TABLE OF CONTENTS

Chapter 1
Computing for business success

LEARNING OBJECTIVES

After reading this chapter you should be able to:

- Differentiate between information technology (IT) and information systems (IS)
- Perceive the relationship between technologies (T), the organisations (O) in which they are located and the people (P) that effectively design and operate the IS
- Understand the changes that have occurred in the business office over the last half-century, with reference to the technology, organisations and people (TOP) framework
- Identify some of the people who have played major roles in technology innovation
- Understand the concept of digital disruption, and appreciate the role computing plays in shaping the world of business
- Understand the uses that end-users could make of the contents of this book

Business computing knowledge and skills essential for success

The University of Melbourne-based, Cisco/Intel/Microsoft-funded Assessment and Teaching of 21st Century Skills consortium (which includes Australia, Finland, Portugal, Singapore, the United Kingdom and the United States) (see ATC21S, 2015), has structured required 21st century knowledge, skills, attitudes, values and ethics into four categories:

1. Ways of Thinking: creativity, innovation, critical thinking, problem-solving, decision-making, and learning to learn;
2. Ways of Working: communication and teamwork;
3. Tools for Working: knowledge and Information and Communication Technologies (ICT) literacy; and
4. Living in the World: citizenship, life and career, and personal and social responsibility.

In this text we focus on – "Tools for Working" – but in situating ICT tools in a business context we will directly and indirectly have much to say that impacts the other three categories. So – What constitutes the ICT knowledge and associated skill sets required by the business graduate in the 21st century? In conceptualising the impact of ICT on the 21st century workforce and the consequences for curricula, Topi et al. (2010) noted that four elements have been, and remain, characteristic of the work of computing/information systems (IS) professionals:

Source: Topi et al (2010) Section V: Guiding Assumptions about the Information Systems Profession

1. **IS professionals exist in a broad variety of domains**, including, for example, business, healthcare, government, and nonprofit organizations. Students must, therefore, understand that:
   - IS professionals enable successful performance in many organizations.
   - IS professionals span and integrate across organizational levels and functions.
   - IS professionals need both an excellent understanding of the domain within which they work and appropriate technology knowledge for their organizational role.
   - Information systems in organizations have increasing strategic significance because of the scope of the organizational systems involved and the role systems play in enabling organizational processes and strategies.
2. **IS professionals must have strong analytical and critical thinking skills** to thrive in a competitive global environment. Students must, therefore:
   - Be problem solvers and critical thinkers
   - Use systems concepts for understanding and framing problems
   - Be capable of applying both traditional and new concepts and skills
   - Understand that a system consists of people, procedures, hardware, software, and data within a global environment
3. **IS professionals must exhibit strong ethical principles and have good interpersonal communication and team skills.** Students must understand that IS professionals should be able to:
   - Critically evaluate and possibly act on current ethical issues in the IS field
   - Apply professional codes of conduct
   - Collaborate with other professionals as well as perform successfully at the individual level
   - Communicate effectively with excellent oral, written, and listening skills

- Demonstrate persistence, flexibility, curiosity, creativity, risk taking, and a tolerance of these abilities in others

4. **IS professionals must design and implement information technology solutions that enhance organizational performance.** Students must, therefore,
   - Possess skills in understanding and modelling organizational processes and data, defining and implementing technical and process solutions, managing projects, and integrating systems within and across organizations
   - Be fluent in techniques for acquiring, converting, transmitting, and storing data and information, including those related to data quality
   - Focus on the application of information technology in helping individuals, groups, and organizations achieve their goals within a competitive global environment

This text addresses the ICT literacy (knowledge and skill requirements) of business graduates – in particular those whose major is not as an ICT professional (i.e. those majoring in accounting, economics, finance, entrepreneurship, international business, management and administration, marketing and advertising, supply chain and logistics, …). As business graduates you will all be interacting in the workplace with computing and with IS professionals, collaborating on the design of business systems, and using those systems to inform your decision making and to facilitate completion of business processes.

To set the scene for the material covered in the remainder of this chapter the following questions are addressed:

- What role(s) does computing play in the world of business today?
- What role might computing play in the future world of business? and
- How did this come about?

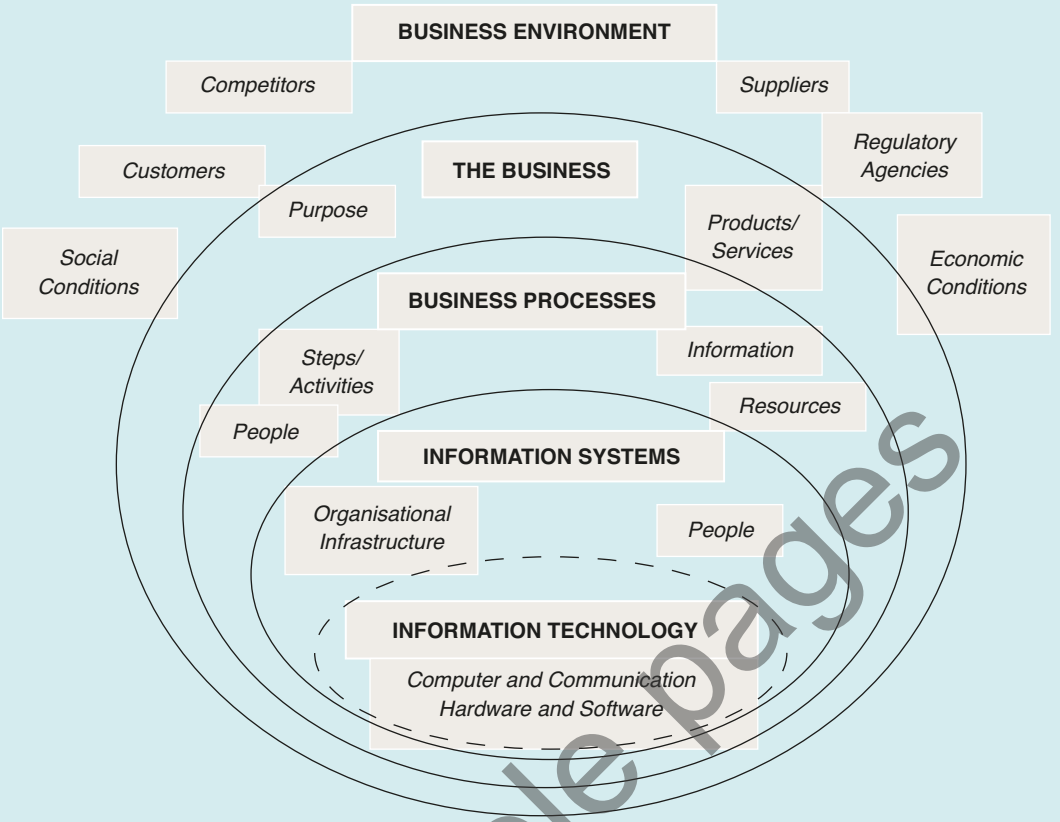
The role(s) computing plays in the world of business today

