

Conclusion

INTRODUCTION

Businesses of all shapes and sizes and across all industries are undergoing an aggressive transformation as they compete in an increasingly digitized world... To address these challenges, many organizations must reassess their IT strategy to ensure their infrastructure supports and enables digital transformation (Smith, 2021, April, para.1).

This book has illustrated how digital technologies have been deployed in different organisational settings, and a range of related themes have been discussed. Case studies have been used to generate frameworks and guidelines that may help practitioners and provide new material for other researchers. Some chapters have been more technical and attempted to enlighten the reader regarding how technology can be best applied and managed. This chapter now draws upon these findings and perspectives and some recently published material to explore the implications of digital transformation for IT strategy development and implementation.

Digital transformation has been discussed and assessed with reference to a variety of environments and contexts. At one extreme, the African Union (2020) argue the case for a digital transformation strategy for the continent of Africa. In this Handbook of Research, however, the focus has in the main been on specific companies, organisations or industry sectors, where there are different perspectives on the challenges of digital transformation and how to resolve them. The terms “strategy” (Splunk, 2021), “initiatives” (Tabrizi et al., 2019, March 13), “program” (Turchi, 2018, February 1), “innovation” (Jackson, 2020, June 30), “framework” (Modiba & Kekwaletswe, 2020), “elements” (Bonnet & Westerman, 2020, November 19) and “roadmap” (Kirvan, 2021, March 8) are used by different authors in conjunction with digital transformation, sometimes within the same text. Tucci (2021, March 10) also suggests a similar but more elaborated list of “14 tips for successful digital transformation” (para. 35). A distinction can be made between a project that is designed to kick-start a number of initiatives across an organisation to implement digital technologies and associated change, and on-going strategy that incorporates the multiple aspects of digital transformation. The two may well be related, and there is room for both, but they are different concepts.

So, for example, when Tucci (2021, March 10) asks “who should lead digital transformation?” and suggests “digital transformation leaders are typically C-level executives with budget, influence and respect,” and “it is typically the CEO who appoints the person in charge of the digital transformation initiative” (para. 35), this is best seen in the context of a short to mid-term cross-company change project to move digital transformation forward. This may lead to development of strategy, but it is not a strategy

in itself. Similarly, when Gareiss (2021, February 8) asserts that “assembling the right team is the most important component of an effective digital transformation strategy” (para. 1), this is more in the context of a specific, probably one-off, project to establish the strategic components of digital transformation and kick-start related initiatives or use cases. However, such initiatives will probably become part of the implementation of wider IT and other corporate strategies, and the team, which may include external consultants, will probably be temporary, with team members eventually returning to their “day jobs”, although these may well be somewhat changed. This type of “special project” to give energy to, and find a solution to, a particular business issue or problem is not unusual, and has been used by many organisations for a range of purposes, notably since the growth of business process re-engineering in the early to mid-1990s. Such projects will usually have lasting impact, and may bring about structural or process change, but they are not a strategy in themselves. They are part of process that helps amend and adjust existing strategies to take on board the implications of major shifts in internal or external environments, in this case that relating to digital technology deployment.

The one exception to this general picture is, arguably, the automotive industry. Here the scale of change and business reinvention is so dramatic that the ownership, development and implementation of IT strategy is already evolving and may change significantly for the long-term. As Kerstin Felser notes, “the automotive industry is undergoing a transformation from a hardware-centric to a software-enabled or data-driven industry. New competencies, knowledge, skills and a new digital mind set will become one of the most important assets for creating sustainable competitive advantages” (chapter 20). Tina Wiegand and Christine Brautsch also conclude that “in the field of connectivity and (shared) mobility services, the established companies are faced with a multi-dimensional disruption initiated by new technology leaders. This will radically change existing business models by establishing a new culture of use for the automobile, based on new digital networking and operating platforms. Future success will depend more on capabilities in the field of digital product features and connectivity than on developing and producing cars” (ch.14). This will inevitably result in some change in the allocation of responsibilities for IT, but this is not just because of digitalisation *per se*. Automotive companies are becoming technology companies, and their main product is more networks and digital technologies than combustion engines and metalwork. As with most technology product companies, the allocation of IT responsibilities and operations will differ somewhat from companies in other sectors.

