Industry Insight.

Information and communications technology.

30 October 2020

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Summary.

This report focuses on New Zealand's information and communications technology (ICT) sector, which is concerned with providing and operating the infrastructure and components needed to capture, transmit and display data and information electronically. In this respect, ICT is generally accepted to mean all devices, networking elements, software applications and systems that enable interaction with the digital world.

Globally, the ICT sector is huge, generating revenues of about $5trn per annum. With revenues of about $30bn, it is also a big deal in New Zealand, although this includes about $12bn worth of hardware equipment and published software, most of which is imported. Home grown revenues were worth about $18bn, almost $10bn of which came from designing and implementing computer systems, with most of the remainder generated from telecommunications and internet service provision.

The ICT sector has many moving parts. While there are a handful of larger players that dominate activity in some market segments, the sector is characterised by many small firms, the vast majority of whom are sole proprietorships. Most are to be found in the computer systems design market segment, with many focusing on the provision of ICT support services.

Many of the large firms that operate in the ICT sector are global firms and are household names. They compete head on with a handful of large local firms, some of whom have offshore interests themselves. They are mainly found in data processing and web hosting, computer systems design and telecommunications market segments.

Demand for ICT products and services is determined by many factors. Some are slow burning and shape demand over time. That includes some of the big structural changes that are reshaping the economy and the shift to a more digitalised future. The growing dominance of the services sector is also important because it uses ICT more intensively than other sectors.

Other demand drivers are of a more cyclical nature and tend to have short-run effects. A sustained period of economic growth, for example, has been one of the key reasons why firms in New Zealand have increased their ICT spending in recent years. Causality also runs the other way, with spending on ICT not only a function of the economic cycle, but also a key driving force behind it.

However, the relationship between economic activity and ICT spending has been turned on its head recently by Covid-19. As the pandemic raged and the New Zealand economy went into recession, many firms ramped up their spending on ICT to minimise the impacts of the pandemic on their operations and ensure business continuity. That in turn accelerated the adoption of subscription based digital solutions, such as cloud-based software and infrastructure services (including new generation data processing) as well as broadband. These services not only allowed people to work from home, but they could be provided remotely.

However, not all ICT market segments were boosted by Covid-19. Traditional processing services, for example, have struggled, with increased competition coming from cloud-based services. Pandemic related uncertainties have also resulted in many ICT projects, especially those requiring a physical presence, either being deferred to a later date or cancelled. Those in the initial phases of development and/or procured by firms in sectors hardest hit by the pandemic were among the most vulnerable.

To produce their products, ICT firms need three things. Firstly, they need access to hardware and packaged software. This is not normally a problem for ICT firms in New Zealand who deal directly with offshore vendors, local distributors, and wholesalers to get what they need. That said, supply chains are still vulnerable to disruptions caused by unusual events, such as Covid-19.

Secondly, ICT firms need access to the right quantity and quality of skills. Unfortunately, ongoing skills shortages are a defining feature of the sector and median salaries tend to be a lot higher than in other parts of the economy. This situation is likely to have been exacerbated recently by Covid-19.

Finally, ICT firms also need the necessary intellectual property to deliver ICT products and services to their customers. That is a key point of difference for many in the sector. To keep ahead of the play, firms must make ongoing investment in their intellectual property. That is normally achieved in one of three ways: direct procurement, merger and acquisition activity, or through inhouse research and development. The ICT sector invests more in research and development than any other in New Zealand and that is likely to remain the case given the pace at which digital technologies are advancing.

Competition is intense. ICT firms compete both within and across market segments. Mobile telecommunication operators, for example, do not just compete against each other for customers that need voice and data services, but also fixed line network operators, who provide similar services.

In similar vein, firms that provide traditional ICT products and services are increasingly feeling the heat from firms that deliver ICT solutions as a service. For example, firms that use the cloud to provide software, platforms, and infrastructure as a service rather than as a product are making big inroads into traditional areas of ICT delivery.

Advances in digital technology are shaking up the ICT sector in other ways too, not least because they are helping to blur the lines of distinction between different industries. For example, the rollout of ultra-fast broadband has allowed wired telecommunication firms to provide streaming services to customers, effectively moving into the space traditionally occupied by digital television providers. In response, digital television providers have also started to provide their own video streaming services.

As is the case in most industries, firms within the ICT sector compete for customers across a continuum, with price at the one end and the ability to add value at the other. As a rule, smaller firms typically provide a narrower range of products and services to customers within specific geographic areas than their larger counterparts.

For those that provide commoditised services, such as wired and wireless voice services, it is all about running big volumes over a fixed cost structure and keeping prices as low as possible. Competition from substitute products and services pose a real threat.

By contrast, those that provide value added ICT products and services compete on their ability to deliver solutions that are tailored to their customer's needs. Competition focuses on the ability of staff to leverage off the functionality offered by their proprietary intellectual property. For smaller firms, it is mostly about providing niche solutions and highly specialised competencies. For larger firms that focus on bigger projects, reputation and branding is key.

Outlook.

Spending on ICT has been strong recently despite a recession. The reason for this has been Covid-19.

Normally, a double-digit contraction in economic activity would have resulted in firms cutting back on their ICT spending. But this time has been different with firms accelerating their use of ICT products and services that leverage off new digital technologies in order to adapt to the reality of Covid-19.

In the short-term, we expect spending on ICT will moderate slightly from current levels but should remain elevated.

With the digital genie now out of the bottle, firms are likely to be more open to new ways of operating, and this will drive spending on ICT products that encompass new digital technologies. That is going to mean more spending on cloud computing as firms look to better manage their processes, such as the recovery of data and safe backup systems. There is also likely to be more spending on social networking software and collaboration platforms because of increased requirements for remote working.

Elsewhere though, the news is unlikely to be quite as good. Even though we expect the economy to improve over coming quarters, ongoing Covid-19 related uncertainties are likely to curb investment on traditional ICT products and services. That is going to mean less spending on hardware, such as computers and peripherals, and on most software categories.

Spending on computer design services, especially those that require a significant physical presence, should also fall in the short-term. Firms are likely to continue to defer their spending on ICT projects, especially big-ticket items. However, some work should still come from downstream firms looking to keep their existing operations and mission-critical projects afloat.

Longer-term, we think the prospects for ICT spending are favourable. When digitisation is truly in play, Covid-19 is largely a thing of the past, and the economy is on a much firmer footing, ICT spending is expected to grow strongly. Indeed, we anticipate big gains across all market segments, but particularly in cloud computing with firms increasingly looking to embrace new digital technologies to not only gain a competitive edge over their peers but also improve their resilience to external shocks. Firms operating at each point in the value chain in the manufacturing, transport and logistics, and retail sectors as well as government, are likely to be among those to see accelerated digital transformations, with demand for 5G mobile technology, mobility software, artificial intelligence, Internet of Things, big data and remote sensors, all likely to grow strongly in coming years. The export market is also likely to be a key area of growth, especially for firms that provide cloud computing services.

