The Impacts of Digital and Enabling or Disruptive Technologies+

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Our view of digital and other technologies depends upon our perspective, whether due to our position or which stakeholder group we belong to. It can be influenced by current pressures and/or a past experience and/or expectations. A cost accountant might be concerned with cost-effectiveness and controlling expenditure, while someone in sales might be more interested in revenue generation. Financial pressure and gloomy forecasts might result in an emphasis upon cost cutting rather than the creation of new options that cannot be funded. Good results and a brighter outlook might encourage a more entrepreneurial approach.

Some people are sceptical or cynical. Others are ambivalent or may suspend judgement until they calculate whether a possible application of technology might benefit or disadvantage them. One person might celebrate the democratisation of access to devices and various apps, and welcome wider opportunities to participate as barriers to inclusion and competition are reduced. Another may be more concerned about the loss of control of personal data, what organisations know about us and a concentration of rewards of entrepreneurship.

Perceptions and Applications of Emerging Technologies

Our descriptions of new and evolving technologies are revealing. Describing them as "enabling" might be regarded as positive. It could suggest a focus on the new possibilities that they might create. Referring to them as "disruptive" could be evidence of concern for potentially negative consequences. Lack of awareness and being behind the curve could result in a technology that has been around for some time being described as "new". Avoiding adjectives could be evidence of a neutral position or a more nuanced view.

In themselves, information technologies are neutral. Whether they help us or harm us depends upon how we use them, who uses them and for what purpose, and how they are adopted and implemented. What can we learn from past experience, particularly of the adoption of digital technologies and their impacts upon people and productivity? They can be deployed to squeeze more out of people or to better support them. Either way, the assessments of some stakeholders may differ from those of others, even within the same category. Thus some customers may be happier with automated processes than others, who might prefer some form of human interaction.

We can also adopt digital and other technologies to improve existing activities, transform them or enable new business models. Expectations of changes in performance and productivity and the criteria used to measure success usually reflect which of these approaches are adopted. Higher returns might be expected from a transformation project in view of the greater levels of risk it often involves. If the intention is to transform the experience of customers and move a business to an on-line platform, the impact upon the people of an organisation might be regarded as consequential collateral damage.

Where the involvement of people is critical to an activity or process, and their contribution cannot be easily automated or otherwise replaced, they may become the focus of an investment in new technology. Large sums are sometimes spent on recruiting expensive people who are not subsequently engaged, effectively used, or appropriately supported. As situations change, views of what represents 'top talent' can quickly become outdated. Many organisations would benefit from more flexible ways of making it easier for affordable people to understand complex issues and helping them to do important, difficult and stressful jobs (Coulson-Thomas, 2012a). Benefits might include higher motivation and creativity.

Objective Assessment of Emerging Technologies

Decisions on whether or not to adopt new and emerging technologies may need to be taken when little authoritative information is available on the experiences of earlier pioneers. By the time cautious boards react and initiate a catch up move more entrepreneurial firms may have already staked their claims in a new area of opportunity. It is sometimes difficult to learn from the mistakes of others when early adopters are keen to keep implementation issues under wraps to avoid alarming investors and other stakeholders.

Media reports and popular views can sometimes be misleading. Those who produce slides to show the exponential increase in the speed with which selected successful innovations have conquered existing markets or established new ones often overlook the number and cost of failed attempts and the length of time that can often elapse before what with hindsight may seem an obviously beneficial innovation is adopted. Long delays may occur before the lift off point from which take up may begin to be measured. Evidence provided by suppliers and sellers of digital and emerging technologies and the case studies they use invariably suggest success. In contrast, negative impacts and failures may be consciously ignored or hidden.

Sometimes a technological breakthrough triggers successive waves of innovation. Those who succeed at riding an initial wave may later come unstuck and/or fall behind subsequent ones. Confronting technology options is sometimes reminiscent of playing a game of snakes and ladders, or entering a maze that has multiple dead ends as well as routes to more than one outcome, all of which turn-out to be staging points on on-going journeys during which market leadership and competitive advantage may be difficult to obtain and retain, unless a degree of dominance is obtained early on. Even then, holding on to a leading position may require investments in continuing innovation that other players struggle to match. Technology that gives one an edge may also take it away again as it is adopted and developed by others.

Helpful and Harmful Impacts

Objective overviews of overall investments in technologies across industries, sectors and business in general are often difficult to come by. Paul Strassman (1990, 1997 & 1999), a serial CIO and former Vice President of Xerox identified the challenges of assessing the productivity impacts of investments in earlier generations of digital technologies and justifying them. He suggested the overall impact of early investments in digital technology was neutral. However, they widened the range of outcomes. Well-run businesses tended to be

helped and to become more competitive as a result of their investments, while in contrast badly run and struggling businesses were often harmed or became worse.

In practice, one encounters a spectrum of impacts as some adoptions are more appropriate and better handled than others. Some of those who adopt and implement technologies that for them are new seem to make more mistakes than the most fertile of minds would think possible. Certain organisations appear to have an almost unlimited capacity to misuse the most apparently benign technologies. For example, in some organisations, many people spend much of their time sending each other time wasting emails rather than talking to each other and sorting important issues. Communication replaces thinking and decision making.

The potential for either helpful or harmful impacts of technology is reflected in contemporary debates, some of which appear to recur after an interval of years. An example is whether the wider adoption of artificial intelligence (AI) will increase or reduce employment. In reality, it is likely to do both, creating opportunity for some and providing a challenge for others. The net effect will depend upon entrepreneurial flair and committed implementation. AI is also a good example of how technologies that have great potential are sometimes among the slowest to be adopted. To discuss and endeavour to assess the actual impacts of technologies, we need to consider particular adoptions and applications of them.