Overall, the evidence from numerous case studies and examples in this book suggests digital transformation should be incorporated into IT strategy, rather than constituting a separate strategic strand or activity. However, this makes some important assumptions about the nature of IT strategy and the IT organisation. Firstly, “IT” is understood in its broadest sense to include information systems and information management strategies, as well as information technology itself. Secondly, the strategy must be aligned with the overall business goals of the company or organisation, and encompass business change issues relating to business processes and people skills and competencies. As such, the IT strategy is embedded in the business as a whole. This is emphasised by Jackson (2020, June 30) in the specific context of digital transformation. He notes “a successful digital transformation depends on people effectively adopting new ways of working or interacting with your organization. This means your digital transformation strategy needs to go beyond just the technology to encompass the people and processes that will support it” (para. 4). Thirdly, the “IT organisation” is viewed holistically (Schröder & Müller, 2017), and will include staff across the organisation, regardless of whether they are located in a specific business area, in the IT department or even in third-party external partners. The IT strategy is thus owned by the organisation rather than just the IT function, with the CIO (or Chief Technology Officer) proac-

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tively leading the initiative. Fourthly, whilst use cases and pilots using agile methods have their place in testing and evaluating different technologies, the IT strategy should not be developed and amended based purely on pilot project outcomes. Rather, a top down approach to strategy development is needed to ensure alignment and coordination across the organisation. As Andrea Altundag notes in the context of analytics at a large aircraft manufacturer, “the introduction of tools has, to date, largely been limited in scope or tactical, and ‘bottom-up’. An integrated ‘top-down’ strategy is required, ensuring end-to-end connectivity and the availability of all the internal and external data. Alignment with overall business strategy and data governance procedures is essential” (ch.6).

Digital transformation can be incorporated into IT strategy by developing and expanding the scope of the key change dimensions of technology, process and people to include both internal and external environments. These three dimensions of change provide a viable framework for managing the development of IT strategy to incorporate digital transformation dynamics in goals, objectives, methods and action plans. A key new component compared with a decade ago is the stronger and significant external focus to complement the internal perspective. These dimensions will in general take on a wider scope because of the all-pervading nature of digital technologies. The digital transformation aspects of these three dimensions are summarised in Table 1 and discussed below, drawing on the findings of the previous chapters.

Table 1. IT strategy dimensions: digital transformation aspects

| Dimension/Focus | INTERNAL | EXTERNAL |
|-------------------|---|--|
| TECHNOLOGY | Plan and budget for digital technology deployment. Use cases (technology aspects). Enterprise architecture. Data management. Cybersecurity. Ethics. | Cloud Services. Platforms. Ecosystems. Fog and edge computing. Technology radar. |
| PEOPLE | New competencies and skills in IT development and support. IT culture review. Advise and support re-training and new skills development in user departments. Possible new management or executive roles (CTO, CDO, CISO etc). | Digital skills recruitment. Co-operative relationships with industry providers. New alliances executive to executive. |
| PROCESS | New IT-user collaborative processes. Use cases (process aspects). DevOps. Agile methodologies. Forecast and forewarn of process impacts in user departments. | Monitor external customer and consumer demand and expectation regarding technology exploitation. Engage in external processes linked to new technology and business networks. Monitor external process change opportunities (B2B/B2C). |

TECHNOLOGY DIMENSION

IT strategy has typically assessed requirements for information systems and basic hardware and infrastructure components – networks, servers, desktops, laptops, mobiles. To these must now be added the digital technologies and the platforms needed to support them and provide connectivity. The digital technologies can productively be trialled through use cases - normally short projects which typically employ agile development methodologies to field test specific tools or technologies, such as analytics and machine learning, as exemplified by Jose Irizar’s study of multi-national companies. Jose concludes “these learnings have been incorporated into IT strategy, and the use case itself has become a key tool in

developing and implementing IT strategy and related objectives. Both strategy and objectives are successful when the use cases address clearly defined business requirements and deliver tangible value” (ch. 2).