ICT spending over the longer-term, should also be propped up by favourable demographics. Younger people in general tend to consume more ICT products and services than others. That is especially true if they have higher incomes and are more educated. As these ICT using cohorts age, there is likely to be a long period of increasing take up of ICT products and services.

This should be good news for the thousands of firms that operate in the ICT sector. However, new digital technologies will not only create opportunities in traditional markets, they will also lower barriers to entry into new markets. This will lead to a convergence between ICT firms that operate in different market segments, as well as between firms in non-ICT sectors. For example, ICT firms are already moving into the pharmaceutical and healthcare sectors. Simultaneously, convergence will also pose a growing threat with new entrants from other sectors entering the ICT sector. That includes motor vehicle manufacturers, looking to make the shift towards driverless vehicles.

Rising demand for ICT products and services that leverage off digital technologies will also pose some big challenges, not least of which is how to keep up with the play. Investment in research and development activities to how best use new digital technologies to deliver cutting edge ICT products and services is likely to become even more important than it is today. So too will be the ability to attract the best and brightest, who will not only have the technical skills to operate in an increasingly digitised world, but also other attributes not traditionally associated with the ICT sector.

The many small firms that operate in ICT sector will also have to attract a lot more foreign direct investment. The sector has a long history of attracting investment from offshore. Not only is New Zealand viewed as an investor friendly country, but locally grown ICT firms are regarded as being highly innovative with a “can do” attitude. Given the large number of firms involved in the sector, it seems likely that only a small select group will be able to attract the investment required to operate in a digitally transformed world.

Competition for skills is also likely to ramp up. Shortages will probably worsen, which will drive up wage costs, a significant cost item for most firms, but especially those that provide computer design services. Whether these costs can be passed on depends on the relative negotiating positions of buyers and sellers. Best placed are likely to be those firms that provide tailored solutions to customers.

Our view is that going forward the ICT sector will consolidate. ICT firms will find themselves being squeezed even harder by two opposing forces. On the one hand they are going to face ever increasing demands for new ICT products and services, but the means of addressing them are likely to become ever more constrained. That is likely to lead to a sustained period of corporate activity, with firms actively merging with and acquiring others within and across market segments, in anticipation of increases in future demand. Given the large number of small firms that exist in the ICT sector, there is plenty of scope for this.

However, while the number of firms operating in the sector is likely to contract, some offset may come from new start-ups, which are likely to buoyed by increased levels of investment. Angel or seed investment in the New Zealand ICT sector has grown strongly over many years, albeit from relatively low levels, and there is nothing to suggest that this will change in the future.

Larger firms in the ICT sector are likely to get bigger, especially those that provide computer systems design services. Given the limitations of a small domestic market, most larger firms will expand offshore, allowing for knowledge transfers. There is also potential for some to expand into other sectors, especially those where there they can apply their intellectual property.

Introducing the industry.

Scope of this report.

This report focuses on New Zealand's information and communications technology (ICT) sector, which is primarily concerned with the delivery of an expanding range of hardware, software and service solutions that enable information to be captured, transmitted, processed, and displayed electronically.

Firms operating in the ICT sector primarily:

Design computer systems and provide related services. These firms are involved in writing, modifying, and testing software, which has been tailored to the specific needs of their consumers. They are also involved in providing consulting services with respect to the planning and designing of computer systems, which includes the integration of computer hardware, software, and communication technologies (including the internet).

Firms operating in this market segment also provide computer facilities management services, including the onsite management and operation of customer's computer systems, as well as facilities support such as disaster recovery. They generally work on a contractual basis, assisting their customers with a particular project or problem, such as setting up a secure website or establishing an online marketplace, or for ongoing activities, such as the management of an onsite data centre or help-desk.

Deliver electronic data processing and web hosting services. These firms are involved in the capturing of raw data, the use of computer processing power to analyse it, the summarising of key trends and the provision of deeper analytical insights. Most of this activity is undertaken at large data centres. Other services include the timesharing of mainframe facilities, electronic data and retrieval services and internet-based services, such as applications hosting, video and audio streamlining services. Also included is the delivery of cloud-based computing services such as "infrastructure as a service", "platform as a service" and "software as a service".

Deliver internet access and web search portals. Internet Service Providers (ISP) provide access to the internet via fixed lines to businesses, households, and government. These firms compete with wireless telecommunication service providers that provide mobile access to the internet, typically through mobile phones. Also included are firms that operate websites (including portals to other websites) and search engines.

Operate telecommunication networks. This includes firms that provide, operate, and maintain wired telecommunication networks which they then use to deliver voice, data, text, sound, and streaming video services. Also included are firms that operate and maintain switching and transmission facilities that provide omni-directional or point-to-point communications via wireless, mobile or satellite telecommunication networks. Like their wired counterparts, they also deliver voice, data, text, sound services, but to mobile device users.

Provide other telecommunication services. This includes firms that provide paging services and specialised services such as satellite earth station operations. Also included are telecommunications resellers, such as mobile virtual network operators, that do not operate their own telecommunication infrastructure, but instead purchase access to network capacity from other carriers.

Exclusions.

This report refers to but does not focus on firms involved in:

Delivering and publishing off-the-shelf computer software. That includes firms that design, create and mass produce branded software. This software is then distributed through wholesale and retail networks covering New Zealand.

Manufacturing ICT hardware components. That includes firms that design and manufacture computers, peripherals, data transmission equipment such as routers or modems, as well as telecommunications, electric wire and cable, receiver and transceiver equipment.

Delivering high-tech products and services that include ICT componentry. That includes electronic office equipment, other electronic equipment, and professional and scientific equipment. It also covers a range of services that leverage heavily off ICT.

Table 1: Market segments within the scope of this report

Within scope of report		
Market segment	Computer services	Communication services
Scope of activities	Computer systems design	ISPs and web search portals
	Data processing & web hosting	Wired network operation
	Data storage	Wireless (mobile) network operation
		Other telecom services
Outside scope of report		
Market segment	Software	Manufacturing
Scope of activities	Published off-the-shelf	ICT hardware
		High-tech equipment

Recent performance of the sector.

Global revenues.

With sales of about US$5trn, the global ICT sector ranks as one of the largest industries in the world. It also one of the fastest growing, with sector revenues having grown by an average 5% per year over the last decade.