As we explore the role that that computing does (and could in future) play in the world of business, you will quickly become aware of the specific use that is made of a number of terms. We must therefore develop a common language, so that the stories we tell will make sense!

Figure 1.1 illustrates why these terms (information technology and information system) must be carefully defined. To make sense of them we must first understand the terms **business environment**, **business**, and **business process**:

- The business environment is everything external to a business that can affect its functioning, including competitors, suppliers, customers, regulatory agencies, and social and economic conditions;
- The business consists of the business processes that exist and compete in the business environment to achieve agreed purposes and produce agreed products and/or services;
- A business process is a related set of steps or activities that use people, information, and other resources to create value for the internal and external customers of the business;
- An **information system** is a combination of information technology, organisational infrastructure and trained people organised to collect, process, store and provide as output the information needed to complete one or more business processes; and finally
- **Information technology** is the computer and communication hardware and software that make information systems possible.

FIGURE 1.1 Information technology and information systems



The modern environment – technologies, organisations and people

The mixture of communications and computing has promoted the development of an information society in which most organisations in the developed world depend on information technology to carry out their everyday activities. One-person businesses such as plumbers and builders depend on their mobile phones to remain in contact with their clients. Small businesses usually use a computer to manage their accounts and to word-process documents. They may even have their own domain name and website hosted on their internet provider's computer to provide an electronic storefront. Large companies and other organisations use IT to facilitate almost every aspect of their operations. The human resources, finance, records management, sales, marketing, project management, research and development, production and strategic planning units all use, and even depend on, IT systems specifically designed to help them do their job. Almost all of those computers are linked into networks that can access other computers, both within the organisation and around the world.

However, it is not only the technology that has changed. People's jobs and behaviour, and organisations themselves, have also changed. Many of these changes are due directly to developments in IT. Technology, the people that use it, and the organisations where they work are all linked together in a relationship.

Written memos have disappeared. An email is easier, faster and able to be distributed to more people. Generally, this is a good thing. But sometimes the ease of use of email can have a negative

aspect. Once you have clicked the send button, it is too late to think about what you have written. Many people have fired off an email while they were angry about a situation or with a person, only to reflect on it later and wish they had been more circumspect. Many people have also said something that was meant to be taken in jest but managed to offend. Email doesn't carry the tone of voice that would have made the joke clear if it had been said on the phone or face-to-face. We are all aware of the distracting and annoying nature of spam from advertisers. There can be spam in organisations as well. When people send out emails to more recipients than needed, it takes up valuable time of workers to read and delete the emails that they shouldn't have received in the first place.

It can therefore be seen that technological changes have had impacts on the way people behave and on the nature of their jobs. Strict working hours are not as important as they were. Workers can listen to their voice mail and read their emails outside of a nine-to-five working day. Being in one place isn't as important as it was. Workers can write up documents and prepare budgets on their laptops or home computers and send them into the office via the internet. Being computer literate is now a requirement of many jobs, and of most jobs in businesses. Students in nearly all vocational degrees are required to undertake subjects that expose them to the computer technologies necessary to fulfil their professional duties. Workers today are much more likely to have to be able to use their computers to solve problems and undertake activities that in the past would have been the responsibility of a specialist. For instance, a manager may have to be able to create complex budgeting scenarios on a spreadsheet. In the past, this task would have been carried out by an accountant.

However, there are also impacts that people have on technology. As mentioned earlier, computers didn't become common in business until GUIs were developed, and the internet didn't take off until the web was developed. When systems are developed, there is extensive user testing done to ensure that the systems fit the requirements of the users. Websites are designed with usability and accessibility in mind. Standards have been developed to ensure that certain basic levels of accessibility are designed into systems. That is why, when a graphic doesn't load properly on a webpage, you will usually see a label with the name or description of the picture instead. These can all be seen as examples of technologies adapting to the needs of people.

Organisations have been shaped by the information technologies that they use. For example, IT has allowed the introduction of **just-in-time manufacturing**. Just-in-time manufacturing is a system where goods are produced in factories only once they have been ordered. The advantage of this system is that companies don't have to keep large amounts of stock in warehouses sitting waiting for orders, and therefore don't have as much of their money tied up and unavailable to them for more profitable purposes. This form of production depends not only on having very efficient production processes and information flows, but also on different organisational structures and relationships. Just-in-time production tends to promote flatter management structures, as too many levels of management can hinder the responsiveness necessary. Just-in-time also tends to promote closer relationships between an organisation and its suppliers, as it is on the timely delivery of its own supplies that the organisation's production depends.