Many of the digital technologies that are already having a significant impact in industry and society around the globe, are nevertheless in the relatively early stages of their development or deployment life cycle. This suggests the pace of change and potential benefits are likely to increase, and underlines the strategic requirement for a “technology radar” capability in the IT function. Kiran and Wynn, for example, point out the enormity of change being ushered in by IoT devices and note “the key to this will be the convergence and consolidation of IoT platforms, which will be able to seamlessly exchange data between people, networks, devices and applications” (ch.8). Similarly, Andrea Altundag reports that, even in an advanced aircraft manufacturing company, the use of advanced analytics is only at “intermediate” stage in the maturity model she developed (ch.6). Christine Baker concludes that “immersive technologies have already made major transformations in many sectors which affect our personal as well as professional lives”, but that “what is clear is that these technologies are not a passing fad and are likely to shape the human experience in social, economic, and technological terms in future years” (ch.3). In the AI field, William Sayers observes that “the application of meta-heuristic methods is still in its infancy as a research field, and the possibilities are immense”, and the “emerging capabilities in data science and machine learning should transfer well into the optimisation and meta-heuristics research field” (ch. 4). Similarly, Asif Basit’s research into stigmergy suggests that “recognising the neural nature of processes, and having a mechanism to control the interactions taking place” (ch.12) will allow process managers to rethink how processes should be designed and controlled; and Andrew Nobbay’s research case study in the oil and gas industry highlights the potential of work-oriented social media for generating innovative ideas from increased knowledge sharing and collaboration (ch.11). There again, the deployment of chatbots in industry and society is still in the early stages, as evidenced in Alexander Skuridin’s account of an industry chatbot project in a major steel company (ch.15).

However, IT strategy must also consider the platforms that underpin and facilitate the use of these technologies. Bonnet and Westerman (2020, November 19) assert that “the foundation for digital transformation is a clean, well-structured digital platform — the technology, applications, and data that power a company’s business processes. None of the other digital elements can achieve their full promise without it” (para. 36). The authors suggest that the digital platform comprises three elements: the “core platform”, for the company’s operational and transactional systems; an “agile externally facing platform” that hosts the websites and systems that are accessed by customers and ecosystem partners, which needs to work with the core platform to allow transaction processing via the web and provide customised personalisation through the companies’ applications; and a “data platform” for data storage and analytics. This is a logical assessment, and indeed these three elements have existed for many years in company IT infrastructure plans and associated IT strategy. The main differences now are in the new digital tools and technologies deployed, and the fact that these platforms are now more likely to be hosted off-site, in the cloud.

Whilst the technology dimension of IT strategy has hitherto had some external elements, often linked to the use of third-party software or e-business systems, the deployment of technology external to the company or organisation is of increasing significance, given the availability of storage and operational environments in the cloud, as well as cloud-based wide area network infrastructure. As Aydin Abadi notes, cloud computing “has been drawing the attention of individuals and businesses as a vital game-changing technology” (ch.17), and this is emphasised by Jose Irizar. He concludes “cloud computing is integrally linked with many of the other digital technologies, and can almost be viewed as a digital transformation

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enabler” (ch.2). In addition to digital platforms, there are digital ecosystems to consider. As noted above, a platform is generally conceived of as providing a location for the governance of existing interfaces between systems, applications and associated tools. A decade ago, in many organisations, these were the distinct server environments: one for internal systems (ERP, CRM, etc), one for the company website, and a third for the data warehouse. Now, the physical location is of less significance, but the basic concept is similar. An ecosystem, however, also comprises the underlying structures and interdependencies between the different actors (Adner, 2017). Both concepts function complementarily when implemented in combination within a “platform economy.” However, the management of these platforms and their interfaces with other platforms and ecosystems requires an integrated and comprehensive approach, and underlines the significance of maintaining a sound and logical “enterprise architecture”, for which there are a range of tools to map and analyse an organisation’s business processes, information exchanges and organisational structures. The availability and use of these platforms are global, and Gomez-Morantes et al. (2019) observe that “digital platforms play an increasing role across socio-economic sectors in developing countries” (para.1). One example of this is provided by Martin Aruldoss and colleagues, when they note that development of the “fisherwoman” app in Tamil Nadu will facilitate “links between groups of fisherwomen and online fish delivery services and vendors” and “service providers such as Zomato, Swiggy, TomoEats, may be used to deliver the fish in some instances and improve the fish delivery supply chain” (ch.5).

There are, however, new risks with digitalisation that need assessing and managing in IT strategy. Cutolo et al. (2021, March 9), for example, warn of the dangers of becoming platform-dependent. They note that “given increasing evidence that platforms are likely to use their enormous powers for their own benefit, businesses need a clear understanding of the implications of operating on a platform in order to avoid becoming subordinate entities” (para.14). In addition, “when one is dependent on a platform, existential uncertainty is endemic, exacerbated by the ever-present possibility that anything a platform-dependent business can do, can be blocked instantly and without warning” (para.20). In similar vein, Christian Weber highlights the risk of “vendor lock” with single or multi-cloud strategies. Christian argues “companies, and especially the large multi-national enterprises, need to check their existing technology stack before making a cloud decision. If their IT workloads are designed to work with older technologies, cloud platforms and infrastructure options are likely limited, and might be the first step towards a so-called vendor lock” (ch.9).

