# Developmental implications of the digital revolution

Professor Chrisanthi Avgerou
London School of Economics and Political Science

**Introduction**

The discourse on the transformational socio-economic effects of IT has lately acquired renewed audacity. Academics, economic analysts, journalists and business strategists draw our attention to the nearly worldwide mobile phone diffusion and significant advances in internet connectivity, a huge and increasing stock of software applications available as service over digital platforms, big data analytics, blockchain, and machine intelligence. They predict transformations across all aspects of society and most prevalent in economic growth, employment, medicine and security.

The extent and the speed of the realization of such effects are debatable. We learned from predictions of transformational effects of earlier generations of IT that the socio-economic impact of technological innovation heavily depends on social and political dynamics. The way the current wave of IT-driven innovation - dubbed the 'digital revolution'[i] - may affect, more specifically, developing countries is uncertain. Optimistic predictions envisage a wide range of life-changing benefits from IT in developing countries, such as mitigation of natural disasters and humanitarian crises, inclusion of the poor in the formal economy, better health through telemedicine, improved education by online courses and participation in the global high-tech industry[ii]. More cautious views acknowledge risks such as 'premature deindustrialization,' that is, the trend of diminishing employment opportunities in manufacturing in developing countries resulting from the use of labour-saving technologies in the advanced industrial economies (Rodrick 2016).

The socio-economic impact of IT is studied across several macro-level disciplines, including economics, geography, and sociology. The field of Information Systems (IS) contributes relevant insights by focusing on the process of IT innovation in organizations. Since the mid-1980s, a stream of IS research on IT-for-development has been studying the diffusion and impact of IT in business and government in countries other than the few advanced economies which are leading the digital innovation race. I draw from this body of research to discuss the extent to

which IT has produced, or might in the future produce, transformative socio-economic effects in developing countries.

**Diffusion and impact of ICT in developing countries**

Until recently there was not much IT in developing countries, at least in comparison to the advanced industrialized countries. Known as the 'digital divide' problem, the very slow diffusion of computers and Internet connectivity in many parts of the world attracted a great deal of attention by international development organizations. Policies fostering telecentres that were intended to bring computer facilities and Internet connections in poor communities did not lead to the expected widespread use of Internet services and telecentre enterprises were often short-lived (Madon et al. 2007).

For many people in poor and remote regions, IT devices and Internet connectivity continue to be in short supply. According to ITU data, Internet penetration in least developed areas is only 7%.[iii] Optimism increased with the spreading of mobile phones in the last 10 years. By 2015 70% of the poorest fifth of the population in developing countries owned a mobile phone (World Bank 2016). Relatively affordable and widely desirable for personal communication, mobile phones have been taken up without policy interventions, bringing for the first time telecommunication capabilities in regions with no fixed telephone lines. But there are still regions without mobile signals, and broadband speed in most developing countries is far below the speed in advanced industrialized countries while prices of Internet connection and mobile phones are higher. The mobile phones of the poor have only basic functionality of voice and SMS. Smartphones, on which mobile telephony converges with the Internet, are beyond the reach of most people in developing countries and so are the digital business and digital services of the digital revolution.

What technology and technology services are available does matter, and we should not expect any country to benefit substantially from the digital revolution without adequate telecommunication infrastructures, advanced IT artefacts and online services. Limited availability of technology is a problem that needs to be addressed by a combination of market and government actions. Yet, it cannot be taken for granted that IT diffusion produces developmental outcomes because the effects of IT innovation are part of many other processes of change in the world's socio-economic conditions. A key question for IT for development research is how developing countries can derive benefits from the diffusion of IT.

