Techno Service Worlds?  
Digitization of Service Businesses

Key Themes

- How are new technologies, particularly digitization, altering service business models?  
  Technology and service businesses  
- Digitization of service businesses  
- Industrialization of service businesses and technology  
- Disadvantages of technology for services businesses  
- Business process management  
- Self-service technology, Internet of Things, big data, robotics, artificial intelligence

Technology and service business have long been allies. During the nineteenth century, the emphasis was on the transformation of manufacturing following the invention of technologies for iron smelting, the steam engine or the rapid expansion of railway networks. This was entirely justified but should not be taken to mean that service businesses were excluded from the costs and benefits of developments in technology; indeed the invention of the electric telegraph not only reduced the friction of distance on effective communications between service firms and their clients but also changed the way in which they operated and created new types of occupations and business models.

This has recently been likened to a ‘Victorian Internet’ that was a precursor to the Internet following the invention of the World Wide Web in 1989 (Standage 2014). As recently as 1993, the Internet was the communication medium used for only 1% of the information flowing through two-way telecommunications networks; this had changed to 51% by 2000 and to more than 97% by 2007 (Hilbert and López 2011). This has dramatically changed the environment within which service businesses now function, an environment in which digital media have almost totally replaced the analogue media that dominated a much smaller volume of digitized information during the mid-1980s. Often referred to as ‘digitization’, there are very few service businesses that do not make use of computers and telecommunications devices; the level and intensity of use will depend on the kind of service being offered—the needs of a hairdressing salon will differ markedly from those of the currency dealing floor of an international bank. This chapter should be read with Chap. 5 as the digitization of service business is part of the on-going debate on service operations and productivity.

But whatever the type of service business, in order to acquire the benefits from technology, there is a requirement to adapt to and change infrastructure and practices. Some service businesses are much better at this than others. Hair and beauty salons, for example, rely on information management programmes for accounting,
payroll, financial reporting, inventory control, scheduling and customer relationship management. But, in addition, more innovative salons have adopted hairstyle and cosmetic imaging software programs that can be used to enable clients to consider different styles before any treatments are applied. These programs come with a standard database of hairstyles and makeup options and can be customized to meet the needs of a particular salon or stylist.

Consumers are playing a critical role in the development of the digital economy. In the US, household consumption and business investment each account for 45% of the ICT sector’s output and government spending accounts for the rest. Household digital consumption has led the ongoing digital transformation of the US economy with innovations targeted at households rather than intended to enhance business or public sector productivity (Manyika et al. 2015, p. 26). An analysis of 22 industry sectors in the US identified the ‘haves’ and ‘have-mores’ in digitization (Manyika et al. 2015). Not unexpectedly, sectors such as ICT, professional services and media are highly digitized relative to several dimensions grouped into assets, usage and labour. At the other end of the spectrum, government, healthcare, hospitality and construction services, many of which are prominent at the local scale, lag significantly in all dimensions. This is not unimportant, in that government and healthcare in particular account for about 25% of employment and GDP of the US, whereas the most digitized sectors account for around 10%. Between these extremes, there are groups of services, especially small- and medium-sized enterprises (SMEs), that have yet to fully develop digitization of customer transactions (education, retail trade, entertainment and recreation, personal and local services). Services that are oriented more towards business-to-business (B2B) transactions, such as real estate, utilities, wholesale trade, also fall into an intermediate group that have yet to fulfil the potential for digital engagement with customers. Here, it is worth considering the disruptive impacts of Covid-19 as sectors, companies and households had to rapidly embrace service digitization including a rapid switch by schools and universities to online provision and with churches introducing virtual religious services. Manyika et al. note that between 1997 and 2013, the most digitized service sectors show the largest growth of assets (2.0x), usage (almost 5.0x) and labour (7.9%). It is important to emphasize that digitization is a general-purpose technology that represents another form of transformational, technological inflection. Thus, innovations in digitization are transforming socio-economic relationships by underpinning process and product innovation throughout the economy.

In this chapter, the focus is on exploring the role that technological innovation has played in the emergence of new service business models and in new forms of service business and work. The emphasis is on the digitization of service operational processes and their impacts. This chapter should be read with Chap. 3 on business models, Chap. 5 on operations and productivity and Chap. 11 on supply chains and logistics. All chapters in this book explore the impacts of technological innovation and digitization on service businesses. Thus, reading and managing service businesses must include an appreciation of the ways in which technological innovation is transforming the management of service businesses.

4.1 What Is ‘Technology’?

Technology can be defined as ‘a means to fulfil a human purpose’ (Arthur 2009, p. 28). There is a task to be undertaken and a way needs to be found for completing it, often taking into account parameters such as time, cost, ease of delivery, processing of raw materials, quality or consistency. An individual, or a group, may be able to accommodate these parameters and successfully complete this task, but to do so in a regular and consistent way to fulfil repeat demand, for example, it is more feasible if a set of tools or machines can be devised to create value from completing the task. These tools and/or machines may be material or immaterial; for many service businesses, computer software, teleconferencing and the use of business methods to improve services to clients are critical immaterial (or virtual) tech-
nologies that in some cases rely upon or complement material technologies such as computer hardware or robot-controlled product-picking systems in large retail warehouses.

The techniques used by service businesses and their employees to organize production, or the user-friendliness of their services, for example, involves the application of technology including digitization. The deployment of techniques to solve problems, fulfil needs or satisfy wants often occurs by harnessing the physical forms of technology such as computers that are now as ubiquitous as paper or pens in the business environment. Both types of technology rely upon the information, knowledge and skills of entrepreneurs and employees to develop, design or implement changes to existing applications or to develop and introduce new or state-of-the-art technologies. This is usefully summarized as the purposeful application and analysis of information, often big data, in the design, production and utilization of goods and services and in the organization of human activities. The types of technological solutions available, although not necessarily used, by service businesses are summarized in Table 4.1.

The rise of the digitization of information, particularly since the start of the twenty-first century, is perhaps the single most important event that has ensured a dependence between technology and service businesses that has superseded their age-long dependence on paper, film or face-to-face meetings for communications internally and with clients/customers.

Central to digitization are developments in access to data and the development of extremely large dataset, or big data. Big data, combined with developments in computer programmes, provides one of the drivers behind the emergence of artificial intelligence (AI) and robotics (see Chap. 5, Sect. 5.3.2). The interaction between big data and computer science has transformed social and economic activity by the application of complex algorithms. We are currently experiencing another form of industrial revolution in which algorithms become critical in shaping social and economic outcomes. Algorithms increasingly

| Table 4.1 Information technology services |
|------------------------------------------|
| Technology                              | Characteristics                                                      |
| Cloud computing platforms               | Data management, including data analytics, that can be accessed from any location. |
| Software applications                   | Designed for specific purposes and can be customized.                 |
| Platforms                               | Developed to manage customized applications including e-commerce platforms, logistics and supply-chain platforms and company information management platforms. |
| Application program interface (API)     | A set of functions, routines, protocols and procedures allowing the creation of applications that access the features or data of an operating system, application or other service. |
| Networks                                | Intra and internet.                                                   |
| Data storage                            | Storage in localized server or on a cloud-based platform.             |
| Data synchronization                    | Synchronization of data across many devices.                         |
| Databases including data analytics      | Assembling, storing and analytics often in real time.                |
| Content management tools                | Enabling documents to be controlled and shared in a secure environment. |
| Content delivery                        | Publishing content automatically to a website or platform.            |
| Transaction processing                  | Platforms that process business transactions including payment.      |
| Workflow                                | Automated systems to manage, control and monitor workflow including supporting business models that are based on charging by the hour for services delivered. |
| Process automation                      | Tools to automate work tasks including e-commerce chatbots based on machine learning. |
| Event processing                        | Managing events including ticketing.                                 |
| Monitoring                              | Monitoring business systems of all types.                            |
| Business automation                     | Platforms that can identify and compare business inputs and make purchasing decisions based on set parameters. |
| Robotics                                | Automated systems, including robotic workers—both actual and virtual. |

(continued)
underpin everyday living. This includes mobile phones and apps, laptops, email, social networking, accessing and viewing online entertainment, ordering taxis and food. Nearly all products and services have been co-created through the application of directly or indirectly linked algorithms. This book has been written using a word processing package that operates through a set of linked algorithms. Banks deploy machine-learning-based algorithms to scrutinize client purchasing activity in real time to identify fraud. Machine learning can be applied to AI to develop systems that automatically learn and improve from experience without being explicitly programmed. Machine-learning algorithms have been applied to finance, including lending decision-making processes and insurance, the legal sector, the criminal justice system, education and healthcare. They have also been applied to core business processes including recruitment and targeting adverts on social media.