IT strategy must recognise the growing importance of data in the digital era. As Jose Irizar records, “although not a new concept, more and more organizations define themselves as ‘data driven’ companies. This implies a challenge to the existing organization in terms of how to accomplish objectives and how to evolve to be able to cope with the new requirements.” Jose concludes that “both organizations studied are adjusting their strategies to accommodate increased investment in cloud and big data. This has involved the introduction of new ‘data sharing’ capabilities, the development of a ‘data catalog’, both having a technology focus, and the corresponding organizational capabilities required for data ownership” (ch.2). Lack of trust in the data is also an issue that requires managing and fixing. In the context of analytics, Andrea Altundag noted that “there is an inherent suspicion that data is of a poor quality, which prevails in the organisation and which demands an effective response, involving the cleansing of legacy data, and definition and strict (automated) quality control of newly introduced data. Only then will the organisation move forward into a more advanced use of analytics” (ch.6).

Data regulation and cybersecurity are closely related issues which require particular focus, renewal and update in IT strategy. Olayinka and Win note “digital technology deployment redraws the cyber threat

landscape and makes redundant cybersecurity strategies and approaches solely focused on securing the network perimeter” (ch.7). A much wider approach is now needed, not least because of the implications of using the cloud. This is emphasised by Christian Weber in his study of multi-nationals. He notes “cloud computing leads to new, more complex security threats. Organizations move their IT applications, databases, and data storage to the cloud, often before any security strategy or consistent ability to secure sensitive data has been developed” (ch.9). In particular, “when applying a multi-cloud strategy, one needs to evaluate the detailed privacy policies from the cloud providers. Multi- and hybrid-cloud approaches are much more complex to coordinate, and therefore pose a higher data protection risk. A single cloud provider’s breach or non-compliance within a multi-cloud deployment can undermine any effort to achieve successful GDPR compliance.” Christian concludes: “ensuring continued compliance with a plethora of new regulations on the horizon will require constant vigilance and careful data management in both the IT function and user departments” (ch.9). In similar vein, Maryam Rezaeian and Martin Wynn reported that “security remains a major issue in cloud computing for universities, and this requires additional resourcing, despite the efforts of cloud providers to build in aspects of confidentiality, availability, and integrity” (ch.1).

Finally, the need for a code of ethics needs to be seen as a component of IT strategy, and this requirement has become critical in the digital era. Peter Jones and Daphne Comfort, in assessing the significance of corporate digital responsibility, point out that “the increasing digital availability of personal data may bring with it the danger that such data will be used to monitor, and potentially constrain, individual and group behaviour, as part of concerted campaigns to reduce personal freedoms and to violate basic human rights” (ch.13). William Sayers adds a further perspective, in concluding that “as more human-centric approaches start to be replaced by computer-driven and optimisation approaches, questions will arise around the ethics of these approaches. It is imperative that these technologies are used with safety foremost in mind, and with considered expert evaluation of their suggestions rather than with blind trust. Should a careless approach result in a loss of life or some other tragedy, besides the obvious and natural desires to avoid such outcomes, trust in these technologies may not recover” (ch.4). Similarly, Jose Irizar focuses on the need for a code of ethics when developing and using AI systems. He observes that “most of the big international companies involved in AI, including the two group companies studied here, have published their own code of ethics. These need to be refined and adapted while the applications evolve” (ch.2).

PEOPLE DIMENSION

The people change dimension in IT strategy has hitherto concerned upskilling of IT staff as technologies have evolved and new systems and tools have been acquired, and identification and support of process owners and systems administrators working out in user departments. With digitalisation, it now takes on additional aspects. These include, for example, the wider training programmes to retrain business staff in IT skills, the establishment of new management roles related to digital technologies and the creation and operation of external alliances and partnerships.