Table 2: Turnover by ICT market segment

Sub-sector		Market segment	Sales ($bn)
ICT Services	Computer	Systems design & related services	9.4
		Data processing & web hosting	0.6
		Data storage services	0.7
		Total ($bn)	**10.7**
	Communications	Internet access & web search portals	1.3
		Wireless network operations	2.8
		Wired network operations	2.6
		Other services	0.2
		Total ($bn)	**6.9**
ICT manufactured goods*		Computer & peripheral equipment	3.8
		Telecommunications equipment	2.4
		Audio & visual equipment	0.8
		Electronic components	0.4
		Electronic devices & equipment	1.3
		Other ICT goods	0.3
		Total ($bn)	**9.0**
Software		Published software	3.1
Total ($bn)			**29.7**

* almost entirely imported from abroad
Source: Stats NZ, IBISWorld, Westpac

Revenue growth has largely been driven by accelerated spending on new digital technologies as companies/ organisations look to transform their own business processes. In 2019 spending on transformative technologies such as cloud computing, internet of things (IoT), artificial intelligence (AI), big data/analytics and virtual/augmented reality (VR/ AR), jumped by 17% when compared to the previous year. By contrast, spending on traditional ICT hardware, software, and services has slowed, increasing by about 3.5% over the same period. Indications are that the Covid-19 pandemic has only accelerated this divergence.

Domestic revenues.

The ICT sector is a big deal in New Zealand, generating an estimated $30bn in revenue during 2019. In relative terms, that makes it slightly bigger than the transport, postal and warehousing sector, but a little bit smaller than the combined rental, hiring and real estate sector.

However, these revenues also include an estimated $9bn generated from the sales of ICT equipment and a further $3bn spent on packaged software each year, most of which is imported either directly by end users, through their ICT service providers, or by importers that sell through local distribution networks. Little ICT equipment manufacture takes place in New Zealand.

Sales from domestically packaged software is unknown but given the increase in number of software publishers operating locally in recent years, it is likely that New Zealand has a thriving local software industry.

A further $18bn was generated from firms that provide ICT services to business and individuals. Firms that provide computer systems design and related services are responsible for more than half of this figure. Included within this market segment are cloud services, which generated revenues of about $600m in 2019. Revenues from cloud services are expected to rise as downstream firms look to focus on core competencies and reduce operating costs.

Turnover generated from ICT services has grown by about 4% per year over the past decade. Growth has been underpinned by a relatively strong domestic economic performance, the emergence of new digital technologies, and the competitive dynamics at play in consuming industries.

The ICT sector in New Zealand is dominated by ICT services.

Revenue growth by market segment.

Most market segments have seen their revenues increase over time, although that is not true for all. Revenues generated from wired communication services, for example, have trended lower over the past decade as advances in digital technology, a proliferation of mobile devices and structural changes in the telecommunication sector, notably the separation of wholesale and retail markets, have underpinned growth in wireless telecommunication services. It might have been worse had it not been for the uptake of ultra-fast broadband (UFB), with adoption rates in New Zealand being among the highest in the world.

Figure 1: Revenue performance for selected ICT market segments

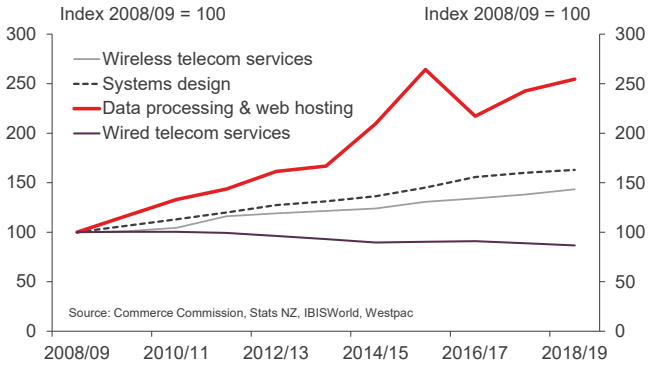
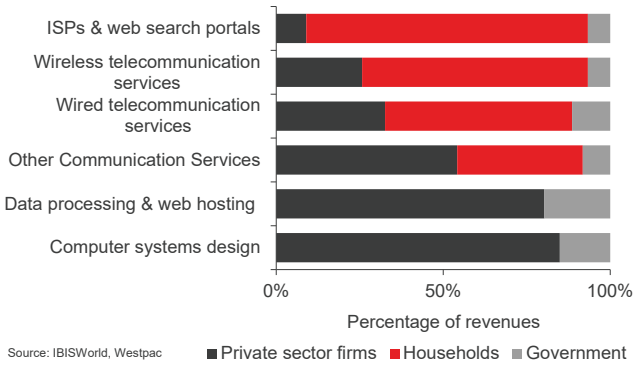


Figure 2: Contribution to domestic revenues by customer type and ICT market segment



By contrast, revenues from systems design services have grown consistently in recent years, with downstream consumers looking to maximise the efficiency of existing technologies they already own as well as the investments they have made in new ones. Specialist computer system design services, such as consulting, business and systems analysis, programming, and cybersecurity as well as the provision of project management and maintenance services, have been key revenue drivers for firms operating in this market segment.

However, it is the data processing and web hosting market segment which has been the fastest growing. Web hosting activities account for about 60% of industry revenues, while data processing makes up the remaining 40%. Revenue growth has been underpinned by the pervasiveness of the internet, the increasing popularity of cloud services, especially software as a service and infrastructure as a service, a continued upward trajectory in computer processing power, and because of new digital technologies, an improved ability to interrogate, analyse and provide deeper insights from data. At the same time, increasing competition in downstream consuming markets has meant a much greater focus on core competencies, with non-core activities, such as data processing and web hosting, increasingly being outsourced to specialist providers.

ICT services have been growing faster than equipment and software, and now contribute almost two thirds of total ICT sales.

Domestic revenues by customer segment.

Spending on ICT services in New Zealand is dominated by firms and private households.

Firms spent about $8bn on computer design services in 2019. They also spent a lot on wired and wireless telecommunications services ($1.8bn), as well as on data processing and web hosting ($0.4bn) services.

Meanwhile, households spent about $1.1bn on accessing the internet, another $1.5bn on wired telecommunications and a further $2.2bn on wireless telecommunications. Spending on wireless communications would also include expenditure on accessing the internet using mobile devices. By contrast, households spent virtually nothing on computer systems design, data processing and web hosting services.

The Government spends relatively little on ICT services compared to private firms and households. That said, it still invested heavily on computer systems design services ($1.4bn) in 2019, as well as wired telecommunications ($320m) and wireless telecommunications ($230m). A further $120m was spent on data processing and web hosting services outsourced to specialist providers.

Government is a small purchaser of ICT services, but is a big market for ICT hardware.

External trade.

New Zealand's external trade in ICT products and services is significant. Imports are dominated by hardware products, mostly computers, peripherals, and mobile devices. By contrast, ICT sector exports are mostly based around services, and to a lesser extent, software.

