be able to work with big data, advanced data-mining techniques, and deep-learning methods, while adhering to business operations, working on-site, and collaborating with practitioners in building IT systems with sound economic rationale. Our journals should use simpler review processes that will allow publication of APIs, software packages, short original ideas, and reports of fieldwork with quick iterations. Fast track publication opportunities should go to research that targets pressing issues such as inequality, data ownership, and new disruptive mechanism design. We may also open review processes and engage more researchers in the development stage of large projects.

Research on the economics IT and digitization should take the lead in embracing new research methodologies and answering new questions. After all, next-generation innovation can happen only when we are willing to take such calculated risks.

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