Within the IT function, new roles linked to digitalisation are emerging. For example, in their study of the impact of cloud computing in a major UK university, Rezaeian and Wynn found that “cloud migration has required support staff to acquire new knowledge and skills and has been the catalyst for a new culture of multi-skilling in the IT support environment”, and that “cloud migration required new skills for both first and second-line support teams, and new teams specialising in identity, access, and platform

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knowledge and management, have emerged” (ch.1). Application development staff have arguably been even more affected. According to Red Hat (2019, May 29), digital transformation is “fundamentally changing the way developers do their jobs” (p.3). For example, the use of containers creates “consistent development environments to rapidly develop and deliver cloud-native applications that can run anywhere” (p.3), and this requires planned and budgeted technical skills training for IT developers. It may also involve recruitment of new staff. Christian Weber found that “four of the five CIOs/IT managers interviewed were concerned about the recruitment of high-quality technical staff to ensure they have the right combination of technical skills within the organization. Investment in new technologies such as cloud, AI, data analytics, and cybersecurity needs to be matched by investment in human capital. To solve this problem, some companies are turning to contract workers to fill this gap. However, this strategy in itself presents new challenges, including personal data security and the protection of intellectual property” (ch. 9).

There is, in addition, the general requirement for all IT staff to develop their business knowledge and communication skills. In this context, Jose Irizar notes “certain use cases have highlighted the need for IT strategy to proactively support more advanced understanding of the business environment. For example, in the context of IoT deployment in car fleet data collection” (ch.2). The development of inter-personal skills has become increasingly important for IT staff. Tyagi and Clearfield (2021, July 21) note “technology is actually a team sport where you build on the ideas of your colleagues. Of course, people need to have technical skills. But you also want them to be great collaborators who support and work efficiently with each other. They have to understand how the code they write drives value for the business and helps clients” (para. 6).

Initiatives for the development of a new culture in the IT function and across the organisation also need consideration. Frick (2020, November 9) observes “to successfully drive business value, CIOs must also ensure they are building a digital-ready culture that aligns with the technology they are implementing - specifically, one that creates an environment with innovation in mind” (para.3). The author cites the case of CarMax, where the CIO/CTO emphasised the importance of creating a more digital-ready culture. He recommended infusing the existing elements of company culture with “more of the digital attributes”, “moving away from a project-based organization to a more product-centered organization” and “building some of the core digital capabilities and technologies that would enable [the company] to scale and innovate faster” (para.5). This resonates with the case examples provided by Jose Irizar. He concludes “the use cases illustrate how the IT function needs to focus its resources on customer-centric and value-delivering initiatives, and to evaluate and enable relevant platforms, tools and frameworks. Standardized pipelines, practices and playbooks need to be integrated and deployed with other systems and technologies. Skills, capabilities and attitudes must evolve to keep pace with this continuous innovation. This requires specific training and new management approaches” (ch.2).

Outside of the IT department, in the user functions, new skills and job roles will be needed and major re-training programmes require planning and budgeting for, in liaison with process or line managers, as part of IT strategy. For example, Jose Irizar notes “the two organizations featured in this research are currently undergoing massive re-training programmes, with thousands of engineers being trained in new AI skills in 2021 alone. In parallel, all functions, in addition to IT and R&D, are currently running ‘user story workshops’, with the purpose of identifying business applications for digitalizing and improving existing processes” (ch.2). This gives an indication of how digital technologies can act as a catalyst for major retraining programmes and new investment in human capital development. Andrea Altundag notes in the context of procurement that successful digital technology deployment “requires a transformation

of roles, responsibilities and jobs that allow cross-functional collaboration inside an organization” (ch.6). This highlights the need for “hybrid” managers that have knowledge and experience in both IT and in business functions. This is nothing new, as the need for multi-skilled project managers dates from the early days of integrated business systems in the late 1980s and 1990s, when IT project managers were often re-located in business functions to supervise systems projects and usher in process improvements. In addition, however, there is a growing requirement for developing and honing new competencies in managing multiple projects across the organisation. Huy et al. (2021) note “the challenges of coping with dynamic markets, global crises, and advancing technologies are forcing organizations to transform quickly, which can require multiple, simultaneous efforts on several fronts” (p.1).

Digital entrepreneurship has emerged as a key competence that draws together a number of the issues noted above. Kerstin Felser studied this concept in the German automotive industry, and found that a main concern was “the entrepreneurial challenge to master the new interface between software and hardware development, which have two widely different development methods and technology cycles”, and that “new management qualities and skills are required in the co-developments with strategic partners” (ch.20). In larger companies and organisations, this may result in new roles at executive level, although Jose Irizar notes that in the multi-nationals he studied “there is still a lack of clarity about how different technology-related roles (chief information officer, chief data officer, chief digital officer, chief analytics officer, etc.) relate to each other.” He suggests, nevertheless, that “these roles will become increasingly important in both leading AI/big data projects, and in accomplishing cultural change” (ch.2).