Mass media, the popular press and several documents by international developing organizations and think tanks give myriad examples of how IT improves the life of the poor in

such vital aspects as income, health, education and contact with the state. Less frequently we read also about failed projects and shattered dreams of making prosperous modern lives with IT. Similarly, relevant academic literature has produced contradictory messages from mixed evidence. Research that followed the unfolding of some high-profile major initiatives addressing local needs found disappointing outcomes. Indicatively, the donation of computers to school-age children has questionable effects (Kraemer et al. 2009), and the telemedicine services India offered to Africa remains severely underutilized (Duclos 2016). Overall, weighing existing evidence of IT diffusion and its socio-economic consequences around the globe, the latest study of IT diffusion and socio-economic impact by the World Bank (2016) found that expected development benefits remain largely unfulfilled. These are disheartening findings for the many advocates of IT for development. Some policy experts and academics with an active involvement in the diffusion of IT in developing countries came to doubt the power of IT to produce expected transformative development effects. It has been suggested that IT re-enforces existing organizational and institutional weaknesses rather than contributing to their elimination (Kenny 2006; Toyama 2015).

Nevertheless research has also revealed cases of IT that surpassed their initial expectations. Kenya's M-Pesa system for micropayments through mobile phones stands out as a case of innovation addressing needs with imaginative solutions feasible under local conditions (Mas and Morawczynski 2009). Studies of M-Pesa shed light on the socio-economic, technical and other peculiarities that enabled the unique success of M-Pesa in Kenya, even as the system struggled to be replicated elsewhere.

So, while the digital revolution encourages ambitious initiatives for the development and diffusion of digital business and government in most countries, their effects on socio-economic development are far from certain. For example, the Aadhaar project of electronic identification in India is a large-scale digital infrastructure with potential developmental effects. It is imbued with expectations for inclusion of millions of poor people in rural areas and urban slums in the formal economy and social services. It is too early to derive conclusions on whether such expectations will be met. The various questions concerning the unfolding of ongoing innovation such as Aadhaar exemplify the uncertainty confronting predictions of the developmental potential of digital innovation. Will Aadhaar become a springboard for the inclusion of marginalized poor into a modern country's social services and economic opportunities, or will it leave their lives untouched or even worse off? Will it enable the state to treat its citizens with transparency and fairness, or will it become an instrument through which state institutions become more powerful with little concern for fundamental human rights such as individual

privacy? Will the existence of an effective electronic identification infrastructure enable further socio-economic innovation that will benefit the poor and marginalized sections of the Indian subcontinent? Can the Aadhaar innovation experience be emulated by other countries and produce similar socio-economic effects?

Neither macro-level disciplines nor IS provide answers with certainty to these questions, but there are important lessons that policy makers and IT innovation managers can draw from prior research as they are faced with the hype surrounding the digital revolution and try to weigh evidence and decide on effective action. I will highlight two such lessons: the mistake of technology determinism and the importance of local IT services.

## Lessons from IS research on IT and development

### *The problem of technology determinism*

A common mistake in the predictions of the impact of IT is technology determinism, that is, the tendency to forecast socio-economic effects on the basis of what technologies are capable of doing due to their material characteristics and their designed functionality. It is equally mistaken to explain, let alone predict IT innovation and its impact as being determined by the social context of an organization or a country, such as power structures, cultures, etc., a position known as social determinism. Not that contextual conditions do not matter – they matter a lot, but they also change by people's action and the help of technology.

Theoretically speaking, technology determinism locates causal agency solely at the properties of technology and forms propositions of universal impact of specific technologies, irrespective of social context, while social determinism locates causal agency at the social alone, positing that the material properties of technology do not matter as far as human societies are concerned. Avoiding both technology and social determinism means that while IT bears a great deal of potential for improving the performance of organizations and socio-economic conditions of a country, the realization of this potential requires persistent actions for changing organizations and socio-economic conditions, for example by strengthening the management of organizations, developing and enacting institutions of modern society, etc.