Table 3: Summary of New Zealand's external trade in ICT

Market segment	Exports ($bn)	Imports ($bn)
Hardware	0.6	4.8
Services	1.2	1.9
Software	0.9	N/A

Source: Stats NZ, IBISWorld, Westpac

Imports.

ICT imports into New Zealand are significant, totalling about $6.7bn in 2019, most of which was on hardware equipment manufactured overseas and on computer design services provided by offshore firms.

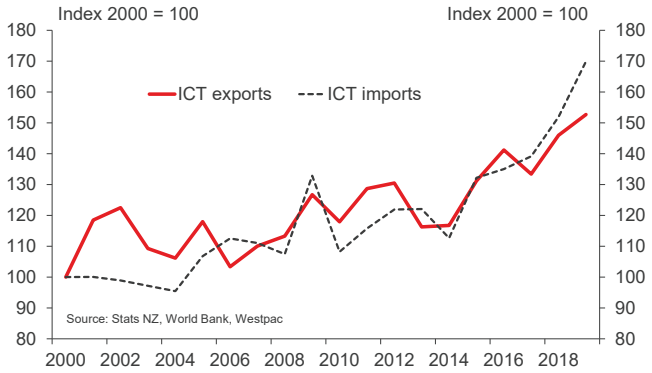
Roughly $4.8bn was spent on imported computers, peripheral equipment, communications equipment, consumer electronics, electronic components, as well as other information and technology goods in 2019. The remaining $1.9bn was spent on software as well as on computer design, data processing and web hosting services from offshore vendors.

ICT imports have grown strongly in recent years. The value of imported computers, peripherals and communication equipment rose 50% between 2014 and 2019, while imports of services rose by about 30% over the same period.

Exports.

Although smaller than imports, ICT exports are also substantial, amounting to about $2.7bn in 2019. That compares favourably with $1.9bn worth of exports from New Zealand's highly successful wine industry.

Figure 3: ICT exports and imports



Of this, telecommunications, computer, and information services exports contributed about $1.1bn, about 50% of which came from IT design, consulting, and development services, as well as technical support services. Just under $1bn was generated from exports of published software, with a further $0.6bn having come from specialised ICT hardware exports.

ICT exports have grown by almost 30% since 2014, with local firms increasingly pursuing growth opportunities in bigger offshore markets. Exports of ICT services have led the way, posting growth of 38% between 2017 and 2019. Growth in data processing and web hosting service exports slowed to just 7% between 2017 and 2019, after having previously doubled between 2014 and 2017 because of a massive increase in demand for cloud computing services.

However, while exports of ICT services have been strong, exports of locally made high-tech equipment (which typically include ICT componentry) have fallen from about $700m in 2017 to just over $600m in 2019. This decline mostly reflects structural changes in downstream manufacturing, with several prominent firms in New Zealand having moved operations offshore to take advantage of low labour costs, particularly in countries in South East Asia. Industry sources also suggest that many manufactured ICT goods produced and sold locally are incorporated into new products or are sold under transfer pricing arrangements with sister firms operating in other countries. Currently there is no formal way of measuring these offshore revenues for the ICT and broader tech sector.

ICT import growth continues to exceed exports and the gap between the two is growing.

New Zealand is a signatory to the international Information Technology Agreement (ITA). This agreement effectively abolishes tariffs on ICT equipment, contributing to an increase in external trade over time. The coverage of the ITA was widened in late 2016 to meet the needs of a rapidly growing and more sophisticated technology sector and customer base.

Shape of the sector.

Number of firms.

There more than 13,700 firms operating in the ICT sector, over 90% of whom provide computer systems design services.

Degree of fragmentation.

The overwhelming majority of ICT firms are small operators, many of whom are sole proprietorships. In addition, the sector hosts a relatively small number of large New Zealand based firms that compete head on with huge international firms that have established a local presence. Some of these big New Zealand firms have also expanded to other countries.

On average, the smallest firms found in the ICT sector are software publishers, followed by computer systems design firms. Conversely, the largest firms are wired and wireless telecommunication operators.

The degree of fragmentation that exists in the ICT sector is high, mainly due to the large number of small firms that deliver computer system design services. Fragmentation is much lower among firms that provide wired and wireless communication services and access to the internet, although higher still for those that deliver data processing and web hosting services such as cloud computing.

Computer system design services.

Most firms operating in the ICT sector provide computer system design services. Typically small, they operate within narrow geographic and service boundaries. By contrast, large firms that operate in this market segment provide a wide range of services to customers across New Zealand.

They also participate in other market segments. For example, Datacom, New Zealand's largest ICT firm, not only provides traditional system design services such as software development and consulting, but also data processing and web hosting services.

Data processing and web hosting services.

Most firms that operate in the data processing and web hosting market segment are small operators, with just a handful of larger firms generating about 60% of its revenue. To a large extent, this reflects the relatively large capital investment required to establish the necessary infrastructure and software to deliver these services. For data processing firms, that mostly relates to the establishment of data centres. As a rule, larger firms that have the capability to deliver the most reliable and secure services, focus on larger institutional customers, while their smaller counterparts tend to focus on small to medium-sized businesses.

Figure 4: Growth in ICT firms by market segment

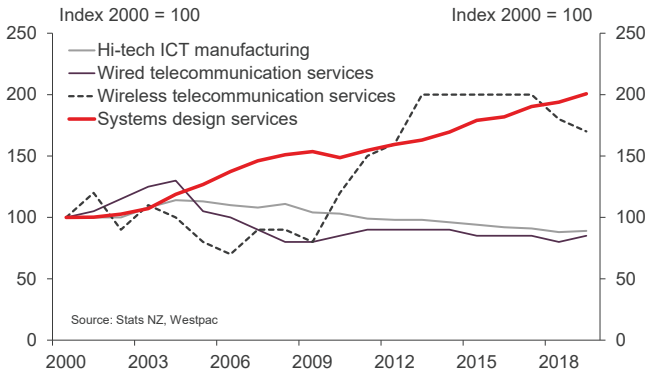


Table 4: Firms and employees by ICT market segment

Sector		Market segment	Enterprises (number)	Employees (number)	Average employees per firm (number)
ICT Services	Computer	Systems design & related services	12,267	34,300	2.8
		Data processing & web hosting	213	1,400	6.5
		Data storage services	102	1,100	10.8
		Total	**12,828**	**36,800**	**2.9**
	Communications	Internet access & web search portals	246	910	3.7
		Wireless network operations	51	6,200	121.6
		Wired network operations	51	4,250	83.3
		Other services	213	1,500	7.0
		Total	**315**	**12,860**	**40.8**
ICT manufactured goods		Computers & electronic equipment	33	95	2.9
		Telecommunications equipment	27	750	27.8
		Other electronic equipment	210	2,900	13.9
		Total	**270**	**3,745**	**13.9**
Software		Published software	318	840	2.6

Source: Stats NZ

Software publishing services.