The term algorithm needs some elaboration. An algorithm is a carefully structured set of logical instructions that informs a computer to undertake a set of tasks in a defined order. Conventional algorithms have been confused with machine learning, but they are a much more restricted form. Algorithms learn from example by analysing data and experiences to search for patterns and perhaps rules. Conventional algorithms are fully coded in which the programming controls the outcomes or alternatively machine-learning algorithms are partially coded with the emphasis placed on the algorithm’s objectives. Most algorithms that support everyday living include legacy code or code that was written by computer programmers who are no longer employed by the firm using the algorithm and perhaps code that was created with computer languages that are no longer widely used. Major problems can occur based on decisions made in the past as these decisions remain embedded in existing computer programmes. Algorithms require precisely crafted sets of logical instructions. Once these instructions have been written, and a computer code becomes functional, then the algorithm will continue to function. Algorithms are extremely effective in scaling up a solution to a problem; once an algorithm has been developed to solve a problem, then the solution can be made widely available. One of the primary drivers behind the shift towards an algorithm-based society is the drive towards efficiency through automation of tasks via the development of new algorithms.

It is worth reflecting on the computer programme as a task and central to this task is a continual process of debugging. In an account of the coding process, Thompson describes the process of debugging a piece of code in the following way:

Debugging a piece of code is more than just staring at those few lines and trying to figure out why they’re wrong. No, it often requires thinking about the enormous hairball of the entire system: how those few lines interact with dozens of hundreds of other modules of code—each one passing bits of data back and forth. You start with one function; see what other pieces of code it talks to; figure out which pieces of code those functions talk to. Slowly, slowly, you can begin to build up a mental picture of the many-nested-interrelations. (Thompson 2019, pp. 108–109)

The algorithms that support everyday living and economic activity are extremely complex—code building upon code.

Scale is critical as it leads to ‘networking effects’ that lock consumers into companies that are providing algorithm-enabled services (see Chap. 3). Once a social network becomes large enough, for example, WeChat or Facebook, then it becomes extremely difficult for customers to close their accounts, because all their friends are participating in the network. The search for scale is partly driven by venture capitalists who place key performance indicators (KPIs) based on the number of users on technology companies in which they have financial interests. This means

**Table 4.1 (continued)**

| Technology          | Characteristics                                                                 |
|---------------------|---------------------------------------------------------------------------------|
| Internet of Things  | Physical artefacts linked to the Internet and monitored and supported by software services. |
| Artificial Intelligence | Automated systems that can make decisions and engage in continual learning. |

Source: Authors’ own
that a key metric for obtaining start-up finance for a new platform are predictions regarding scale and also the potential for a firm’s products to rapidly create a networking effect.

4.2 Why Not Industrialize Service Business?

Technology such as computers, including artificial intelligence (AI), are now widely used by service businesses to create their ‘products’. This raises the important issue regarding the substitution of service workers with technology and raises the question of can service businesses adopt an industrialization approach to service provision? Industrialization involves identifying and removing redundancies in systems, standardization of processes wherever possible and automation. Industrialization developed through the application of this approach to manufacturing and agriculture in response to enhanced competition and the requirement to reduce the cost base of firms and, at the same time, to reconsider the value creation process.

Industrialization involves operational decisions that focus on the replacement of variable costs with fixed costs through the application of technology. This substitution of labour with capital takes two forms. First is the direct substitution of a task that was previously performed by an employee with a technological solution. This substitution might increase the speed of task delivery. Second is the application of technology to a task that completely transforms the task. This is much more than substitution but reflects a qualitative transformation in the delivery of the task. Thus, any discussion of the substitution of variable costs with capital investment must include an analysis of alterations in task production and delivery. This is to distinguish between qualitative versus quantitative alterations in the creation of service tasks.

The application of technology to tasks that leads to qualitative alterations—the task has been transformed—highlights that labour substitution by technology may be a discontinuous process; a new task is developed that transforms the tasks that it displaces. The shift from analogue to digital represented a dramatic qualitative transformation. The application of AI, machine learning and robotics to the delivery of service tasks is also transformational, creating new types of services. Existing service tasks are being displaced by automated systems. This is an on-going process that involves job destruction combined with the creation of new types of employment.

By the middle of the twentieth century, industrialization had been incorporated into business models widely used by manufacturing businesses to achieve consistent product quality control and to improve employee productivity. In the early 1970s, when the growth and diversification of service businesses was beginning to attract attention, it was suggested that compared with manufacturing, service businesses were inefficient (productivity was poor) and suffered from variability in quality (Levitt 1972). It was proposed that the provision of services could follow the industrial model by investing in technology that was systematically deployed with careful planning to optimize service creation delivery and with consistency in quality. The merits of this approach are clear to see in the case of service businesses that are oriented towards mass markets, such as Starbucks, McDonalds, KFC, Pizza Express, Tim Hortons, CNHLS, Da Niang Dumpling, LEM hamburger and numerous other national market and international market providers. This business model emphasizes standardization of customer experiences (environment, product quality, predefined choice of items and ingredients), timeliness of delivery and low prices. Employees were also expected to make the service encounter a personable and enjoyable experience. This is the antithesis of assembly-line production where the emphasis on time, speed, accuracy of customer order receipt and delivery leaves little scope for personalizing or customizing service delivery. As a result, mass service providers experienced high staff turnover, poor morale and a reduction in service quality (see Chap. 6). They also tended to focus on the provision of low-value but high-frequency service products.
While standardization of services remains at the forefront of some service business models, it has also helped to highlight the significant part played by the personal touch in service delivery and the customization of the service experience. Material technology can be deployed using assembly-line models but irrespective of its impact on costs or product consistency, the ultimate success of a service business, and its efforts to create value and profitability, relies heavily on the human element. And this is not just on the delivery side of the equation; in fast food restaurants, for example, customers are expected to return trays, redundant packaging and unconsumed food to strategically located trash cans and storage, thereby helping to maintain the appearance of the service space and reducing the time and staff required to perform the task. Such self-service is also a feature of other service businesses such as banking that extensively use material technologies such as ATMs that can be used 24/7 by customers, bypassing expensive, staffed branch-based banking facilities (many of which also have ATMs inside). You might think that the bank example points to lowered expectations of personal service, but it also depends on the nature of the service business/customer interface. The most highly rated telephone banking services in the UK achieve high score for the attitudes, helpfulness and knowledge of banks’ call centre employees. This highlights two points: first, that even where material technology (servers, computers, telephones, smartphones) are the core platform for a service, the human interface is a critical element for the delivery of successful service encounters, and second, that because supplying and sharing knowledge is at the heart of many services, in many cases, it will be impossible to use standardization of provision. Mass customization of marketing or call centres is aided by material and immaterial technology; computers are the hardware and computer software is customized to the requirements of the service provider enabling a degree of flexibility or customization. This is not the same as standardization and, ultimately, there is still a necessity for personnel at the interface between the service business and the customer to mediate a transaction and the service experience.

4.3 How Can Technology Assist Service Businesses?

Developments in technologies that could be applied to service businesses were a very gradual process—from the telegraph to the telephone and the typewriter—until the early 1980s when the first desktop and the early 1990s when email, networked computers and the Internet became generally available (Table 4.2). For both employers and employees, these very quickly became very powerful tools for conducting business; emails could be transmitted more or less instantly irrespective of the distance between communicators, large quantities of data and information could be gathered, stored, processed and exchanged using desktop or handheld devices with the capacity and processing power of computers that formally required the space of a large room. It is important to appreciate the impacts that these technologies had on households and consumers. This transformed consumption, but also converted consumers into content producers including the growth in e-publishing but also the rise of social media influencers and, in particular, vloggers.