The increased quantity, speed and flexibility of information flows inside organisations due to IT have meant that management structures have become much more flexible. In the past, it was normal for most organisations to have a well-defined hierarchical structure. Hierarchical structures have very clear lines of authority and communication, and they have a pyramid shape; like an army with its ranks. There are many organisations today that have team structures or flat structures, rather than hierarchical ones. It is the flexibility of information flows due to IT that, at least in part, has facilitated this change.

Using these definitions let's examine the role that computing does (and could in future) play in the world of business. We consider three dimensions that allow us to recognise the parallel evolution of information technology (IT) and information systems (IS).

In this book, the framework of 'technology, organisations and people' is used to explain and analyse many of the concepts and processes presented.

We call this the "TOP" framework.

Technology supports the performance of diverse business tasks. Available technologies and their use changes over time, however. For example, with the emergence of personal productivity tools people now tailor their use of technology to immediate functional needs. As business requirements and technology change, end-user usage alters. Some technological features or creations are maintained and embedded in business organisational systems, as others are abandoned and forgotten.

Communication technologies connect areas within organisations to ensure the integration of tasks and the development of shared understandings. The knowledge created as a result reflects the objectives of the organisation and creates examples of best practice, where people coordinate information technology and the business processes that result in a product or service.

Organisations evolve, in part to embrace and exploit technologies. Routine and repetitive low-order skill-based work has been automated and computer competency is now an assumed, critical job skill. Organisational models, structures, cultures, communication networks and problem solving approaches have evolved to support the human capacity to request, organise and use information to create knowledge and innovate. Communication technologies have also enabled people to communicate beyond organisational structural and hierarchical boundaries and beyond traditional geographical limitations. As such, the concept of an organisational boundary has changed. The notion of the organisation now encompasses industries where cooperating partners using inter-organisational information systems to enable integration across entire supply chains, from raw product producers to retail outlets.

Finally, people complete the thinking work; they handle exceptions, provide services, communicate and solve problems. A philosophy of end-user computing has emerged. For some applications in business it is now easier to train end-users to complete their own computing tasks than to employ information technology specialists and train them in the functional objectives of the organisation. The driver for learning is now the requirement to utilise skill sets to solve problems rather than the skills themselves. This has profound implications for the role of individual workers in business to support best practice. The focus is on using the human capital or intellectual abilities to enable innovation and the solution of hard-to-solve problems, rather than merely completing defined procedures.

IT tends to be an amplifier. If good organisational processes are in place to begin with, and the IT is implemented in a well-planned way, then the introduction of appropriate IT systems can enhance those processes, resulting in more efficient and effective people and structures. If bad processes are in place, or if the IT is implemented badly, the introduction of IT exacerbates existing failings and inefficiencies and results in lower staff morale and effectiveness.

Evolution of the office – yesteryear, today and tomorrow

When your grandparents were in their first jobs 50 or more years ago, the business office was a very different place. Managers wrote their letters by hand before sending them to the typing pool for typing. A typing pool was a room where people, usually women, sat at typewriters and typed up documents. While they were typing, they often fixed up spelling errors and grammatical mistakes. Accountants added up columns of figures by hand. Or, if they were lucky, they may have had a mechanical adding machine that required them to press a row of buttons to make one number, then another row of buttons to make another number, and then turn a handle to add the two rows together as metal gears whirred

around inside. Librarians filed small cards in wooden catalogue drawers, and records offices contained filing cabinets in which were stored folders containing typed and handwritten documents. Sales clerks wrote out sales dockets by hand, which they spiked on a metal needle. At the end of the day, they would manually sort and count them, and then record them in a sales book.

If a second copy of an existing document was needed, a secretary had to type the copy by hand. Typewriters had keys that were connected to metal bars that sprang up to hit the paper when that key was pressed. On the end of each bar was a small head with the raised metal shape of a letter or number on it. When the head of the type bar was just about to hit, a ribbon with ink embedded in it would pop up between the head and the paper. Because the head hit the ribbon, which in turn hit the paper, a mark would be made on the paper corresponding to the letter on the key that was pressed.

In order to create two copies of a new document, the secretary would place a piece of carbon paper, one side of which was coated with ink, between two sheets of typing paper in her typewriter. In this way, the type bars would hit the ink ribbon, which would hit the first sheet, which would hit the carbon paper, which would hit the second sheet, making the two copies at the same time.

If many copies of a document were needed in your grandparents' office, they could have used a mimeograph, or stencil duplicator. This machine required the secretary to replace the paper in her typewriter with a special wax-paper stencil. The typewriter would cut the shapes of the letters into the wax on the stencil. The stencil could then be put into the mimeograph machine so that each time the handle was turned, ink would be squeezed through the cuts made by the typewriter and on to a clean sheet of paper. This method could produce up to 100 or so copies before the stencil became too soggy and had to be typed out again. The copies were usually wet, and would have to be dried out before they could be used.

The telephone was invented in 1876. Initially it was thought that the device would be a method of broadcasting, rather than a means of person-to-person communication. One of the first demonstrations of telephone technology was set up to allow a crowd to hear a lecture being given some distance away, by having the receiver connected to a loudspeaker. Once it was realised that the telephone would be more useful as a person-to-person communication medium, the first telephone lines were installed in local areas to allow people living in the same town to talk to each other using the device. There was no attempt initially to connect up towns that were some distance apart.

The telephone became an important tool for business once the local networks were joined up nationally in the early twentieth century.

Sometime after it was set up, the Bell Telephone Company employed a new general manager who had previous experience with establishing railway lines across the United States. He realised that the local networks needed to be joined up so that they could form a long-distance network like the railways. In the early 1900s, with the extensive installation of long distance lines, business really began to exploit the telephone.

By the time your grandparents were going to work in an office, the telephone was fairly common. But there would have been just one in a small office that everyone had to share. They would have needed a good reason for using it, rather than writing a letter or having a meeting. In a big office with a large number of phones, there may have been a switchboard that required the operator to physically plug and unplug the wires that connected the various telephones.