Firms that design, develop and publish software are even smaller in size. Although off a low base, growth in the number of firms operating in this market segment has massively outpaced growth in other market segments, underpinned in large part by the need for software that can make best use of the capabilities of new digital technologies. These firms, however, still face huge competition from imports, especially from large foreign software publishers who produce desktop and mobile operating systems software.

Wireless and wired telecommunication services.

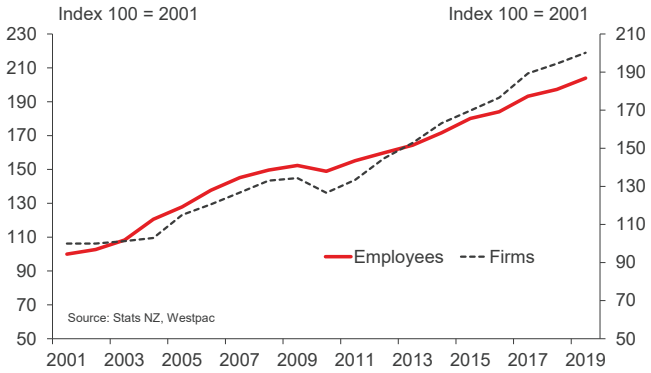
The largest firms operating in New Zealand's ICT sector can be found in the telecommunication sector. These firms build and maintain wired and wireless/mobile telecommunications infrastructure, as well as operate the network. In the case of mobile telecommunications, these firms are usually one and the same, with the exception being mobile virtual network operators (MVNOs) that purchase bulk access to the network, which they then resell to retail customers. That said, MVNOs are only a tiny part of the New Zealand's mobile telecommunications market. By contrast, infrastructure provision and network services in the wired telecommunications market segment were separated in 2011.

Wired telecommunications infrastructure primarily refers to the copper and UFB fibre networks. The rollout of the UFB fibre network is replacing the slower copper network, which has traditionally been used to deliver communication services to end consumers. The deregulation of the final loop, which is that part of the wired telecommunication infrastructure connecting end users to the wider network, has helped to facilitate the entry of new internet service providers (ISPs) that offer competitively priced broadband and electricity service bundles.

Number of employees.

The ICT sector is also a big employer, directly employing about 54, 000 people, about two-thirds of whom work in firms that deliver computer system design services. About 80% of people working in the sector are permanently employed, while contractors make up another 17%. The remainder are part-time or casual workers.

Figure 5: Growth trajectory of ICT firms and employees



Unlike most other sectors, highly skilled managers and professionals make up well over 50% (and in some market segments more than 80%) of people employed in the sector. That is more than double the average across all sectors of the economy. A high skills requirement is reflected in a median salary which is about 80% higher than the national average.

An additional 50, 000 people work in high-tech manufacturing concerns that produce a range of electronic equipment incorporating ICT componentry. Also included are firms that deliver services that leverage heavily off ICT.

A further 20, 000 or so staff work in the IT departments of firms spread across different sectors, including those in government, financial services, finance, education, healthcare, utilities, and professional services.

ICT firms are getting smaller, particularly in market segments where barriers to entry are relatively low.

Value chain model.

To deliver a vast range of outputs, the ICT sector is heavily dependent on skilled workers. Our value chain model suggests that these are either procured directly through the employment or contracting of workers or indirectly through the procurement of services.

Figures 6 and 7 on the following page summarise the value of input and outputs produced by telecommunication network operators and firms that provide computer system design services, respectively. They are expressed in basic price terms and as such exclude taxes payable, any subsidies received and transportation costs. Values are based on prices for the year ended March 2013, adjusted by the producer price index up to 2019.

Wired and wireless telecommunication services.

Telecommunication network operators provide a wide range of wired and wireless services, such as voice, data and text services, broadband and mobile internet access, web search portal services and the delivery of remote platform and software services.

To deliver these services, network operators spend a lot on services, with the biggest cost item being the $2.2bn spent on contracted specialist telecommunications, software, and technical services.

Labour costs incurred by telecommunication network operators are also significant. That is because they are a big employer of highly skilled workers. About 30% of people employed in this sector are technicians, while another 20% are either professionals or managers.

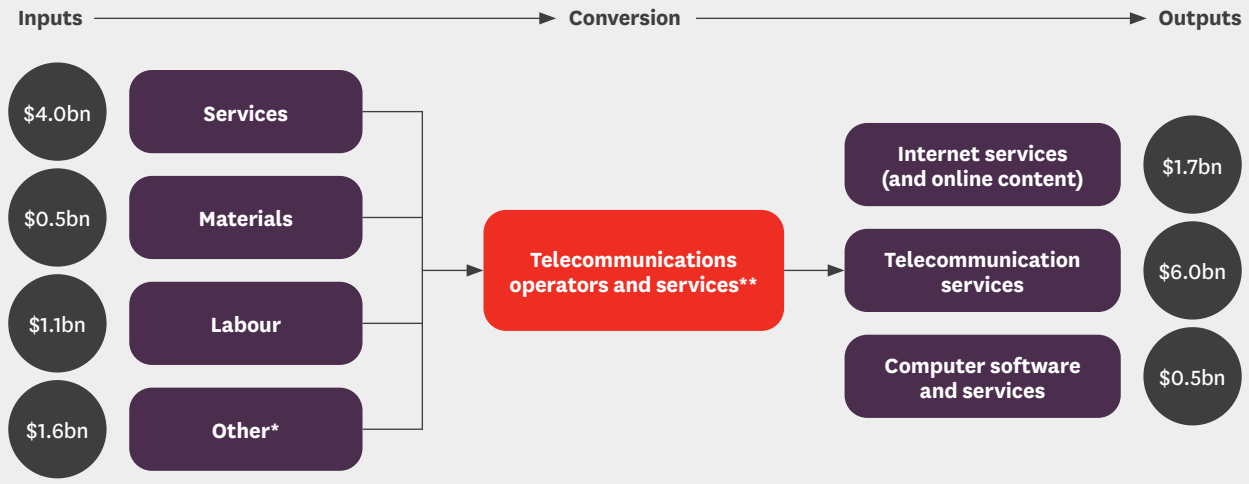
Computer systems design and related services.

Computer system design firms provide consulting, analysis, and programming services. They also provide installation services which integrate computer hardware, software, and communication technologies, as well as ongoing ICT management services and technical support.