An example that demonstrates the fallacy of technology determinism and the interdependence of technology innovation and socio-economic interventions for development is the widespread expectation that diffusion of e-government will solve the problem of corruption that plagues the public sector of many developing countries. There is little evidence that the use of IT in public sector organizations, including the development of services to citizens over the Internet, gets rid of corruption. There are many ways in which administrators can continue

malpractices in computerized public organizations. For example, in Hyderabad, India, a toll-free electronic hotline system intended to streamline complaints and repair requests to the water board was perversely used by administrators who resented the increased monitoring afforded by this system, resulting in repairs not being made in about half of cases reported as fixed in the system (Davis 2004).

Pragmatically, and consistent with IS theory, policy makers and the public should expect incremental, rather than radical, improvements in the performance of the public sector. These can be achieved only if the implementation of IT is accompanied by extensive change of organizational processes and persistent efforts to modernize the bureaucratic administrative model and constrain historically entrenched patrimonial relationships between governments in office and administration.

**The importance of local capacity for IT services**

IT has become amazingly user friendly, with much of its computational complexity hidden behind simple interfaces. Consider, for example, all those apps available on our mobiles. Moreover, most IT functionality is now delivered as a service by a few digital platforms. Increasingly companies rely on cloud computing services for their enterprise systems, new business firms rely on a few digital platforms for e-commerce and e-payment or on the new business models of the sharing economy such as Uber and Airbnb [iv]. And yet, there is evidence that developmental effects are achieved by synergies between users, local entrepreneurs and local service providers. Two examples from my research can demonstrate the importance of having a vibrant local environment of IT services for development.

Since the early 1990s I have been studying the development of software products and services by developing countries and I have seen the importance of advanced local IT capabilities. In the 1980s India and Brazil were the two major countries in the developing world with ambitions for indigenous software production and worked out policies to that effect. But they followed different routes. India's software production was export oriented. Initially selling cheap programming labour to the US and European countries, but later forming software corporations offering full information systems services, India became known in the international literature as the case *par excellence* of a developing country with a highly successful software industry. But this was achieved with a clear preference of contracts in advanced economies, avoiding engaging with local user industries or the government sector. The local customer was considered a 'curse': unable to pay much and awkward to satisfy given their organizational dysfunctionalities. Only around 2006 the globally successful Indian software corporations started

engaging with Indian customers – primarily the Indian government. One of their many technology achievements since then is the development of Aadhaar.

In contrast, Brazil was unable to export software and IS services, mainly because of language barriers. They oriented their software production and IT services industry to the local market. For example, the Brazilian software industry helped local banks to cope with the hyperinflation of the country's economy in the 1990s by developing very advanced banking applications. They also developed a very successful e-voting system that facilitated national elections and the restoration of democracy after decades of dictatorship (Avgerou 2013; Avgerou et al. 2007). In my research in Brazil in 2004-2008 I found a country with a vibrant software industry adding value to the country's user industries and modernizing government organizations. Few noticed this Brazilian achievement because we not good in measuring the value IT adds to other industries. Exports are easier to measure and international organizations that promote development have been keen to highlight the Indian software industry as an example of a developing country that prospers by competing in the global open market.

A second example of the importance of local IT services for a country's socio-economic development is from my research in China (Avgerou and Li 2013). My co-author and I studied clusters of entrepreneurial activity in villages and towns supported by the services of Taobao, a branch of the giant Chinese e-business services company Alibaba. Taobao made it possible for young people with no capital and little prior experience and formal training to start business activity on its digital platform. It provided them with e-commerce services appropriate for the Chinese consumer. Indicatively, unlike eBay, that did not allow communication between sellers and buyers, the Taobao platform was equipped with messaging and voice tools to facilitate information seeking by customers and bargaining. Crucially, Taobao also offered offline business training and support to the micro-entrepreneurs. They thus created the by now famous Taobao villages, bustling with business and lifting families out of poverty.

**Conclusion**

No country can afford to ignore the ongoing digital revolution. Challenging as it is for developing countries to continue investing in IT and IT capabilities, it has to be done. And it is not enough. IT investment does not automatically translate to socio-economic benefits. It requires constant questioning of the effectiveness of historically developed traditions, organizational processes and institutions and interventions by policy makers and managers for change.