Fifty years ago, the business office was indeed a very different place!

The development of modern information technology

1965 – 2000: The technology that we take for granted in the modern office is relatively new – much of it only came into existence during the years 1965 to 2000. This technology is based on several significant developments: computing, networking and mobile devices which includes the emergence of the Internet, first adopted by business in the 1990s.

There is a very famous quote from the then chairman of IBM who in 1943 said, 'I think there is a world market for maybe five computers.' He was wrong, but it did take some time before businesses began to buy computers as a matter of course.

In the mid-1970s the first computers were made that were specifically designed for non-computer experts; what we now refer to as a personal computer (PC) or desktop computer. Apple released the **Apple** II in 1977, and the first IBM PC was released in 1981. The first popular **spreadsheet**, database and word-processing programs, VisiCalc, dBase and WordStar, were all released in the late 1970s. While the external shape and components of those early personal computers looked roughly the same as computers do now, the information displayed on the screen would not be recognisable to many people today. There were no pictures, just lines of brown or green text on a black background and strange commands that had to be typed into the computer to get it to do anything. The most famously unfriendly of these commands was the dBase 'dot prompt'. After the dBase program had loaded, the only thing that appeared on the black screen was a single full stop. There was no information at all on how to work it or what to do next. This wasn't user-friendly computing. It wasn't until Apple released its Macintosh in 1984, and then IBM followed with its **Windows** system in 1985, that users would see screens that contained the icons and helpful tips that users of today are familiar with. After the introduction of the graphical user interface (GUI), personal computers began to enter business and then became ubiquitous.

Steven Paul "Steve" Jobs (February 24, 1955 – October 5, 2011) was an American entrepreneur and inventor, who was the co-founder, chairman, and CEO of **Apple** Inc. Through Apple, he was widely recognized as a charismatic pioneer of the personal computer revolution.

Daniel Singer "Dan" Bricklin (born 16 July 1951), often referred to as "The Father of the Spreadsheet", is the American co-creator of the **VisiCalc** spreadsheet program.

William Henry "Bill" Gates III (born October 28, 1955) is the former chief executive and current chairman of Microsoft, the world's largest personal-computer software company. Microsoft launched its first retail version of **Microsoft Windows** on November 20, 1985.

Sir Timothy John Berners-Lee, OM, KBE, FRS, FREng, FRSA (born 8 June 1955), also known as "TimBL," is a British computer scientist, best known as the inventor of the **World Wide Web**.

The other element of the equation was networking. Networks allowed computers to be linked together and to share the information they processed using communications networks, the same as telephones do. Various networking systems were developed, although in general, like the telephone networks before them, they were at first local systems that allowed only computers owned by a particular company or research group to be joined up. Soon it was realised that it would be advantageous if more extensive wide area networks could be developed. The large telecommunication companies cooperated to put in place data networks alongside their telephone networks, and it was then possible to conceive of truly worldwide networks that would allow computers at vast distances to interact. The internet was first developed as a tool for the military, academics and other researchers in the early 1970s. Then, in the 1990s, with the invention of the **World Wide Web** (WWW) as an easy and convenient way of distributing information across the internet, it exploded into the worldwide phenomenon that it is today.

Computers by themselves are very powerful tools, but when we can link them up together and pass information from one to another they become far more useful. Computers are also embedded inside most modern machines. Our cars and washing machines contain computer chips that regulate their actions. The photocopier, introduced in 1960, was a simple copy machine that could not connect to any other machine. But because our current photocopiers contain a computer and can be connected to a network, they can now behave like printers or scanners as well. It is precisely this mixture of computing and communications technologies that allows the manufacture of four-in-one printer/copier/fax/scanners, as well as mobile phones that can process photos and play games, ATMs that can withdraw funds from accounts on the other side of the world, and almost every other business-related technology that we take so much for granted today.

Networks, cloud computing and mobile technologies

2000 – Present: Three further technology developments of the first 15 years of the twentieth century have profoundly affected the world of business: Web 2.0 (Social networks), cloud computing, and mobile technologies.

The World Wide Web of the 1990s, now often referred to as **Web 1.0**, was composed of Web pages connected by hyperlinks. Web 1.0 refers to the Web when it was a set of static websites that were not yet providing interactive content. Web 1.0 is simply an information portal where users passively receive information without being given the opportunity to post reviews, comments and feedback. Web 1.0 applications were also generally proprietary, offering what some refer to as "brochureware" – sites that advertise services and products but offer little or no opportunity for those visiting the site to participate in content creation.

Exactly where Web 1.0 ends and Web 2.0 begins is widely debated. This change happened gradually as the Internet became more interactive, enabled by broadband Internet and more capable browsers.

Since 2004, **Web 2.0** has been the term used to describe the social Web, where user-to-user communication is at the centre of users' online activities. Major features of Web 2.0 include social networking sites, self-publishing platforms, tagging, and social bookmarking. Users can provide the data that is on a Web 2.0 site and exercise some control over that data. Web 2.0 sites that are now part of everyday experience include: **Facebook** (Social Networking application), **Twitter** (Microblogging), YouTube (Video sharing), Wikipedia (open content online encyclopaedia), Pinterest (image and video sharing) and WordPress (open source publishing software).

Mark Elliot Zuckerberg (born May 14, 1984) is an American computer programmer and internet entrepreneur. He is best known as a co-founder of the social networking website **Facebook**.

Jack Dorsey (born November 19, 1976) is an American programmer and businessman widely known as a co-founder of **Twitter**. In 2012, The Wall Street Journal gave him the "Innovator of the Year Award" for technology.

The emergence of Web 2.0 functionality in the early 2000s has offered business new ways to connect with, understand and inform both their suppliers and their customers. Electronic Commerce (eCommerce) is now much more than buying and selling using networks – it is about exploiting social media to build relationships.