Firms involved in designing computer systems spend a lot on labour. Again, that is not surprising considering the large number of highly skilled people that work in this market segment. According to Ministry of Business Innovation and Energy (MBIE), the average worker employed by a computer systems design firm earns an annual wage/salary of about $100k, which is more than 40% higher than the national estimate. With little being spent on equipment, this market segment reflects a low capital intensity.

Computer system design firms also spend heavily on services, just less than half of which goes on off-the-shelf and customised software. Expenditure on management consultancy services, which mostly focuses on specialised contracting work, is also substantial. Firms also spend large on professional services, including legal, accounting and taxation, advertising, and marketing.

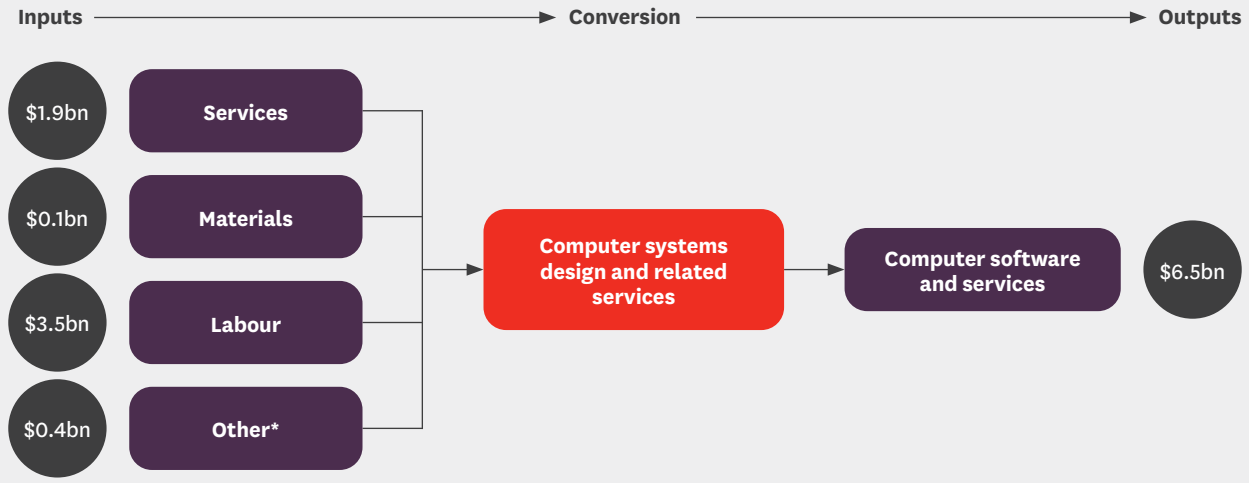
Figure 6: Simplified value chain map of wired and wireless telecommunication services market segment



* 'Other' refers to the depreciation of fixed assets.
** Includes wired and wireless telecommunications network operators as well as elements of data processing & web hosting, internet access and web search portals.

Source: Stats NZ, Westpac

Figure 7: Simplified value chain map of the computer systems design and related services market segment



* 'Other' refers to the depreciation of fixed assets.

Source: Stats NZ, Westpac

Legislative and regulatory environment.

Regulation in the ICT sector is applied with a "light touch". Firms that provide systems design and data processing/web hosting services operate with little regulatory control. By contrast, telecommunication network operators face more regulation, most of which focuses on improving services to the consumer.

Computer design and related services.

No specific regulations or licences are required by firms operating in the computer systems design and related services market segment.

Data processing and web hosting.

Firms that offer data processing and web hosting services are not heavily regulated. However, given the nature of their operations, they still need to ensure that they comply with New Zealand's Privacy Act, and particularly those aspects which deal with the collection and disclosure of personal information. The Act, which was amended and re-enacted on 30 June 2020, does not just apply to customers – all personal information is covered, including information about employees.

All New Zealand firms that hold, store, or process personal data of people living in the European Union (EU) are required to comply with the EU's wide-ranging general data protection regulations (GDPR), which came into force in May 2018. The GDPR is different from regulations in other jurisdictions in that it applies to any organisation, anywhere in the world, in any industry, that retains or manages personal data on any EU citizen. It is also quite broad in its definition of personal information, extending it to data that can "directly or indirectly" identify an individual. Fines of up to 4% of annual turnover or €20 million may be imposed by data protection authorities for any breach, as well as damages payable to any person that has suffered losses because of a data breach.

Data processing and web hosting firms in New Zealand are having to comply with increasingly stringent privacy requirements across the world.

The New Zealand Government also specifies regulations regarding the storage and use of its data by government agencies. According to the Government's protective security requirements, any data that is classified at a restricted level or above must be stored in data centres located in New Zealand. However, most data collected by the New Zealand Government is unclassified and can be freely stored in data centres in foreign countries. Local data processing firms are thus vulnerable to competition from offshore firms, especially those that operate massive data centres offshore and can leverage off economies of scale.

Data centres operating in New Zealand are increasingly having to be aware of government policies with respect to energy efficiency. Although they do not currently need to meet efficiency standards, the Energy Efficiency and Conservation Authority (EECA) is considering introducing voluntary measures.

Wired and wireless telecommunications/ISPs and web search portals.

The Privacy Act also applies to telecommunications network operators and ISPs that provide access to the internet. Firms operating in this space must also adhere to a code of practice covering how the personal information of customers must be handled. Exceptions to the Telecommunications Privacy code are allowed under certain circumstances and where the public interest is best served, such as combating criminal activity within and across New Zealand borders.

The Telecommunication Act 2001 regulates the provision of wired and wireless telecommunication services in New Zealand. The objective of the legislation is to promote fair competition and protect the rights of consumers. The Commerce Commission has regulatory oversight.

Under the Act, the Commerce Commission has two main functions. The first is to regulate certain fixed-line (wired) and mobile (wireless) services by setting the price and/or access terms for that service. The second is to monitor and report on competition, performance, and developments in telecommunications markets.

Recent amendments to the Act, which came into effect on 1 January 2020, focus on creating a regulatory framework for fast growing ultra-fast broadband (UFB) fibre networks; the removal of regulations covering unnecessary copper fixed line access services; the streamlining of regulatory processes to ensure a rapid response to competition issues; and an increased regulatory oversight of retail services (including ISPs) to ensure competitive prices. The Commerce Commission is also required to monitor and report on the quality of retail service delivery in a way that is more accessible to consumers.

The long-term objectives of the new framework are to support investment in New Zealand's telecommunications infrastructure; ensure that telecommunication services are provided at competitive prices and that network operators are responsive to consumer demands for quality services.

Amendments to the Telecommunication Act should further enhance New Zealand's connectivity in the new fibre environment.