Artificial Intelligence and Human-Technology Interaction

Within Xerox there were working AI environments during the 1980s. Not all their uses reflected the full potential of the technology. At Cambridge University some recipients of AI workstations and software donated by Xerox left their machines on overnight in winter and the heat they generated helped to keep damp off the walls. This was not a use envisaged by those who initiated the Corporation's university grant programme. What early users do with a technology can influence and constrain how it is viewed by others. There is an interaction between people and technology. Each can limit or enhance the potential and capability of the other. When they are brought together in ways that allow each to play to their particular strengths upward spirals of mutually beneficial development can occur. When AI environments are able to learn and steer their evolution progress may be greatly speeded up, and more humans may fear a loss of control and being left behind (Lovelock, 2019).

In its early days, Xerox Corporation's Palo Alto Research Centre was sufficiently well-funded to allow staff sufficient freedom to develop technologies and technology concepts that matched how they preferred to work and operate. Hence the technology used within PARC which the author encountered in the 1980s, including AI environments, tended to complement human capabilities and intelligence. Accordingly, it was welcomed and viewed positively by its users. Wherever one looked there seemed to be opportunities to amplify human capability with a complementary and personalised intelligence that operated 24/7 with almost unimaginable speed and with what appeared to be an unlimited capacity to analyse data and identify links, patterns and relationships across wide swathes of information and knowledge and to which users could be alerted while they worked.

Elsewhere, applications of technology have often seemed to be about putting humans in their place and either distracting them or replacing them, rather than helping them and setting them free. The processes and systems that were put in place against the imperative of a ticking clock during complex mission critical projects the author was a vision holder of were very different from the AI environments witnessed at PARC. People were expected to modify how they had previously operated and preferred to work to fit in with the requirements of the technology. In such situations, there is a risk that thoughtful and capable people who used to have a degree of discretion might quickly became unmotivated when forced to operate according to rules designed to suit the systems of which they become a temporary appendage.

Deskilling or Supporting the People of Organisations

Digital and other technologies that operate as black boxes and quickly produce answers, responses and solutions can deskill their users and increase their dependence upon the technology concerned. For example, an experienced engineer may weigh a variety of sensory clues such as noise and vibration in order to identify the source of a problem. The use of a push button diagnostic device that speeds up the process may well result in the erosion or loss of this capability and the replacement of the engineer by someone who is cheaper to employ, or a built in self-diagnostic device that is easy to install and use. Whether or not this is desirable from a longer-term perspective will depend upon the situation and context and how quickly they are changing, what new developments are occurring or might occur, the speed of re-skilling and the capability of machine learning, and one's involvement and perspective.

Diagnostic devices and automation have their advantages. They can often ensure greater consistency of performance and may be easier to update than humans. The deskilling and increasing dependency of human users is not an inevitable consequence of the introduction of such devices. The use of a transparent rather than a black box approach that allows a user to understand how each answer was arrived at, or a window that opens and gives a reason for a particular outcome, could increase a person's understanding and capability with each use. Ensuring a relationship between people and technology that could increase the capability of both might enable more complex problems to be identified and addressed. It might also limit the use of scarce natural capital by enabling a device to be repaired rather than replaced.

If certain environments and applications developed at Xerox PARC had been rolled out, they might well have already transformed how we work and learn as well as education and health systems. Paul Strassman (2008) has considered the reasons for the past missed opportunities at Xerox. Despite an objective to derive a half of its income from integrated office systems, Xerox Corporation failed to leverage technologies that it had played a key role in developing. Many of the senior management team whose experience had been largely in the copier business did not understand the very different office systems sales and support requirements. Success required building relationships over a longer period, at a senior level and with a group of decision makers rather than a print room manager. A new strategic direction and new technologies need to be accompanied by the people and capabilities required to understand and implement them.

Adopting Complementary Technologies

If people and/or a particular business model are important, adopted technologies should complement them. Paying for talented people may make little sense for organisations that cannot harness, or capture and share, what they do differently. While a process vision holder of complex mission-critical projects as energy markets opened up, I encountered a willingness to spend large amounts on new suites of processes and systems that were largely the same as those used by most competitors, but a reluctance to spend relatively small sums on practical performance support tools that would quickly transform how people undertook key jobs that contribute directly to key corporate goals and enable them to learn and stay up-to-date, deliver multiple other benefits for both them and the organisations concerned, while providing huge returns on investment (Coulson-Thomas, 2012a & b, 2013)..

In some contexts we need to move on from single-issue initiatives such as preparing a few 'high fliers' for an unknown future, to boosting the performance of key workgroups and enabling them to upskill and re-skill as they work to match changing requirements and priorities. We also need to adopt affordable approaches which can achieve improved results by taking people as they are, rather than as we would like them to be. Performance support offers a route to a high performance organisation with the people one has and can attract and retain, and with an existing corporate culture. Regularly updated 24/7 support can ensure people stay current and remain vital.

One should not adopt a new technology or approach just because others have, it appears trendy or suppliers champion it. Hype can lead to expensive, time consuming and frustrating journeys to dead ends or quicksand, when much better and cheaper alternatives may exist. In order to transform performance, many people still adopt general, expensive, time consuming and disruptive approaches such as corporate wide restructuring, motivational drives or culture change programmes that often fail to deliver. A more cost effective approach that can also incorporate AI may be to adopt a better business model and/or provide support that makes it easier for key work groups to excel at difficult jobs, by either adopting the approaches of high performers or better confronting novel situations. Continuing relevance can be helped by flexible and complementary technologies that adapt to changing circumstances.

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