PROCESS DIMENSION

As digital technologies are implemented, changes in business processes are almost inevitable as the organisation looks for benefits delivery from new technology projects. This needs to be planned for and managed through a business aligned IT strategy, and subsequent cost-benefit analysis on a project or case by case basis. As noted above, this may involve new ways of working, changing role briefs and staff re-training, and even a change in the company’s business model in some cases. There are examples in the literature of radical change in business model at companies such as Domino’s Pizza, Capital One, Walmart and Tesla (Tucci, 2021, March 10), but for the majority of companies, processes will be changed, sometimes significantly, but the underlying business model will remain largely the same.

The concept of business model replacement is often more complex than some of the documented case studies suggest. For example, in his analysis of a UK-based SME, Phillip Turner reports that “the company has a wide portfolio of product or service offerings which have very different customer types, markets, value propositions, monetization and value capture attributes. Therefore, company vision and strategies and how they relate to day-to-day operations and the role of technology therein, is not, and cannot, be a simple matter of the often assumed one-size-fits all business model for a company to reason over and strategize about.” His in-depth study and analysis of the company over several years concludes “that the role of technology - whether it be the selection of classes of technology to meet some objective, or, whether digital transformation is itself an objective - is not related to the business model change theme” (ch.16).

Major process change in one particular area of the business may also be seen as a localised change in business model, with limited impact on the overall company model. For example, Andrea Altundag notes in the context of strategic procurement, that “a truly digitally transformed procurement function goes

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far beyond the implementation of new technology, and requires a change in the procurement business model, encompassing people, processes, and culture”, and “procurement needs to develop organisational structures and processes to respond effectively to dynamic sourcing market conditions and upcoming megatrends, such as digitalisation and sustainability” (ch.6). Even with this degree of change in strategic procurement, the basic business model of the aircraft manufacturer may not be majorly affected (although other external events and trends may indeed lead to such a change).

The issue of whether digital transformation is disruptive or not has been discussed in the context of business process improvement and business model change. Tucci (2021, March 10), for example, asserts “make no mistake, digital transformation *per se* is disruptive: emerging technologies such as AI, IoT, robotic process automation (RPA) and edge computing open up entirely new business opportunities and give rise to completely new customer expectations. Companies with the resources and mindset to take the leap gain a competitive advantage, widening the gap between digital laggards and leaders” (para.8). The key point is, perhaps, that digital technologies *can* be disruptive, but that they do not necessarily have to be so. This is clearly evidenced in the contrasting experiences of companies in the German automotive sector and a small equipment assembly firm in the UK researched by Phillip Turner. In the former, Tina Wiegand and Christine Brautsch note that “new forms of cross-industry cooperation and collaboration will be important drivers to shape the upcoming changes”, and “the cooperation between BMW and Intel, or the joint purchase of a manufacturer for digital map and navigation systems by Audi, BMW and Daimler, illustrate how players in the automotive industry in Germany have recognized these challenges, and are working together to shape the future of the industry” (ch.14). On the other hand, Phillip Turner concludes that digital technologies have had no disruptive impact on company processes and that “technology in and of itself has no role in business model change or its management in this company, and remains a concept firmly within project implementation as a facilitative tool” (ch.16).

It is perhaps most appropriate to see digital transformation as a combination of disruptive and non-disruptive activities. Chan Kim and Mauborgne (2019), for example, suggest that “non-disruptive creation opens a less threatening path to innovation for established companies” (p.9), and that the challenge is to “use your creative power and the latest technology developments to solve problems or seize opportunities previously seen as out of reach by conventional means and methods” (p.18). Accenture (2019, February 7) also suggest that disruption will be limited to certain companies, and that there will be a levelling off of the impact of these technologies. They predict that “every company will eventually converge on the same turning point—one where digital-era technology, which began as a differentiating advantage, is something expected from every business. In other words, the digital playing field will eventually even out” (para.2). They nevertheless maintain that “the coming era will be characterized by massive pressure as customers, employees and society make their demands known. But it will also provide tremendous opportunities for those companies that can deliver the appropriate experience at just the right time” (para.5).