A computer should not be considered as a stand-alone device. This is especially the case with on-going developments in the Internet of Things (IoT) in which computing devices are embedded in everyday objects, enabling them to send and receive data. A computer has the potential to be connected to any other computer and is able to store, share and process information rapidly. The emergence of integrated networks of computers, including especially smartphones, provided opportunities for the creation of new services and for the transformation of existing services.
Information technology involves the application of computers, telecommunication systems and online platforms to store and share information that has some utility for the conduct of service business. Some examples include email, online customer support software (including chatbots and data bases that contain information that may be directly accessed by customers, e.g. to answer queries or to help resolve technical problems without the need to speak directly with an employee), software for enterprise resource management (ERP) or customer relationship management (CRM), software for streamlining sales processes or electronic shopping carts of the kind used by online retailers (Table 4.1).

Productivity management has long been challenging for service businesses (see Chap. 5). The tools made available by technological innovation, including AI, data analytics and robotics, offer a real prospect for significant advances, especially as tasks, such as planning, co-ordination, collaboration or design, can be performed more rapidly and reliably. This is the case for both tasks internal to service businesses and outward-facing activities including processing customer orders, customer software queries and updates, or service delivery via email, Skype, web forums, online chat rooms or the telephone. Service businesses can use social media to raise their visibility to potential clients including text messaging, online advertisements and online mapping packages, for example, Google Maps. Google Maps provides users with access to satellite mapping, ground-level photography and information about

| 1960s | 1970s | 1980s | 1990s | 2000s | 2010s |
|-------|-------|-------|-------|-------|-------|
| Innovation | Mainframe and databases | Desktop and personal computing | Business software | Internet, platforms including e-commerce | Mobile broadband, social media, social media, smartphones and apps | Big data |
| Technologies | Modern programming languages, advances in algorithms | Desktops and PCs, basic office software, games and visual graphics | Enterprise software | Internet technologies, personal computing | GPS, Wi-fi, 2G/3G, laptops, mobile phones | Smart devices and sensors, predictive algorithms, machine learning |
| Business impacts | Business calculations, database management systems | Document processing, file storage | Efficient and automated business processes | B2B and B2C e-commerce, Email, chatrooms | Remote work and 24/7 connectivity, digital advertising and marketing | Predictive analytics, natural languages, big data, Internet of Things |
| Consumer impacts | Limited | Individuals with computers in larger firms, gaming and document processing | Creative destruction of jobs | Email, e-chatting and VoLP, e-commerce, remote work via VPNs | Connected anytime, anywhere, multiple devices per person, individuals as content creators | Data generation, content creation, digital devices everywhere |

Source: After Manyika et al. (2015, p. 23)
nearby businesses. Google Maps is based on the application of Global Positioning Systems (GPS) to identify the location of GPS-enabled devices. GPS underpins a set of tools developed to explore the ways in which people and products move through space. This enables new services to be created, but also productivity improvements to be identified (Milner 2016, p. 191). It is important, however, not to use technology as a catch-all for enhancing productivity; rather the most effective and efficient tools should be adopted according to a careful evaluation of the outcomes required from a particular task.

The on-going application of digitization to service business has the potential to enhance productivity (Table 4.3). There are three impacts here to consider. First, digitization will enhance labour productivity including the application of online recruitment or talent platforms and the development of digitally enabled flexible work. Second, the Internet of Things (IoT) will continue to link assets with performance and monitoring systems, leading to enhanced asset utilization. This will also reduce energy consumption, facilitating the on-going development of the responsible business agenda. Third, companies investing in big data analytics and in IoT technologies will continue to contribute to enhancing multifactor productivity. This includes developments in applications that connect employees in the field and machine and facility or building monitoring systems. It has been estimated that the combined impacts of digitization on labour, capital and multifactor productivity in the US could generate a combined annual impact of between $1.6 and $2.2 trillion by 2025 and this would increase GDP by between 6% and 8% (Manyika et al. 2015, pp. 12–13).

| Table 4.3 Effects of digitization on service businesses productivity |
|---------------------------------------------------------------|
| **Effect** | **Outcomes** |
| Labour: increased supply and productivity, including accessing labour remotely | Increased labour force participation including inclusion. Recruitment platforms better able to match applicants with jobs including an increase in speed. Increased labour productivity. |
| Capital: enhanced asset efficiency | Increased utilization of assets. Preventative maintenance based on sensors reducing downtime and maintenance costs with impacts on productivity. |
| R&D: process and product development | Data analytics of big data facilitates process and product innovation. Escalation in the speed of product development cycles. Virtual development and testing using computer-aided design systems. |
| Operations and supply-chain optimization | Real-time monitoring and control of supply chains. Path optimization and prioritization of logistic routing. Enhanced energy efficiency through optimization. |
| Resource management | Enhanced energy efficiency through intelligent facility management. Decreased waste of time and raw materials including recycling. Increased fuel/water efficiency. |

Source: After Manyika et al. (2015: 13)

4.3.3 Communication

Many improvements in productivity are linked with telecommunications technology (Tables 4.2 and 4.3). Many service businesses supply smartphones to employees in communication-intensive roles: sales, marketing, promotions, after-sales, delivery of services at customers’ homes or at business premises, amongst others. Employees with smartphones can also keep in regular touch with managers, exchanging emails, information and applications in ways that keep them abreast of customers’ requirements, providing prompt solutions for unexpected customer queries, or receiving ‘just in time’ guidance on the next client to contact or which address to go to for the next service repair or delivery. For some service businesses, it is vital to maintain active networking; smartphones enable text and social
messaging to be conducted 24 hours a day, seven days a week.

Smartphones have disrupted existing service operational delivery models and led to the emergence of new services. This has led to developments in marketing and promotional campaigns targeted at smartphones, but also new services. For some users, smartphones have replaced watches, audio players and cameras. Different technologies have been captured and incorporated into smartphones—the implication being that many service businesses communicate with customers via their smartphones (Table 4.4).

### 4.3.4 Digitization and the Marketing Mix

Marketing is the lifeblood for many service businesses and this includes a focus on the ‘8Ps’ that are part of the marketing mix approach: Product, Price, Place, Promotion, People, Processes, Physical Evidence and Productivity and Quality (Zeithaml et al. 2006). Printed brochures, flyers and advertisements in newspapers and magazines have long been staple marketing tools and continue to have a role, but only alongside email, messaging and social media that can reach existing and potential customers rapidly and over much larger geographical areas.

Advertising, information, sales, technical support and updates and upgrades can all be promoted via the Internet while text messaging, pop-ups embedded in web browsers and in smartphone apps, including mapping apps, are just some of the ways of targeting customers or of promoting brand loyalty. The key point is that innovations in digitization have transformed the application of key elements of the marketing mix and this includes big data analytics to create highly targeted marketing campaigns with personalized communications (see also Chap. 9 on marketing).

### 4.3.5 Customer Service

Tangible and intangible technology has also ‘raised the game’ as well as customer expectations with respect to customer services provided by service businesses. Customer satisfaction is multi-dimensional; it includes the quality and price of a service, technical support following a purchase, consistency, reliability, access to help, advice and guidance from sales or service teams, the time required to reach sales or technical support via the telephone or email, access to chat services to resolve technical problems or answer queries about the suitability of one product compared to another. Speed of access to information has been transformed by a combination of telecommunications and software such that customer expectations with respect to service business response times have escalated. For example, efficient software-based routing of incoming calls, text messages or emails to the appropriate individual or group that can handle the query or problem identified by the customer is vital. This equipment and software is often

| Task                           | Characteristics                                                                 |
|--------------------------------|--------------------------------------------------------------------------------|
| Mobile money transfer          | Mobile devices used to transfer money and to make cash or bank card payments.    |
| Mobile ticketing               | Replacement of paper tickets with digital tickets                              |
| Mobile vouchers/loyalty cards  | Distribution of vouchers/coupons and loyalty cards via an app.                  |
| Purchase of content and delivery | Downloads for payment including apps, games, music, ring tones, wallpapers and video. |
| Local based services           | Place-based marketing including local discount codes, weather forecasts, tracking and monitoring people |
| Information services           | News, stock market information, sports results, financial analysis, traffic news. |
| Mobile banking                 | Accessing account information and making transactions                          |
| Mobile brokerage               | Stock market services accessed via a mobile app                                |
| Auctions                       | Participating in online auctions                                               |
| Purchasing                     | Accessing e-commerce                                                           |
| Mobile marketing               | Advertising targeted at smartphone devices.                                    |

Source: Authors’ own
expensive and sophisticated but this does not guarantee customer satisfaction; this will be determined by the extent to which the technical support or other staff responding to customers are trained in how to use the technology and in customer service techniques.