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet). Cloud computing entrusts centralised services with your data, software and computation on a published application programming interface (API) over a network. End users access cloud based applications through a web browser or a light weight desktop or mobile app, while the business software and data are stored on servers at a remote location. Cloud computing can be utilised by enterprise customers to create cost effective IT solutions, with the complexities and expenses of managing the underlying hardware and software being outsourced to the cloud provider. For example, **Google**, in addition to their web search site services, offers browser-accessed home and office services including: Gmail (searchable email), Drive (file storage and sharing), Documents (document creation and editing), Sheets (spreadsheets), Slides (presentations), Forms (surveys), Sites (websites and wikis) and Calendar (schedule organisation and sharing). In similar vein, **Yahoo!**, an American multinational technology company is known globally for its online business-relevant services including its Web portal, search engine, and related services, including Yahoo Directory, Yahoo Mail, Yahoo News, Yahoo Finance, Yahoo Groups, Yahoo Answers, advertising, online mapping, video sharing, fantasy sports and its social media website.

Google was founded by **Larry Page** (left, born March 26, 1973) and **Sergey Brin** (right, born August 21, 1973) while they were Ph.D. students at Stanford University. Google offers online productivity software including email (Gmail), a cloud storage service (Google Drive), an office suite (Google Docs) and a social networking service (Google+).

Marissa Ann Mayer (born May 30, 1975) is the current president and CEO of **Yahoo!** Previously, she was a long-time executive, usability leader, and key spokesperson for **Google.**

Mobile technology refers to the technology used for cellular communication. Since the start of this millennium a standard mobile device has gone from being no more than a simple two-way pager to being a mobile phone, GPS navigation device, an embedded web browser, an instant messaging client

and a handheld game console. Mobile computing by way of tablet computers has boomed. It is widely argued that the future of computer technology rests in mobile computing with wireless networking.

Disruption and emerging technologies – A new future

Reasons for the explosive growth in computing and networking technologies outlined in the narrative above might be appreciated in terms of a principle known as Moore's law. In 1965, Gordon Moore, co-founder of the Intel Corporation, observed that the number of transistors per square inch on a computer chip doubles every 18 months. This statement has been widely misinterpreted to be that the speed of a computer doubles every 18 months. Whilst this is formally incorrect, history has shown it to be approximately the case over the last 50 years. If such exponential growth continues the future may well bring us technologies well beyond anything we might imagine.

To whet your appetite, however, two technologies relevant to business, and already the subject of extensive research and development, might be considered:

- The Internet of Things (IoT) – The Internet of Things is envisioned as a network of physical objects or "things" embedded with electronics, software, sensors and connectivity. These objects will be able to exchange data without human intervention, with a manufacturer, operator or with other connected devices. Business-relevant scenarios for the use of such technologies include: automatically collecting information in settings ranging from natural ecosystems to buildings and factories; instant and ceaseless inventory control in warehouses and retail outlets; energy management to optimise energy consumption; medical and healthcare systems that can remotely monitor health and notify emergencies; and the automatic integration of transport/logistics operations. Some experts estimate that the IoT will consist of almost 50 billion objects by 2020. and
- Ubiquitous Computing – Ubiquitous computing envisions small, inexpensive networked processing devices, distributed at all scales throughout everyday life and meeting everyday purposes. For example, in your home or office the lighting and temperature controls might be interconnected with personal biometric monitors woven into your clothing. Illumination and heating conditions in a room could then be adjusted imperceptibly, to meet your personal specified preferences. Devices such as refrigerators could be made "aware" of their tagged contents, and programmed to plan a variety of menus from the food available, and warn of stale or spoiled food.

Business organisations

1965 – 2000: During the years 1965 – 2000 significant steps were taken towards re-thinking organisations, not as individual silos of activity, but as 'systems'. A **system** can be defined as a collection of interrelated components (subsystems) that function together to achieve some well-defined purpose(s).

Business organisational structure

Business organisational structure refers to the interrelated components (subsystems) of a business and the way these components are related to each other in the organisation. Depending on the goals of the organisation and its approach to management, a number of organisational structures can be used. The structure adopted directly affects the flow of data and information within the organisation and determines how business information systems are viewed and what kinds of business information systems are to be used. The structure directly affects the flow of data and information within the organisation and determines how business information systems are viewed and what kinds of business information systems are to be used. Although there are many possibilities, business organisational structure

typically falls into one of the following categories: traditional, project, team or multi-dimensional (Stair and Reynolds, 1999).

Although there are many possibilities, the majority of business organisational structures employed during the period 1965 – 2000 would be typically classified as traditional/hierarchical.

The **traditional (hierarchical)** organisational structure is built on the division of responsibilities according to individual business functions. These business functional areas are usually organised into departments such as marketing, production, accounting, research and development, and so on. The positions or departments that are directly associated with the making, packing or shipping of goods are called line positions. A production supervisor who reports to a deputy general manager of production is an example of a line position. Other positions may not be directly involved with the formal chain of command but may assist a department or area. These are staff positions, such as a legal counsel reporting to the general manager. Figure 1.2 presents an organisational chart for a traditional business organisational structure.

The **traditional organisational structure** is hierarchical, since it can be viewed as a series of levels (layers) like an inverted tree, with those at higher levels having more power and authority within the organisation.

Taking a systems approach to the organisation also encouraged managers to adopt what has been termed 'soft systems thinking' approaches to their decision making. **Soft systems thinking** recognises that when analysing complex situations there will be divergent views about the definition of the problem that must be recognised and reconciled. Such views can be deeply embedded in the culture of an organisation – the set of beliefs, understandings and assumptions that characterise an organisation, and can shape organisational behaviour.