The new regulatory regime also requires that the Commerce Commission regulates telecommunication infrastructure provider Chorus in a similar way to how electricity lines and gas pipeline firms in New Zealand are regulated. That involves setting the maximum revenue that Chorus, the only national provider of wired telecommunication infrastructure in the country, will be allowed to earn from its UFB fibre network and the quality of services it must deliver. Limiting the maximum revenue Chorus can earn from operating the UFB fibre network, coupled with the roll-out of UFB, has encouraged non-traditional firms to enter the telecommunication sector.

Mobile termination access services (MTAS) are the termination services that firms in the telecommunications sector are required to purchase from other operators to facilitate communications between their subscribers and those on a competing mobile network. These services encapsulate both voice termination and data services, such as short messaging services (SMS). MTAS became a designated access service under the Telecommunications Act 2001 in September 2010.

Also regulated under the Act is number portability, which allows consumers to switch more easily from one wireless carrier to another while still retaining their telephone number. For wireless network operators, the ability to switch networks effectively increases the buying power of customers. MBIE published the latest version of the determination in December 2016, which is set to expire in December 2021.

The Telecommunication Dispute Resolution (TDR) is an independent body, established by the New Zealand Telecommunications Forum (TCF), for the prompt, unbiased resolution of disputes in the telecommunications services industry. The TCF aims to foster cooperation among service providers to ensure the efficient provision of regulated and non-regulated telecommunications services.

Research and development.

The Taxation (Research and Development Tax Credits) Act 2019 introduces a 15% research and development tax credit and sets out the eligibility criteria and conditions that need to be met to receive it. That is particularly important for the ICT sector, because R&D investment is significantly higher in ICT than in other sectors of the economy. Further measures have been introduced recently to encourage more research and development activity in the ICT sector.

Climate change.

The decarbonising of the New Zealand economy holds few fears for the ICT sector and many opportunities. With new digital technologies coming to the fore, the sector has every chance of making a real contribution to New Zealand's goal of net zero carbon emissions by 2050.

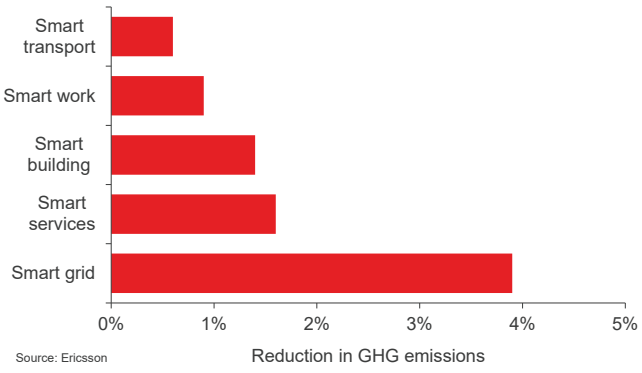
The ICT sector is a very small contributor to New Zealand's overall carbon emissions. It emits about one million tonnes of CO_2-equivalent each year, most of which comes from the end use of ICT equipment and infrastructure. Very little comes from direct activity in the sector. New Zealand's ICT sector also produces more than 100k tonnes of waste each year, of which only 2% is recycled.

Electricity use in the ICT sector will continue to rise as demand for ICT products and services increases. However, that is unlikely to derail or detract from progress being made towards being net carbon zero by 2050. In part that's because renewables are expected to make up an ever-larger proportion of the energy mix in New Zealand, meaning more cleaner energy to power ICT products in the future. Increasingly under pressure from consumers who expect their ICT providers to do their best to combat climate change, many firms in the ICT sector are shifting towards renewable energy.

Rather than detract from New Zealand's efforts to decarbonise, the ICT sector is set to make a big contribution. Indeed, ICT solutions that exist already could potentially reduce global carbon emissions by up to 15%. In terms of global decarbonisation, this equals around one third of the halving of emissions deemed crucial by 2030.

Furthermore, the contribution that ICT makes to reducing global carbon emissions is only likely to increase as new digital technologies come to the fore. Indeed, the Internet of things (IoT), artificial intelligence (AI), robotics and automation, all offer the promise of smarter, more energy efficient cities, transport systems and electricity grids in the future. That also includes a more circular economy, which seeks to minimise waste and maximise the re-use of products.

Figure 8: Potential reductions in global greenhouse gases by 2030 due to ICT adoption



Source: Ericsson

Summary of competitive forces.

Competitive forces in the ICT sector are intensifying as firms look to meet the increasing demands being placed on them by their customers, while at the same time having to come to grips with widening skills shortages and an ongoing need to invest to remain relevant.

Firms operating in the ICT sector face a complex balancing act. On the one hand, they face increasing demands from downstream customers to deliver ICT products and services that embody or leverage off the latest digital technologies, while on the other they find themselves competing for skills that are not only in short supply, but are continually changing.

At the same time, ICT firms need to make ongoing investments in intellectual property (IP) to remain competitive. That is normally achieved in one of three ways: direct procurement, merger and acquisition activity, and/or through inhouse research and development. With advances in digital technology happening at an ever-quickening pace, the need to invest is likely to become even more important in the future.

Advances in digital technology are shaking up the ICT sector in other ways too, not least because they are helping to blur the lines of distinction between different industries. For example, the rollout of UFB has allowed wired telecommunication firms to provide streaming services to customers, effectively moving into the space traditionally occupied by digital television providers. In response, digital television providers have also started to provide their own video streaming services. It is also created some threats, with large firms in other sectors increasingly looking to cherry pick opportunities in the ICT sector.