4.3.6 Working Practices in Service Businesses

The outward-facing impacts and opportunities afforded to service businesses by tangible and intangible technology are numerous. But it also has impacts on internal operations, practices and the costs of service businesses. Apart from employee salaries, one of the other unavoidable costs for service businesses arises from the requirement for office space. Some start-ups and on-going service businesses will be able to minimize this overhead by using a room at home as an office but most have to factor in substantial rents and service charges for office space supplied by a third party and only a few will be able to invest in custom-built office or warehouse space. Smartphones, intranets and video conferencing apps, for example, GoToMeeting, Zoom, Google Meet and Skype, provide opportunities for employees to work from home, whilst travelling or in clients’ premises.

In the case of office space, historically it has been assumed that all employees require a space (in an open plan or as individual offices), five days a week. This requirement has been reassessed in the light of innovations in telecommunications technology; it has allowed greater flexibility in relation to where, and how, employees perform their day-to-day tasks, and interact with one another or with customers. They no longer need to be in their offices every working day; communications technology allows employees to work from home, from vehicles, from trains or aircraft for all or part of the working week and as needs dictate. Mobile computing, text messaging, emails and software (including cloud services) enable remote collaboration between colleagues and with customers. Practices such as hot-desking then enable service businesses to reduce their office space needs and related overheads while still being able to use technology that allows them to monitor when, where and how employees are working.

Apart from encouraging changes in employee working practices and the ways in which service businesses use working spaces, technology has also transformed the ways of doing business. The role of face-to-face interaction has not, as some expected, been usurped by telecommunications technology; rather, it is now complemented by time and cost savings enabled by telephone, video or web conferencing for tasks undertaken within service businesses (especially those with operating units located nationwide or globally) and between them and their customers wherever they may be located (see, e.g. Duffy and McEuen 2010). Depending on the method used, participants can hear and/or see others, as well as share presentations and exchange documents in real time. One of the principal benefits for service businesses is a reduction in meeting costs, including the time taken by travelling.

In 2020, Covid-19 and the lockdown transformed the adoption of Internet-based teleconferencing and online services. This included established legal firms shifting to complete online provision, virtual church services and online teaching introduced for core provision of teaching by schools and universities. For many service businesses and their workers, remote working was relatively unusual, but Covid-19 forced rapid adoption by all service businesses able to substitute face-to-face service provision with online provision.

4.3.7 Boost to Profit Margins

Digitized service firms have the potential to capture more business opportunities and are more likely to be involved in internationalization including exports and attracting foreign visitors. Investing in digital technology is a high-risk but also high-reward activity. On the one hand, it may be essential for the survival of a firm. This is the case for high-street retailers who have had to establish effective online e-commerce platforms.
For many retailers, their largest store has become their e-commerce store. On the other hand, the emergence of the digital economy has created new business opportunities.

Going online also impacts profitability and there is a direct relationship with productivity. Data for US businesses reveals that post-tax profit margins improved by 60% between 1993 and 2013 for highly digitized firms in IT and business services and in media services well ahead of all other sectors for which data was available (Manyika et al. 2015, p. 21). Healthcare and retail services, which had low levels of overall digitization, showed little or no improvement in profit margins over this period.

4.4 Disadvantages of Technology for Services Businesses

Although technology has revolutionized the ways in which service businesses operate and innovate, the rush to embed technology into their activities exposes them to risks and challenges.

4.4.1 Costs of Technology Adoption

Whether a start-up or a well-established service business, a headlong rush into embedding technology, as part perhaps of a business plan, is not advisable. This is not to suggest that a service business should not adopt technology but it is vital, amongst other things, to consider: the stage reached in the development of the business, the identification of technology that is appropriate to the tasks to be performed, to weigh up the costs and benefits of leasing versus the purchase of hardware and/or software or accessing services via cloud-based solutions, the anticipated costs of depreciation and replacement of hardware/software as well as service maintenance packages, whether and at what cost training will be required for employees expected to use the technology, and the consequences for employee wages and/or job descriptions. The details will vary according to the type of service business, size and configuration.

In most service businesses, the necessary expertise for evaluating and implementing a technology ‘strategy’ will not be available in-house; the costs of commissioning external expertise, including that required for employee training, will also need to be incorporated into the equation. For many service businesses, especially start-ups, the costs of embedding technology can be daunting and are certainly a major hurdle to cross before the expected benefits materialize. Here it is important to appreciate that Covid-19 was an inflection point for all service businesses, forcing them to rapidly innovate and to shift to online provision.

4.4.2 Consequences for Employees

Ultimately, service businesses embed technology with a view to automating transactions and routine tasks undertaken by employees (Frey and Osborne 2013; Brynjolfsson and McAfee 2011). Computers and telecommunications substitute for employees in relation to cost estimates provided to customers, invoicing, chasing debtors, company budgeting, salaries and pensions, taxes and inventory management. Receptionists can be replaced by automated telephone answering systems and virtual receptionists. Incoming telephone call management and routing at call centres can be used to reduce the number of employees required to provide a service. The employee displacement effects of technology will vary depending on the type of service business; some tasks are more vulnerable than others but there is no doubting the scope for job losses, revised job descriptions, changes to working hours and salaries and deskilling.

In some circumstances, embedding technology does not only displace jobs in situ, it may also enable service businesses to relocate all or part of their activities to other parts of the country or even other parts of the world, whether to access untapped markets or perhaps because employee costs will be lower. Companies may employ receptionists located in low-wage economies but
linked via online systems enabling customers located in high-wage locations to access their services. Ultimately, of course, most successful service businesses rely on attracting and retaining committed and effective employees; sensitive handling of technology adoption will, therefore, be at least as important as a careful assessment of the costs of the necessary hardware, software, expert advice, employee training, cyber security and system maintenance.

### 4.4.3 Keeping the Service Business Secure

Perhaps the most important downside of technology adoption by service businesses is the constant threat of digital security breaches. These are now so commonplace that, unless they affect the very largest firms, they hardly warrant a mention in the business press. Firms are most vulnerable if they rely on the Internet. Developing and maintaining secure systems is an on-going difficult and highly specialized task. For smaller firms, it is difficult to keep up with developments that might undermine their firm’s digital or cyber security. The level of cyber threats has increased exponentially with the dependence on information systems. Both proprietary and other information owned by a service business, as well as its confidential customer databases, which may include credit card details and other sensitive information, are targets for security breaches. The possibilities are numerous but the most common digital breaches involve covert amendments or drawing down of business records without the knowledge of the service business, infecting databases with ‘trojans’ that enable hackers to draw down whatever information they need as and when they want or even to totally or selectively delete records at a predefined time (Table 4.5).

Distributed denial of service (DDoS) attacks that work by overloading websites or other online services with traffic so that they go offline increase year-on-year. Digital security is a universal threat with potentially significant costs for all service businesses. The most vulnerable are small- and medium-sized firms that do not have

| Company         | Date  | Number of user files (m) | Details of the data breach                                      |
|-----------------|-------|--------------------------|-----------------------------------------------------------------|
| LinkedIn        | 2012  | 117                      | Email addresses and encrypted passwords                         |
| eBay            | 2014  | 145                      | Passwords, email addresses, birthdates and physical addresses   |
| Equifax         | 2017  | 145.5                    | Names, birthdates, social security numbers, driver’s licence numbers and addresses of 144.5 million Americans along with 200,000 credit card numbers |
| Under Armour    | 2018  | 150                      | Usernames, emails, encrypted passwords                          |
| Exactis         | 2018  | 340                      | Religion and hobbies                                            |
| MySpace         | 2016  | 360                      | 427,484,128 passwords and 360,213,024 email addresses          |
| AdultFriendFinder | 2016 | 412                      | Encrypted passwords, email address, date of last visit and membership status |
| Yahoo           | 2014  | 500                      | User personal information                                       |
| Marriott International | 2014 | 500                      | Discovered in Sept. 2018. Names, email address. Mailing address, phone number, birthdates, passport numbers |

Source: Adapted from Malwarebytes, [https://www.malwarebytes.com/data-breach/](https://www.malwarebytes.com/data-breach/), accessed 30 November 2019
the fiscal resources or the expertise to set up or maintain digital security systems that will minimize the threat of security breaches. Nonetheless, every service business has no option but to ensure that arrangements are in place for protecting data and information since a security breach is not only very costly to rectify but also risks significant reputational damage with consequences for the future viability of the business.