2000 – Present: The focus of organisational thinking during the first 15 years of the 21st century has moved to the concept of the 'agile organisation'. An **agile organisation** is quick to respond to changes in the marketplace or environment. The 'agile or entrepreneurial organisation' focuses on customer satisfaction and the delivery of exemplary service which calls for customized rather than standardised offerings. A highly agile organisation reacts successfully to the emergence of new technologies and innovates as a response to external threats to business or recognised opportunities. Agile enterprises thrive when structured in non-hierarchical ways. As such, alternate organisational structures have emerged: project, team and multidimensional.

The **project organisational structure** is based on allocating the responsibilities and resources to the main products or services in an organisation, as shown in Figure 1.3. For example, in a manufacturing

FIGURE 1.2 Traditional (hierarchical) structure

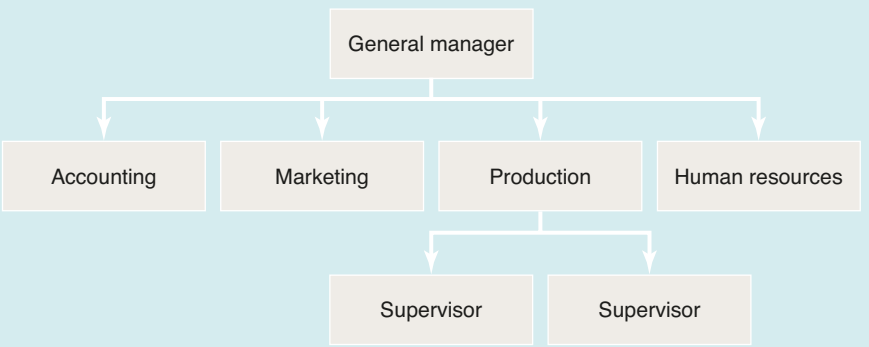
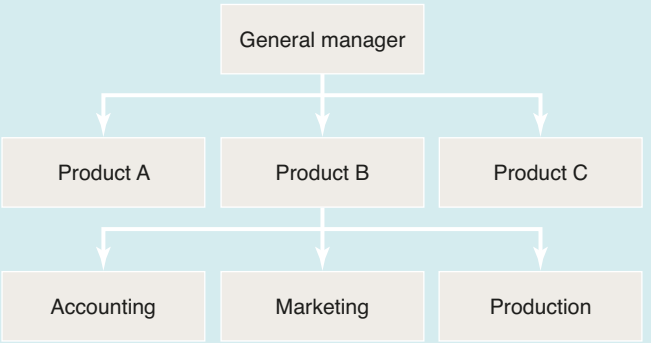


FIGURE 1.3 Project structure



firm that produces numerous types of products, each type is produced by a separate unit. Traditional functions such as marketing, accounting and production are positioned within these main units.

Project structure is often temporary. When the project is complete, the project members go on to new teams formed for the completion of some other project. This is particularly true for businesses in the networked economy, in which changes and business reorganisations are a part of life.

The **team organisational structure** is centred on work teams or groups. In some cases, these teams are small; in other instances, they can be very large. Typically, a team has a team leader who reports to an upper-level manager in the organisation. Depending on the tasks being performed, the team can be either temporary or permanent.

A **multi-dimensional organisational structure** (Figure 1.4) may incorporate several structures at the same time. It is a hybrid organisational structure aiming to take full advantage of each individual organisational structure. For example, an organisation might have both traditional functional areas and major project units. It is not uncommon to find this kind of organisational structure in multinational corporations such as Microsoft, BHP Billiton and Telstra.

The popularity of the multi-dimensional organisational structure is due to its ability to simultaneously stress both traditional corporate areas and important product lines. When used appropriately, it can create an effective balance between control and autonomy within an organisation and facilitate communication within the organisation. A disadvantage of this structure, however, is the multiple lines of authority that are created within the organisation that may lead to conflict if not handled adequately.

Figure 1.4 illustrates a multi-dimensional matrix organisational structure.

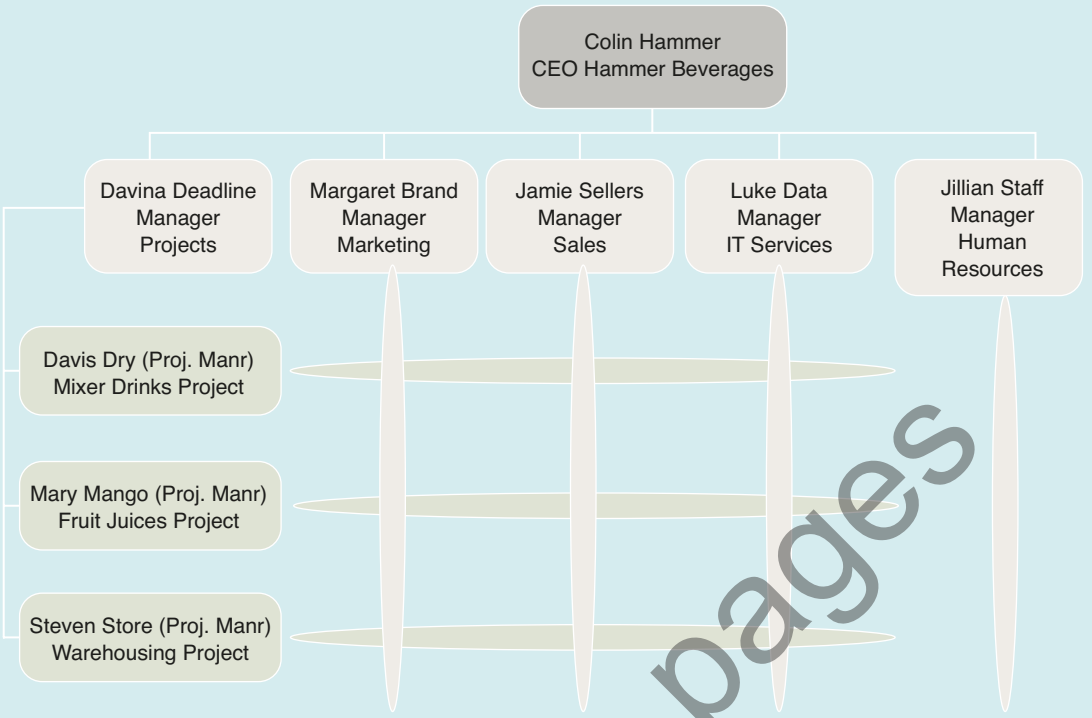
The concept of agility also underpins business approaches to the operation of supply chains. This has required that business rethinks the notion of organisational boundaries. Business-to-business electronic commerce requires that organisational boundaries now encompass cooperating business partners who use inter-organisational information systems to enable integration across entire supply chains, from raw product producers to retail outlets.