Digital technologies have also played a part in significant change in the project management process, in two regards. First, as Tina Wiegand and Christine Brautsch observe (ch.14), agile project management methods are best suited to the type of short-term project with major user involvement that typifies digital technology initiatives. This is supported by Alexander Skuridin’s investigation of a chatbot project in a major steel company. The author reports that “the complex nature of AI projects, difficulty in formulating requirements and need to experiment, require a project management approach, which enables teams to avoid the bureaucracy of the traditional engineering methodologies. Agile methodologies respond to this challenge by establishing adaptive and incremental processes with a strong focus on communication

between the people involved” (ch.15). Second, the COVID-19 pandemic and the nature of globalisation have given renewed impetus to the transition to virtual projects and virtual teams, supported by digital technologies. As Anatoli Quade observes “digital technologies provide the necessary platform to be able to work virtually and facilitate the conduct of complex projects with a high degree of flexibility” (ch.10). More specifically, Tina Wiegand and Christine Brautsch note “the project teams today are diverse teams with very mixed know-how. In terms of tools, Skype and Microsoft Teams are used for virtual meetings and communication. In addition, a lot of work is also done by e-mail, Jira (an off-the-shelf system for planning, tracking, and managing agile software development projects) in combination with Confluence (a team workspace product for knowledge documentation, communication and sharing)” (ch.14).

Overall, then, there is a range of process change aspects to IT strategy that need appropriate assessment and management. Although new technologies are regularly depicted as the drivers of process change, this will often come after technology deployment and people skills training, and can be difficult to implement in practice. This was illustrated in Andrea Altundag’s study of advanced analytics in the strategic procurement function of an aircraft manufacturer. Andrea concludes “coordinating process change with new analytics tools is problematic and can get caught in a negative vicious circle. Existing processes and procedures cannot easily be re-produced and amended in newly applied technologies, which are thus being operated within a legacy process set-up. Fundamental process change is also hampered by concerns for product safety and airworthiness assurance, which constitute significant barriers to procedural change in this industry sector. Realistic process change at present is linked to, predominately, acceleration and reduction of manual activities” (ch. 6). Driving through process change to deliver the expected benefits of new technologies is rarely straightforward, and requires appropriate consideration in IT strategy formulation.

FINAL REMARKS

More than 20 years ago, the journal *Virtual Business* published an article by the author that examined the transition from e-commerce to e-business in industry (Wynn, 2000a). Using a case study of a major drinks company, the article suggested that both e-commerce and e-business had followed a similar cycle of technology innovation - capability development - partnership opportunity - capability exploitation - commercial norm. The author noted “this cycle, which took about 10 years in the e-commerce world, is moving much more rapidly with current e-business initiatives, and we are already in the phase when partnerships are being formed and the opportunities for business exploitation are to the fore” (Wynn 2000a, p.18). Today, with digital technologies, the pattern is similar, but there are two main differences. First, the pace at which this cycle is being enacted is faster, and getting faster still. Second, technology innovations are happening more frequently and in clusters, initiating a series of overlapping and interconnected cycles from innovation to commercial norm.

In the same year, the author gave a presentation at the IT Directors’ Forum at Cranfield University in which he attempted to highlight some of the key challenges faced by CIOs in delivering IT strategy (Wynn, 2000b). This was the era of the ever-widening use of the internet, the early examples of social media technologies in industry to complement the corporate intranet, the ever-growing significance of e-business, new systems and business concepts such as knowledge management and web-based ERP packages, and rapid application development (RAD) methodologies for new bespoke systems incorporating significant user input. The key challenges for the CIO identified in the paper included the “charge

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to e-business”, the growing significance of information and data management, the need to multi-skill the IT team, the need to manage the Board-to-supplier relationship, the business ownership of IT, the role of the IT function in mergers and acquisitions, the need to market the successes and value of the IT function internally as well as externally, and the aftermath of Y2K and related security issues. If “digital transformation” is substituted for “e-business”, and “cybersecurity and data protection” for the one-off Y2K phenomenon, there are clear parallels with the issues facing CIOs today in developing an IT strategy appropriate for the digital era. This surely supports the view that digital transformation, rather than constituting a paradigm shift as some commentators suggest, can best be seen as another step, albeit a significant one, in the evolution of IT and its application in businesses, organisations and society at large.

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