In many ways, the requirements for creating a secure business are daunting. They are not only multi-dimensional but are also highly dynamic, requiring constant monitoring, updating and where appropriate training to ensure that everybody in the business understands the vital importance of digital security. This starts at the top of the service business; managers must map where (inside the business, on external servers or in ‘the cloud’) information and data is stored, on what kinds of device, who is authorized to access it, the security controls that are in place and whether they comply with any legal requirements, and whether there is a disaster recovery plan in place proportionate to the likely risks. The latter does not just arise from digital breaches or failures but also the consequences of ‘acts of God’ such as earthquakes, fires or floods.

An employee acceptable-use policy, defining how employees should behave online at work, how data is to be shared and restricted, and whether monitoring of their online activities takes place is necessary. This includes guidance on the use of company and/or individual laptops, tablets and smartphones, especially outside the office when doing business or at home. The value of training employees in how to identify and counter potential cybercrime, such as email, search engine, deceptive and malware-based phishing, should not be underestimated. The risks arising when employees web-surf beyond the sites really necessary to undertake the work of the business (and therefore known and trusted) are also important. To some extent, depending on the type of service business, it may be necessary to conduct background checks on prospective employees (in some cases, these will be required by law) to establish whether there is any criminal history or whether their public social media use might be a cause for concern.

Then there are all the actions that employers need to ensure are in place to minimize the exposure of employees and the business to cybercrime; firewalls, encryption, password authentication, conforming to data privacy requirements, ensuring that software updates and patches are installed as soon as they are made available and seeking external technical support (or perhaps using managed security on a contract basis) to counter malware or Trojan attacks. Since service businesses will invariably rely to some extent on third-party technology providers, it will also be necessary to be aware of their digital security arrangements, the backup arrangements, their fitness for purpose and their responsibilities should their systems fail to the detriment of clients.

4.5 Disruptive Digitization?

The potential for a cyber-attack is an ever-present possibility for all service businesses but another source of disruption is digitization itself. Although analysed from the perspective of large, established companies, Dawson et al. (2016) explores how digitization changes the nature of supply or demand (or both). On the supply side, digital technology brings into play sources that may in the past have been uneconomic or impossible to access, while on the demand side, distortions are reduced by digitization as customers can access more complete information about aspects of services that may have previously been bundled with products for the convenience of a supplier. As Dawson et al. (2016, p. 5) put it: ‘The newly exposed supply, combined with newly undistorted demand, gives new market makers an opportunity to connect consumers and customers by lowering transaction costs while reducing information asymmetry’. They cite two examples: Airbnb uncovering demand that always existed for greater variety in accommodation choices and prices, and Uber increasing the chances of hiring a taxi by improving the utilization of vehicles already on the road.
Companies providing tickets for major entertainment and sporting events, or airline companies, deploy digitally determined dynamic ticket pricing to more closely connect daily, or even hourly, fluctuations in supply and demand (see Chap. 5, Sect. 5.3.2).

Demand has become less distorted as consumers (as well as business-to-business relationships) use connectivity, technology and apps to obtain information about exactly what they want, where and when it is available, and with the best delivery times and prices. The ways in which services are offered alter as well as how customers prefer or want to use them, and this, in turn, raises consumer expectations of what to expect from a service and gives them a greater sense of empowerment over scheduling where exactly and at what time they choose to consume a service— even better if the service is free (such as deliveries by online retailers such as Amazon). All this is a source of disruption that service firms cannot overlook because, if they do not respond, it is very likely that other firms will find ways to do so. Your service business could be vulnerable if your customers have to cross-subsidize other customers; your customers have to buy the whole service for the one bit that they want; your customers can’t get what they want where and when they want it; your customers get a user experience that doesn’t match global best practice. (Dawson et al. 2016, p. 6)

The effect of digitization on supply is that it allows new sources of service products and labour to enter markets in ways that were previously more difficult. Some of the indicators of disruption to service businesses triggered by previously inaccessible sources of supply include ‘customers use the product only partially; production is inelastic to price; supply is utilized in a variable or unpredictable way; fixed or step costs are high’ (Dawson et al. 2016, p. 7).

More extreme disruptions can be initiated by digitization. This may be the result of new or significantly enhanced value propositions for customers, a re-imagination of business systems, or entirely new value chains and ecosystems, taking the form of the appearance of businesses from adjacent markets or companies with very different business objectives but exacting ‘collateral damage’ on existing players (Dawson et al. 2016). This may have an impact on profits and introduce new control points for value, making established companies vulnerable even if they believe that they can rely for protection from things like regulatory requirements or the costs of investing in any necessary physical infrastructure. Regulations can be reconfigured in line with user demand, ways will be found by firms to collaborate in the use of costly infrastructure or other disruptive mechanisms will emerge. It will be important for different types of service businesses to take account of changes in the forces of supply and demand that are specific to their industry or ecosystem.

4.6 Cautious Digitization?

Given the ubiquity of technology, combined with an accelerating rate of change in its characteristics in a very short period (30 years), it is tempting to think that every type of service business cannot overlook digitization. The bottom line is that digitization is appealing because it has already delivered cost efficiencies and annual growth rates enhancing profitability. Yet a study examining the digitization challenges facing 150 large businesses worldwide suggests that their digital maturity (expressed as a Digital Quotient [DQ]) reveals a large range of digital performances (Catlin et al. 2015; see also Olanrewaju et al. 2014). Indeed, the number of corporations with a below-average DQ far exceeds the number of ‘emerging leaders’ and ‘established leaders’. The DQ incorporates 18 ‘practices’ and Catlin et al. (2015) found that digital strategy showed the greatest variation between the corporations in their study. Digitization based on following the established leaders is risky unless firms develop the correct digital strategy; for most businesses, it is necessary to make a 100% commitment rather than applying it to only selected parts of a firm’s activities.

The universal application of a corporate digital strategy then requires investment in appro-
appropriate digital capabilities. Service businesses should not overlook the ways in which digitization has impacted the ways in which customers identify, search, evaluate and make purchasing decisions; successful digitization incorporates and fulfills internal objectives and outward-facing demands. Catlin et al. (2015) also identifies the importance of an adaptive culture within businesses as another key variable, especially where technical requirements such as analysing big data or digital content management are beyond the reach of all but the largest corporations. Finally, businesses should always evaluate/monitor the delivery of a chosen digital strategy using appropriately specified key KPIs, organizational structures and employee development programmes aligned to digitization needs. As Catlin et al. put it:

Collectively, these lessons represent a high-level road map for the executive teams of established companies seeking to keep pace in the digital age. Much else is required, of course. But in our experience, without the right road map and the management mind-set needed to follow it, there’s a real danger of travelling in the wrong direction, travelling too slowly in the right one, or not moving forward at all. (Catlin et al. 2015, p. 2)

While there may be a consensus about the risks of failing to engage with digital technology, Fitzgerald et al. (2014) concluded that employees find the adoption process slow and complex, often because many company managers still lack urgency and fail to engage with their employees in a vision of the ways in which digital technology can transform a business. All this must be placed in the context of Covid-19 that forced all service businesses to explore the application of digital solutions to service delivery.