Business organisations in the future

In a 2015 article, Forbes proposed "The 14 Principles of the Future Organisation". Of these, several relate directly to the role that computing must play in enabling future businesses, including:

- Globally distributed with smaller teams – "We are absolutely seeing a shift towards organisations "command and conquering" where they are distributing their real-estate and their employees

FIGURE 1.4 Multi-dimensional structure



among various pockets around the world. … Talent is no longer dependent on proximity to the corporate headquarters."

- Connected workforce – "A company cannot have a distributed workforce unless that workforce is able to stay connected with the right people and information; anytime, anywhere, and on any device. This means deploying the right collaborative technologies that enable this to happen. Technology is the central nervous system of an organisation."
- Entrepreneurial – "The same spirit, passion, and creativity that entrepreneurs have must also be fostered inside of organisations. Employees should be able to test out ideas, run experiments, pitch new projects, and "run" with the ones that have potential."
- Operates like a small company – "A small company makes decisions quickly, isn't bogged down by bureaucracy, and is more agile and adaptable. In a rapidly changing world organisations cannot operate as their stereotypical "larger selves" where employees spend all their time checking emails, have meetings about having meetings, and basically operate at the speed of sludge." and
- Runs in the cloud – "On-premise technologies have a shelf life and their days are surely numbered. How much longer do you think your company can sustain its on-premise deployments before falling behind every single other competitor that is able to adapt to technological change faster than you? … Stall as much as you want but the "future

People in the office – The rise of the Information Society

1965 – 2000: Over the past 50 years, a major change has taken place in the nature of office work. In the same way that there was a burst of technical invention in the 17th and 18th centuries, with the development of machines to produce products, heralding the arrival of the industrial society, the years from 1965 to 2000 were characterised by a burst of invention in the field of electronics. The exploitation of the solid state transistor (invented in 1947) and the silicon chip (invented in 1961) in ever more powerful computing devices, as discussed earlier in this chapter, together with advances in communications, has allowed workers to store, access and use quantities of data and information that were previously unthinkable. The use of computer technology inside the machines that make goods means that they have become so efficient that fewer people are needed to operate them.

At the same time, an increasing number of people have been employed to cope with the flood of data and information that organisations need to use in order to survive. At some stage in the second half of the 20th century, more people began working with data and information than were left working the machines that make things. The **'information society'** arrived. In an information society, most people are busy sending, receiving, storing, and processing data and information.

2000 – Present: In the first decade of the 21st century the term 'information society' was widely replaced by the term **'knowledge economy'**. The term knowledge economy has aspects that are both positive and negative. On the one hand, the replacement of the word 'information' with the word 'knowledge' refers to an increasing focus on the incorporation of information into our understanding of the world around us. On the other hand, the use of the term 'knowledge' does overstate the level at which most people are performing in their everyday working lives. There are still many more people in the knowledge economy performing routine types of tasks, such as doing data entry and working in call centres, than there are people creating new knowledge.

To support business operations in the knowledge economy, two important work functions emerged:

- **Business analytics**: The task of applying various technologies and algorithms to extract, from large business data repositories (sometimes called "big data"), insights that build understanding of current business activity (descriptive analytics), predict future business performance (predictive analytics), and prescribe the optimum decision to take at the present time (prescriptive analytics); and
- **Knowledge management**: The process of capturing, developing, sharing, and effectively using organisational knowledge (including the knowledge generated through the practice of business analytics). Knowledge management refers to a multi-disciplined approach to achieving organisational objectives by making the best use of knowledge.

The replacement of the word 'society' with the word 'economy' is also ambivalent. On the one hand, it emphasises the fact that it is vitally important for organisations, especially businesses, to understand that the basis of their success is now tied to their ability to identify and harness their information resources and to make them work for the strategic goals of the organisation. It helps to remind businesses that their fundamental value and profitability are now as dependent on how they manage these aspects of their operations as on the efficiency of the machines they run and the people they employ. On the other hand, the use of the term 'economy' overlooks the wider role that information and knowledge have to play in our whole society. It is not just in the wealth-generating parts of our society that information and knowledge have become fundamental.

Non-profit sectors of society depend on the efficient and effective use of information and knowledge resources as well. For instance, international charity organisations depend on being able to

channel information concerning crisis situations in Third World countries to affluent people in rich countries to encourage them to make donations. Individuals in their daily lives also need access to such resources to enable them to fully participate in the range of situations they find themselves having to deal with. For instance, if diagnosed with an unusual illness most people will go on to the Internet to seek information concerning the illness. They may do this in order to:

- gain a deeper insight into their condition than that likely to be given them by an overworked hospital doctor;
- connect with other people who have the same condition or any available support groups; and
- better understand and communicate with the doctors when they next talk to them.

In this book, although we have introduced separate definitions of the terms 'information society' and 'knowledge economy' we will not dwell on the distinction. Either term can be used to refer to the current state of advanced societies such as in North America, Europe, Japan and Australia, where most people spend most of their working day dealing with data, information or knowledge, rather than making goods or growing food.