It is often suggested that digital innovation follows global technology trajectories and has universal socio-economic effects. Yet, IT innovation and its consequences vary substantially around the world and assumptions of a uniform trajectory of IT-induced socio-economic transformations are bound to lead to wrong guidance for practice and wrong predictions. The digital revolution poses a challenge to developing countries: there are potentially unprecedented opportunities for change, but their harnessing requires the steering of organizational and institutional change. And this is where many developing countries are particularly weak.

**References**


Avgerou, C. 2013. "Explaining Trust in IT-Mediated Elections: A Case Study of E-Voting in Brazil," *Journal of the Association for Information systems* (14:8), pp. 420-451.

Avgerou, C., Ganzaroli, A., Poulymenakou, A., and Reinhard, N. 2007. "ICT and Citizens' Trust in Government: Lessons from Electronic Voting in Brazil," *9th IFIP WG9.4 international conference: Taking Stock of E-development,* L. Silva and C. Westrup (eds.), Sao Paulo.

Avgerou, C., and Li, B. 2013. "Relational and Institutional Embeddedness of Web-Based Entrepreneurial Networks: Case Studies of Netrepreneurs in China," *Information Systems Journal* (23:4), pp. 329-350.

Davis, J. 2004. "Corruption in Public Service Delivery : Experience from South Asia's Water and Sanitation Sector," *World Development* (32:1), pp. 53-71.

Duclos, V. 2016. "The Map and the Territory: An Ethnographic Study of the Low Utilization of a Global Ehealth Network," *Journal of Information Technology* (31:4).

Kenny, C. 2006. *Overselling the Web?: Development and the Internet*. Boulder, CO: Lynne Reiner Publishers.

Kraemer, K. L., Dedrick, J., and Sharma, P. 2009. "One Laptop Per Child: Vision Vs Reality," *Communications of the ACM* (52:6), pp. 66-73.

Madon, S., Reinhard, N., Roode, D., and Walsham, G. 2007. "Digital Inclusion Projects in Developing Countries: Processes of Institutionalisation," *IFIP WG9.4 9th international conference 'Taking Stock of E-Development',* C. Wesrup and L. Silva (eds.), Sao Paulo.

Mas, I., and Morawczynski, O. 2009. "Designing Mobile Money Services: Lessons from M-Pesa," *Innovations* (4:2), pp. 77-91.

Rodrick, D. 2016. "Premature Deindustrialization," *Journal of Economic Growth* (21:1), pp. 1-33.

The Economist. 2018. "The Ins and Outs: Fixing the Internet Special Report," in: *The Economist*. London.

Toyama, K. 2015. *Geek Heresy: Rescuing Social Change from the Cult of Technology*. New York:

World Bank. 2016. "World Development Report 2016: Digital Dividents," World Bank, Washington, DC.


[i] 'Digital revolution' is a notion that is part of Schumpeterian theory of socio-economic evolution consisting of periods of creative destruction that is driven by technological change. It is juxtaposed with precedent 'industrial revolution' and 'agricultural revolution'.

[ii] See the discussions and papers of the World Economic Forum on Africa www.weforum.org/agenda/2016/05/africa-s-digital-revolution-a-look-at-the-technologies-trends-and-people-driving-it, and https://www.weforum.org/system-initiatives/shaping-the-future-of-digital-economy-and-society visited July 19, 2018.

[iii] ITU (2015). ICT Facts and Figures, available at www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf.

[iv] It should be noted that beyond the issue of IT and development that I discuss here, the concentration of internet services to a few mega corporations of digital services raises fundamental questions about the transformation of the role of the Internet from an infrastructure initially thought to allow for extreme decentralization to an infrastructure that actually creates extreme centralization (The Economist 2018).