4.7 Digitization Is Not Just for Larger Service Businesses

Larger service businesses have been in the vanguard for the implementation of digital technology as they are more likely to possess the required human and fiscal resources. Nevertheless, smaller service businesses can now also make this transition more easily. This follows from the relatively recent growth in the number of digital platforms with a global reach that are readily accessible to all service businesses as well as their clients/consumers. Facebook, Twitter, LinkedIn, Skype, Alibaba, WeChat, eBay and Amazon are just some of the digital platforms that connect service businesses and individuals across international borders. The emergence of platforms has led to a rapid and radical reconfiguring of capitalism. In 2008, the ten largest global companies included oil and gas companies. By 2018, these firms had been replaced by seven platform-based businesses (Table 4.6). The creation of digital communities and marketplaces allowing different groups to interact and transact has enabled companies like Tencent and Amazon to grow rapidly. For platforms, the network effect

| Rank | Company      | Founded | USBn | Rank | Company      | Platform business model | Founded | USBn |
|------|--------------|---------|------|------|--------------|-------------------------|---------|------|
| 1    | PetroChina   | 1999    | 728  | 1    | Apple       | *                       | 1976    | 890 |
| 2    | Exxon        | 1870    | 492  | 2    | Google      | *                       | 1998    | 768 |
| 3    | GE           | 1892    | 358  | 3    | Microsoft   | *                       | 1975    | 680 |
| 4    | China Mobile | 1997    | 344  | 4    | Amazon      | *                       | 1994    | 592 |
| 5    | ICBC         | 1984    | 336  | 5    | Facebook    | *                       | 2004    | 545 |
| 6    | Gazprom      | 1989    | 332  | 6    | Tencent     | *                       | 1998    | 526 |
| 7    | Microsoft    | 1975    | 313  | 7    | Berkshire Hathaway |          | 1955    | 496 |
| 8    | Shell        | 1907    | 266  | 8    | Alibaba     | *                       | 1999    | 488 |

Source: The Innovator, 2019, https://innovator.news/the-platform-economy-3c09439b56, accessed 30 November 2019
implies that first movers have a considerable advantage and are able to lock out competitor companies.

Platforms provide opportunities for smaller firms, and even individuals, to develop platform-enabled service business models (see Chap. 3). These platforms provide access to a very large potential customer base as well as being a launching point for marketing by service businesses. Existing and potential customers can very quickly be made aware of what is available, when and where, and at what price and to the extent that a snowball effect can occur in hours or days for an event or a product that is widely discussed and shared through digital platforms including social media. These platforms also allow service businesses to identify suppliers, to collaborate with one another and with clients, to develop capabilities and to learn across geographical spaces that, in the past, were much more constrained.

Facebook estimated that in 2019, about 90 million SMEs, many of which will be service businesses, used its pages—double the figure for 2015. About 30% of these SMEs have cross-border ‘fans’. Likewise, in 2019, Amazon’s 12 platforms (the US, the UK, Germany, France, Canada, Japan, India, Italy, Spain, Mexico, Brazil and China) hosted about 5 million third-party sellers. The likelihood that service SMEs with a presence on Facebook will export will certainly be higher than for offline businesses. This is further enhanced by the ways in which PayPal or Alipay provide platforms for cross-border financial transactions for service SMEs and their customers. A key issue with cross-border trade is the ability to move money simply across borders and between different currencies and payment systems. Specialist payment platforms have been established that provide firms with the ability to transact cross-border business, but with the payment difficulties dealt with by a specialist third-party payment provider. SMEs can also extend their search for funding using crowd-funding platforms such as Gofundme, Indiegogo and Kickstarter.

4.8 Technology as a Service

Technology provides service businesses with a set of tools that can support existing business models or strategic goals. But these tools can also be used to create services in their own right for use by other service and non-service businesses. As digitization has deepened and penetrated all areas of the economy and society, it has stimulated new ways of thinking about how all the objects that are digitized can be used in new and innovative ways for the benefit of businesses and customers. The starting point is that every digitized object, smartphone, smart meter, server, laptop, computer, weather sensor, biochip transponder, DNA analysis devices, environmental/food/pathogen monitoring and smart thermostat is by definition electronically connected to something else and that object in turn is connected to other objects. There is a network of objects, buildings, vehicles, aircraft, devices and many other things mediated by software and sensors. Such a network allows objects not only to collect data for transmission somewhere else but also allows for two-way flows of data between devices.

4.8.1 The Internet of Things

The opportunities created by integration between computer-based systems and the physical world are encapsulated in the term Internet of Things (IoT). The term was introduced in 1999 by a British entrepreneur (Ken Ashton) at Auto-ID Labs by way of reference to a global network of radio-frequency identification (RFID) connected objects. The interconnections at the heart of the IoT allow greater automation of tasks in many sectors such as transport and traffic management, health care or local government services, as well as in the operation, for example, of smart cities (using ICT to improve interactions between urban services, to improve contact between citizens and government or to better manage the costs of city management and consumption).
An example of a service business promoting and harnessing the IoT as a medium for service businesses to open up new horizons by working together in new and different ways is Iotic Labs. Based in the corridor between East London and Cambridge (UK), this group of creative engineers starts from the premise that service businesses (or individuals) are stuck in a ‘linear world, connecting more and more devices to bigger and better data centres’ rather than following a different path that Iotic Labs imagines as a world of distributed but connected data. Existing data systems exist for specific organizations for a particular purpose, resulting in numerous data ‘silos’ with little or no exchange of data with other organizations that might have an interest and who might benefit from the same source. This is an Intranet of Things, not an IoT.

The principle behind distributed data is simple to express but many questions that a typical service business might ask need to be answered before putting it into practice, such as how can things share data together?, how can all sorts of different types of data be mashed together?, would the outcome make any sense?, what about privacy and security?, does a business hide proprietary information that it does not want to be found, but wants to share with a client that it trusts?, how can things that are part of or owned by a business such as data or key documents be protected from misuse? The Iotic Labs solution is Iotic Space; things can interact within this creative space but to do so they must be present inside it so that all variety of things can be ‘mashed’ using Iotic’s Mashapps and application programming interfaces (APIs) (sets of routines, tools and protocols for building software and applications).

Security within the Iotic Space is managed by a Registrar that retains metadata about everything and everyone that joins it. Thus, the data within the Space and what the data means are separated so that it will be possible for someone to identify a data value from a thing, such as a sensor, but this would be meaningless without knowing the kind of sensor and its location. Without access to the Registrar, the data makes no sense at all.

The IoT has not escaped the attention of large and prominent services businesses. SAP AG, which provides enterprise application software and software-related services worldwide, suggests that companies:

Transform the way you do business with Internet of Things offerings from SAP. Our end-to-end offering for Internet of Things provides everything your business needs to create a System of Things—M2M Connectivity, cloud platform, device management, big data management, event stream processing, predictive analytics, and apps-to make IoT projects real, repeatable and scalable.

Oracle Corporation develops, manufactures, markets, hosts and supports database and middleware software, application software, cloud infrastructure, hardware systems and related services worldwide. This business model is based on the understanding that the proliferation of intelligent and connected devices has created a market for entirely new solutions based on IoT technology. Key to the IoT is effective communication between all the elements that are part of the architecture of the IoT. Oracle has developed an IoT platform that provides an integrated, secure, comprehensive platform for the entire IoT architecture across all vertical markets. A key danger with the IoT, and a business opportunity, relates to cyber protection as any product connected to the IoT may be subjected to a cyber-attack.

4.8.2 Big Data

Intertwined with the IoT has been the rise in the importance of big data—very large and complex data sets that are difficult to process using established methods of data processing. Big data are data streams that have increasing volumes, greater variety and velocity. Combined these are known as the three Vs. Volumes matter with big data and, in this case, firms and governments can access high volumes of unstructured data, from data feeds, clickstreams, apps, webpages and sensors. Velocity includes data that is streamed in real time. Variety includes data that includes text, images,
video and audio, and these types of data require pre-processing. Big data is used by companies for product development, predictive maintenance, monitoring customer experiences, identification of fraud and compliance issues, machine learning and AI to monitor and enhance operational efficiency and to support innovation.