Knowledge workers of the future

In a 2009 article Time Magazine investigated "The Future of Work". In the first paragraph of that article they posed the following:

> *"Ten years ago, Facebook didn't exist. Ten years before that, we didn't have the Web. So who knows what jobs will be born a decade from now?"*

Let's not, therefore, be too ambitious in our speculations. What might characterise the workforce, say, over the next decade? Current research suggests the following:

- High Tech – as noted by Time (2009): "Top grads will tack toward a variety of potentially lucrative positions that prize technological savvy and analytical aptitude. According to consulting giant McKinsey & Co., nearly 85% of new jobs created between 1998 and 2006 involved complex 'knowledge work' like problem-solving and concocting corporate strategy." It is widely expected that this trend will continue.
- Globally Integrated – The ability of a business' workforce to manage complex, globally-interrelated issues may well become a significant competitive advantage for organisations. The 'knowledge organisation' will demand knowledge and skill sets amongst its employees, supported by information and communication technologies, that will make the difference between corporate competitiveness and failure. and
- Increasingly Freelance – as reported by the Economist (2015), enabled by ever-expanding mobile communication technologies, "Freelance workers available at a moment's notice will reshape the nature of companies and the structure of careers". The Economist reports that: "The obvious inspiration for all this is Uber, a car service which was founded in San Francisco in 2009 and which already operates in 53 countries…. SherpaVentures, a venture-capital company, calculates that Uber and two other car services, Lyft and Sidecar, made $140m in revenues in San Francisco in 2013, half what the established taxi companies took …, and the company shows every sign of doing the same wherever local regulators give it room. Its latest funding round valued it at $40 billion."

Making sense of the evolving role of computing – digital disruption

The concept of "disruption" emerged almost 20 years ago. It was introduced by Harvard Business School professor, Clayton Christensen. His original theory referred to 'disruptive innovation'. It described the way new ideas and technologies could be deliberately employed to upset the status quo, so redefining industry best practice, changing "the rules of the game". Emerging digital technologies, even the early forms described above, were key drivers of rapid and disruptive innovation. The term 'digital disruption' has now emerged to describe the impact such new digital technologies are having across all industries and sectors.

McKinsey Global Institute (2013) has highlighted twelve "disruptive technologies". McKinsey describes these, somewhat dramatically, as "advances that will transform life, business, and the global economy". Indeed, writers such as Riddell (2015) argue that the term "disruption" is inadequate to describe the "seismic upheaval" that is actually occurring – "The tectonic plates of society and business are being shifted and shaken. However, for many of us, our understanding of 'disruption' does not align with change of this magnitude". The first four of the "disruptive technologies" listed by McKinsey displayed in Figure 1.5 are the Mobile Internet, the Automation of knowledge work, the Internet of Things and Cloud Technologies.

It is important to understand that Digital Disruption can occur at various levels. Riemer and Johnston (2015) have classified the possible focii of disruption as follows:

- **Disruptions to individual life practices** (eg: Mobile connectivity disrupts established work-life boundaries)
- **Disruptions to work practices** (eg: Narrating work via microblogging in the workplace changes what counts as (valuable) work)
- **Disruptions to business practices** (eg: Workplace social media disrupts the way information travels in the organisation and induces shifts in power relationships)

FIGURE 1.5 Disruptive digital technologies

	Mobile internet	Inexpensive, capable mobile computing devices with Internet connectivity
	Automated Knowledge Work	Intelligent software systems that can perform knowledge work involving unstructured tasks and requiring subtle judgments
	The Internet of Things	Networks of low-cost sensors and actuators for data collection, monitoring, decision making and process optimisation
	Cloud Technology	Computer hardware and software resources delivered over a network (or the Internet), often as a service

(Adapted from McKinsey, 2013)

- **Disruptions to industry structures** (eg: Digitisation of media content and user-generated content disrupts traditional value chains of content production and delivery)
- **Disruptions to societal systems** (eg: Social media participation disrupts traditional practices of public opinion making)

The rest of this book

This book is designed to introduce its readers to some of the basic theory and processes of information systems within the context in which they are used in organisations, in particular by end-users. End-users are not information technology, information systems or information management specialists. They do not want to spend their days tinkering with IT. They are nurses, administrators, marketers, teachers, accountants, lawyers, scientists, and all the other diverse range of roles necessary within organisations. They need to use the technology or the information in order to get their job done.

The philosophy of end-user computing is that, for some applications in business, it is easier to train end-users to complete their own information systems tasks than to employ IT specialists and train them in the functional objectives of the organisation.

There are some problems that need to be solved by end-users which can be solved more effectively if they are able to comfortably learn new IT skills and processes. The motivation for learning in these cases is the requirement to utilise new IT skill sets to solve problems, rather than to learn the skills for their own sake. This has profound implications for the role of individual workers in business. It means that all workers need to have the capability to learn new IT skills as the need arises.

When there are information systems requirements beyond the ability of the end user to learn them, it is imperative that end-users are able to communicate with IT specialists. Having enough end-user knowledge to know how to describe the problem or, even better, what a solution could look like will save time, effort and money.

Understand and apply a knowledge of Information Systems to operationalising business opportunities and generating problem solutions. The TOP framework will be used to assure an holistic approach to is used to develop effective business procedures.

This text is structured as three modules, introducing you to the knowledge and skills necessary to make use of emerging technologies effectively in business.

1. **The Business Computing Context** – Manage your computing resources in an environment where mobile technologies and social networks mean that your business can operate globally, and which demands that you address issues including information system security, risk, project/change management and, above all, that you behave ethically.
   - Computing for Business Success
   - Social Networks and Mobile Technologies
   - Managing IS Security and Risk Ethically
   - Surviving Change in the Workplace
2. **Business Analytics** – Capture relevant data and process it to produce information that will inform all of your business decision making.
   - Systems Thinking and Business Analytics
   - Analytics Drives Business Intelligence
   - Big Data Visualisation Promotes Good Business Decisions
   - Business Communication