Big data is generated continuously by digital processes including sensors and social media exchanges. The resulting datasets contain such a variety of information that the application of predictive analytics (data mining, predictive modelling, machine learning) is required to compile historical and current facts that form the basis of predictions about future trends and developments. It has reached the stage where big data is an essential factor of production, alongside human capital and physical assets. The ways in which big data creates value for service businesses has implications for how they are structured, organized and managed. According to Manyika et al. (2011, pp. 4–5):

For example, in a world in which large-scale experimentation is possible, how will corporate marketing functions and activities have to evolve? How will business processes change, and how will companies value and leverage their assets (particularly data assets)? Could a company’s access to, and ability to analyze, data potentially confer more value than a brand? What existing business models are likely to be disrupted? For example, what happens to industries predicated on information asymmetry—e.g., various types of brokers—in a world of radical data transparency? How will incumbents tied to legacy business models and infrastructures compete with agile new attackers that are able to quickly process and take advantage of detailed consumer data that is rapidly becoming available, e.g., what they say in social media or what sensors report they are doing in the world? And what happens when surplus starts shifting from suppliers to customers, as they become empowered by their own access to data, e.g., comparisons of prices and quality across competitors?

Service businesses in the computer and information sectors are already gaining substantially from the application of big data, with government, finance and insurance and business and professional service sectors also benefiting from big data provided that barriers to use, such as concerns about personal data security and freedom, can be overcome. Factors such as the availability of talent, the IT intensity of service businesses, the degree to which the management and employees have a data-driven mindset and whether suitable data is available contribute to the ease with which service businesses benefit from big data (Table 4.7).

Big data overlaps with cloud computing, essentially storing and accessing data and programs via the Internet rather than from a computer’s hard drive. The tangible benefits of deploying cloud services include more flexible access to technology, faster access to technology, cost savings over on-premise solutions, reductions in capital expenditure and on demand/predictable costs. There are intangible benefits including improved customer service, improved collaboration between departments, improved customer engagement, undertaking more development using an agile methodology and improved communication between departments.

Adobe and Microsoft, for example, offer monthly subscription services providing clients with access to imaging and design programmes (Adobe) or the Office suite (Microsoft) without the need to store programmes or the images or data that they generate locally on hard drives. They permit collaboration between employees within the same business or amongst those distributed across a number of businesses as well as with clients. The key consideration is that one master document is modified or updated in one place as and when the collaborating employees work on it. Software-as-a-Service (SaaS) arrangements such as Think Salesforce.com are one option. Another, Platform-as-a-Service (PaaS) that allows a service business to create its own custom applications for use by all in the company, while Infrastructure-as-a-Service (IaaS) provides rented space in the cloud from platforms provided by companies like Amazon, Microsoft, Google and Rackspace for use by other service businesses.
Working with big data can take advantage of cloud computing but the objective is different. IBM Analytics, for example, provides service businesses with a range of analytics that enables them to target the right customers using predictive modelling (predictive customer intelligence), to identify dissatisfied customers by uncovering patterns of behaviour using social media analytics), and correlating and analysing a variety of data that enable customer service issues to be addressed more promptly (customer service analytics). Big data analytics can also be tailored to the requirements of different types of service businesses. For example, IBM offers retailers advanced sales analytics; by analysing detailed information about customers and their purchasing habits, it is possible to tailor product offers to better match individual buyers’ demands. In the case of banking services, behaviour-based customer insights based on predictive models derived from big data are used to identify patterns of individuals’ transactions and spending behaviour to understand their needs and propensities, to anticipate life events, and thereby allow some customization of their experience of using a bank’s services. By the very nature of big data and the skills required to undertake predictive analytics, most service businesses will require the services provided by specialist providers. IBM is just one of a growing number of big data companies that include HP, Teradata, Oracle, SAP, Microsoft, Amazon Web Services and Google.

### Table 4.7 Service businesses and big data

| Company          | Big data                                         | Application                                                                 |
|------------------|--------------------------------------------------|-----------------------------------------------------------------------------|
| Amazon           | Search and order histories                       | Advertising algorithms                                                      |
| American Express | Purchasing transactions                          | Predict customer churn and loyalty                                          |
| BDO              | Client accounts                                  | To identify risks and fraud during the client audit process                 |
| Capital One      | Customer demographics and spending patterns      | Targeted marketing                                                         |
| General Eclectic (GE) | Data streams from machinery—gas turbines, jet engines | Predict problems and plan pre-emptive servicing                             |
| Miniclip         | Customer data, including use and experience      | Enhance user experience to increase customer retention                      |
| Netflix          | Viewing habits and customer demographics         | Informs the commissioning of original programming content as well as purchasing rights to films |
| Next Big Sound   | Data from Spotify streams, iTunes sales, SoundCloud plays, Facebook likes, Wikipedia page views | Insights to predict potential consumer reactions to new music. Artists and companies access this data to inform promotion strategies |
| Starbucks        | Traffic, area demographics, customer behaviour   | Informs decisions to open new stores. The analytics enables Starbucks to make a fairly accurate predication regarding the likely success of a new store location |
| T-Mobile         | Customer transactions and interactions data      | Enhanced customer retainations                                              |

Source: Adapted from ICAS, [https://www.icas.com/thought-leadership/technology/10-companies-using-big-data](https://www.icas.com/thought-leadership/technology/10-companies-using-big-data), accessed 30 November 2019

### 4.9 Technology and the Shift Towards Self-Service

The interactions between service businesses and their customers/clients occur along a continuum from total control by the provider, a balanced contribution from the provider and the customer, to almost total control by the customer. Technology and digitization are involved at any stage in this continuum, but their most obvious contribution is associated with the rise of self-service technologies (SSTs). These are interfaces that allow customers to produce services independently of direct involvement with service business employees. There are various types of SST that can be grouped as follows:
1. **Telephone and interactive voice response (IVR) systems.** These are often used by banks, car and home insurance providers, restaurants providing home delivery services, and utilities to manage and process customer orders and billing inquiries but can also be used to perform tasks including customer surveys.

2. **Interactive freestanding kiosks.** These are increasingly used in large retail stores or in shopping centres as sources of customer information about product availability and location, the appropriate replacement battery for a specified equipment item, or passport verification and for issuing airline tickets at airport check-in.

3. **Internet-based connection systems.** Pay-at-the-pump petrol stations and bank ATMs are good examples, along with Internet banking, credit card services and bill management by utilities such as electricity, water or gas services. Logistics services such as DHL or UPS, or retailers such as Amazon, use online technologies to allow customers to track the progress and likely arrival times for their packages.

4. **Video/DVD/CD-based technologies.** Companies increasingly use these to train their employees, to familiarize sales representatives with new products and to introduce new products to consumers. In addition to online courses, colleges and universities provide undergraduate, graduate and continuing education classes via video and CD formats.

### 4.9.1 Implementing Successful Self-Service Technologies

Using extensive interviews with a range of companies that adopted or were thinking of adopting SSTs, Bitner, Ostrom, and Meuter (2002; see also Meuter et al. 2005) identified six critical success factors for their implementation. First, a service business should be very clear about the strategic reasons for introducing SST. There are several questions to address, such as whether it is being introduced to reduce costs, to develop relationships with customers, to add to customer satisfaction or to diversify a client base. It is not enough to introduce SST just because competitors have adopted this approach. Second, it is essential not to lose sight of the need for SST to be first and foremost customer friendly. Third, SST does not market itself; customers need to be educated in how to use it and what steps to take if the SST fails. This is the case even if customers already understand the benefits of using SST. Fourth, even the best-managed SST will fail; a contingency plan for service recovery is essential. Fifth, do not assume that SST, however good they are, will be used by every customer every time they deal with the company. Make sure that alternative methods for undertaking transactions are always available. Finally, introducing SST is not a one-off activity; the technology environment as well as the customer environment is constantly changing and firms successful with SST delivery must be prepared to adapt and adjust their offer accordingly (Zhu et al. 2013).

### 4.9.2 Artificial Intelligence, Robotics and Technological Transformation

The relationship between innovation and radical economic change can be traced back to the origins of the industrial revolution. In 1620, Francis Bacon, the English philosopher, argued that:

> It is well to observe the force and virtue and consequences of inventions; and these are nowhere to be seen more conspicuously than in those three which were unknown to the ancients … namely, printing, gunpowder and the magnet. For these three have changed the whole face and state of things throughout the world.

In combination, these three inventions transformed the world. The invention of printing made it possible for ideas to be preserved and transmitted across time and space. Gunpowder altered
warfare, whilst the magnet led to the development of the mariner’s compass that laid the foundations for navigation, and ultimately global commodity chains. Since 1620, engineers and technologists have continued to be ingenious, but with some important alterations. Three are worth highlighting here. First, the escalation in the pace of technological change. Second, the rapid pace of technology adoption, combined with the ability to shift ideas around the world in the twinkling of an eye. Third, the extent and variety of technological changes that impact all aspects of everyday living.

There are two on-going transformations that are changing ‘the whole face and state of things throughout the world’, in Bacon’s words: artificial intelligence (AI) and robotics, and developments in the application of platforms to economic activity. These are related innovations. The three inventions identified by Bacon created employment with very limited displacement. This reflects the introduction of new inventions that created new markets (Bryson and Ronayne 2014). In contrast, the application of AI and platforms to production systems is destroying existing processes and business models and creating new business opportunities. These represent disruptive technological innovations that will continue to create new forms of labour combined with the displacement of existing firms and business models.

It is worth considering the core driver behind the application of new technology to production systems and to labour. This represents the application of capital to alter the ways in which labour is involved in the production of both goods and services. It is possible to identify a set of what can be termed timeless processes that emerged with the development of capitalism, and which continue to transform space and place (Andres and Bryson 2018). These timeless processes produce different outcomes depending on the context. The primary timeless process is perhaps the ‘division of labour’ (Smith 1977 [orig. 1776]), and the ‘spatial division of labour’ (Massey 1984) (see Chap. 2). This process refers to the disaggregation of complex tasks into several simpler tasks that can be undertaken by different individuals or groups of individuals. This division of tasks can occur on the same site or at the same location, or tasks can be transferred to other places so that a spatial division of labour emerges that is the foundation of global value chains or global production networks.

There are three important points to make about the division of labour. First, a division of labour always precedes mechanism; tasks are disaggregated, facilitating the identification of which tasks can be mechanized or replaced with artificial intelligence and robotics, and which are more effectively undertaken by people (Bryson et al. 2017; Bryson 2018). Second, the division of labour is the primary driver behind global value chains. At a city-region scale, tasks may be allocated to one place, given the existence of concentrations of specialist labour or other forms of place-based processes or incentives that provide a specific city-region with a competitive advantage in the performance of a task. Third, the division of labour is on-going. Day-by-day decisions are made to further sub-divide tasks, and to replace people with machines or robots, and to alter the geographic distribution of tasks. In this process, jobs are restructured or reshaped; some jobs are destroyed, and new jobs emerge (Bryson 2018).

### 4.9.3 The Future Impact of Artificial Intelligence

The application of AI, including robotics and autonomous systems (RAS), to some types of labour represents the most recent reworking of the relationship between an evolving division of labour and technological innovation (Bryson and Andres 2018). RAS are combinations of physical and software systems that can perceive their environments, and reason, adapt and control their actions. Developments in RAS are making it possible to automate tasks that previously could only be undertaken by people. There is much media discussion about RAS and its impact on work,
but very few studies have assessed the potential impacts RAS will have on labour markets more generally.

One difficulty is that there is no rigorous and robust technique for forecasting such impacts. Nevertheless, RAS can be seen as just another stage in the application of machines to labour that could potentially increase productivity, destroying some forms and employment, but also creating new forms of work. It might be that RAS increases unemployment, by creating jobs with higher barriers to entry based around capabilities in computer programming and mathematics or highly developed social skills. Any assessment of RAS impacts, at the moment, is based on speculation.

There have been high-profile predictions regarding the impacts of AI/RAS on economic activity and labour markets. The Frey and Osbourne (2014) study estimated that 35% of jobs that existed in the UK in 2013 had a greater than 66% chance of being automated in the coming decades. In 2016, Arntz et al. (2016) explored 2012 data and estimated that for 10% of UK jobs, it would be possible to automate 70% of their component tasks over the next decade and that another 25% of jobs could have at least 50% of their tasks automated. The most recent study by the OECD suggests that 14% of all jobs across 32 countries have a high risk of automation, and a further 32% of jobs may experience significant change (Nedelkoska and Quintini 2018).

AI places more low-skilled jobs at risk compared to previous rounds of technological displacement. The OECD analysis suggests that the risks related to AI in the labour market decline as educational attainment and skill levels rise (Nedelkoska and Quintini 2018). The difficulty with these studies is that they say nothing about new tasks and jobs that might be created through the application of RAS. This is the ‘known unknown’ of the implications RAS will have on future labour markets. Another key issue is that AI and RAS are also among the drivers behind the reshoring of manufacturing tasks back to developed market economies. The application of AI to manufacturing is transforming labour-intensive tasks to capital-intensive tasks (Vanchan et al. 2018).

4.10 Wrapping Up

There is an interesting paradox to explore. This is the tension between the role service workers play in creating and delivering service experiences through face-to-face encounters versus the substitution of service workers by technology. On the one hand, service customization and the quality of a service experience are still founded on interactions between service producers and service consumers. On the other hand, there is the emergence of service encounters in which service workers are a hidden rather than a visible part of the service experience. They are hidden as frontline service workers may have been replaced by back-stage or back-office workers and some of this substitution involves computer programmers (see Chap. 6).

There is no question that technology is playing a much more important role in service delivery and service experiences. This is challenging existing business models as well as consumer expectations, but it also provides opportunities for the development of new types of service-based business models. The drivers behind these alterations are the interactions between technologies that create streams of big data and developments in computing. Big data facilitates machine learning and continued developments in AI.

It is perhaps possible to identify three types of services. First, there are services in which face-to-face encounters between a service provider and a consumer will always remain essential. It would perhaps be possible to replace service workers by technology, but this would undermine the nature of the service experience. Second, there are services in which technology has displaced service workers. Here it is important to highlight the replacement of service
workers initially by computer code and eventually by robots. The codification of money and markets is on-going, and this includes the codification of trust through the analysis of big data (Ross 2016). These two categories are perhaps the extreme ends of a continuum. The final service type is based on firms developing a segmentation approach to service delivery based on blending face-to-face delivery systems with technology. In this case, a consumer will be able to access a service either via a face-to-face encounter or through interacting with some type of interface with a set of algorithms. This third strategy is becoming dominant in financial services and retailing reflecting the on-going delivery of these services via e-commerce or face-to-face encounters.

The balance between these three different types of service delivery systems will be challenged by developments in quantum computing. There have been important recent developments in quantum computing. This includes the announcement by IBM in September 2019 of the introduction of a new 53-qubit quantum cloud-based ‘mainframe’ computer. Quantum computing is beginning to transform research and development and, at some point in the future, will begin to develop solutions to problems that are currently impossible to solve with conventional computers. Nevertheless, there is a real danger that existing forms of data encryption will be undermined by Quantum computing. One implication is that, for some services, face-to-face encounters will become much more important as being present in a service encounter may be the only way of confirming a service client’s identity.

It is worth revisiting two short essays written by John Maynard Keynes (1930a, b) in the second year of the Great Depression. In these essays, Keynes reflected on the economic impacts of technological change for our grandchildren, introducing the concept of ‘technological unemployment’. His argument was that a ‘temporary period of maladjustment’ occurs in labour markets because of technologically driven, disruptive change. But he noted that this was a temporary phenomenon, as technology would transform production systems creating new employment opportunities. This continues to be the case; technological innovation simultaneously destroys and creates employment, firms and business models.

Learning Outcomes

- Technology and service businesses have long been allies.
- Services are increasingly digitized—both knowledge-intensive and manual services.
- Digitization enhances productivity.
- Internet of Things, big data, robotics and artificial intelligence are enhancing self-service deliveries.
- Service businesses must develop strategies for adopting digitization, and this should include an appreciation of the disadvantages, costs, security problems and consequences for employees.
- Online platform businesses have reconfigured capitalism.
- Digitization creates new forms of employment and business models but also destroys jobs and existing business models.

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