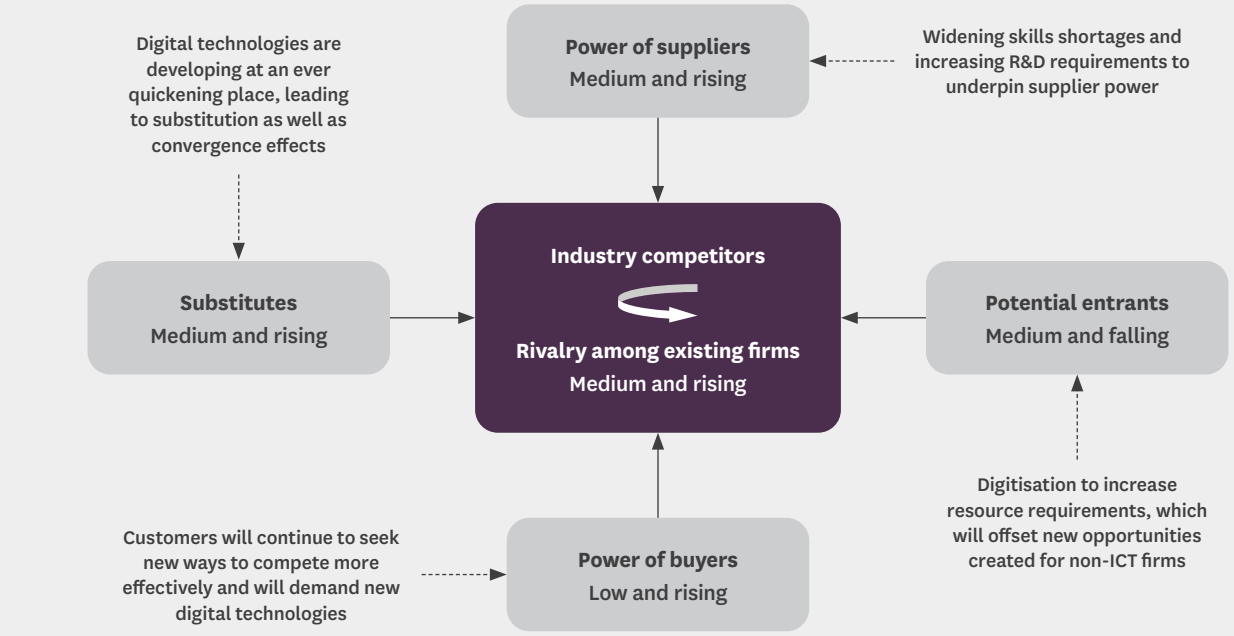
Barriers to entry differ by market segment. In the wired and wireless telecommunications market segment, for example, where fragmentation is low and capital requirements are significant, barriers to entry are high. By contrast, in the computer systems design space, where there are many firms and resource requirements are low, barriers to entry are typically lower.

Despite some interest from firms operating in other sectors, barriers to entry into the ICT sector are likely to increase in coming years. That is because in a digitised world, skill shortages are likely to worsen and the need for ongoing investment is likely to increase. These developments are likely to drive corporate activity in the future, with mergers and acquisition activity leading to consolidation within the sector.

Figure 9 below summarises the magnitude of the competitive forces shaping the ICT sector in New Zealand and provides a high-level assessment of where they are headed in the future. Specifically, it assesses where a competitive force currently has a “high”, “medium” or “low” impact on firms in the sector and whether this impact will be “rising”, “stable” or “falling” in the future.’

The figure uses a framework developed by Professor Michael E Porter from Harvard Business School. It includes three forces that relate to “horizontal” competition: the threat of substitutes, which in this case refers to the complementary nature/connectedness of ICT products and services; the level of rivalry between firms; and the threat posed by new entrants particularly in the computer system design market segment. It also includes two other forces that relate to “vertical” competition: namely the relative negotiating position of those that supply inputs, principally hardware, IP and skilled labour, as well as the bargaining power of downstream customers that use ICT products and services.

Figure 9: Porter's 5-forces model for the ICT sector



Source: Westpac

Demand drivers.

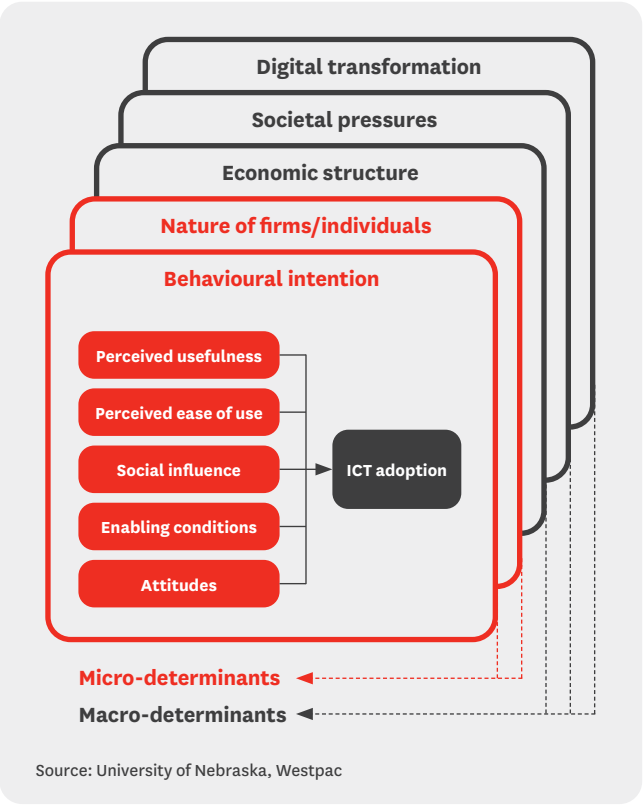
The demand for ICT products and services is driven by many structural and cyclical factors. The impact of these factors, however, has been distorted by Covid-19, which has propelled demand for some ICT products and services, even as the economy has gone into free fall.

Structural factors.

Summary.

From a structural perspective, demand for ICT is a function of a set of macro- and micro-determinants.

Figure 10: Macro and micro determinants of demand for ICT products and services



Source: University of Nebraska, Westpac

Macro-determinants refer to the factors that shape the environment that firms and individuals operate in. They include factors like the level of digital transformation within an economy, societal values and pressures, the structure of the economy and demographics.

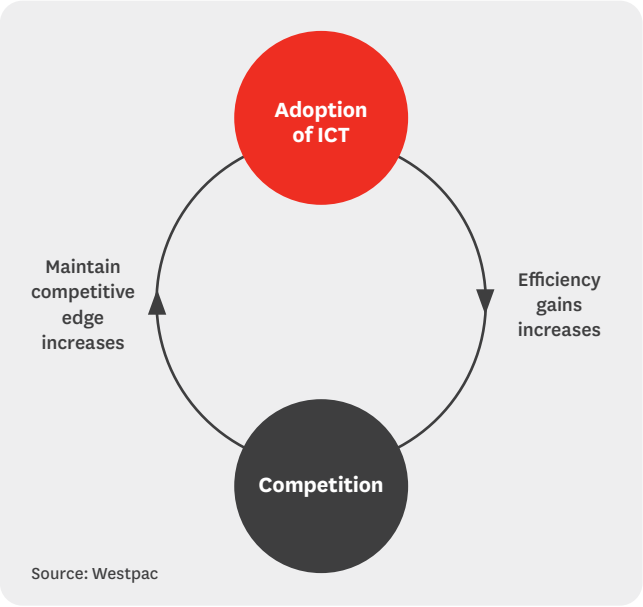
Micro-determinants on the other hand, refer to factors that influence individual customer preferences with respect to ICT. Prominent factors include age, income, and education levels, as well as more behavioural factors such as social influences and general attitudes towards ICT.

Competition and industry rivalry.

To a large extent, demand for ICT hardware, software and services represents both a response and a contributor to increased competition among firms in the wider economy.

To remain competitive, firms need to keep up with their investment in ICT or risk being left behind by their more productive peers. With other firms responding in kind, this sets in motion a "race to the top" that drives an ever-quickening investment cycle.

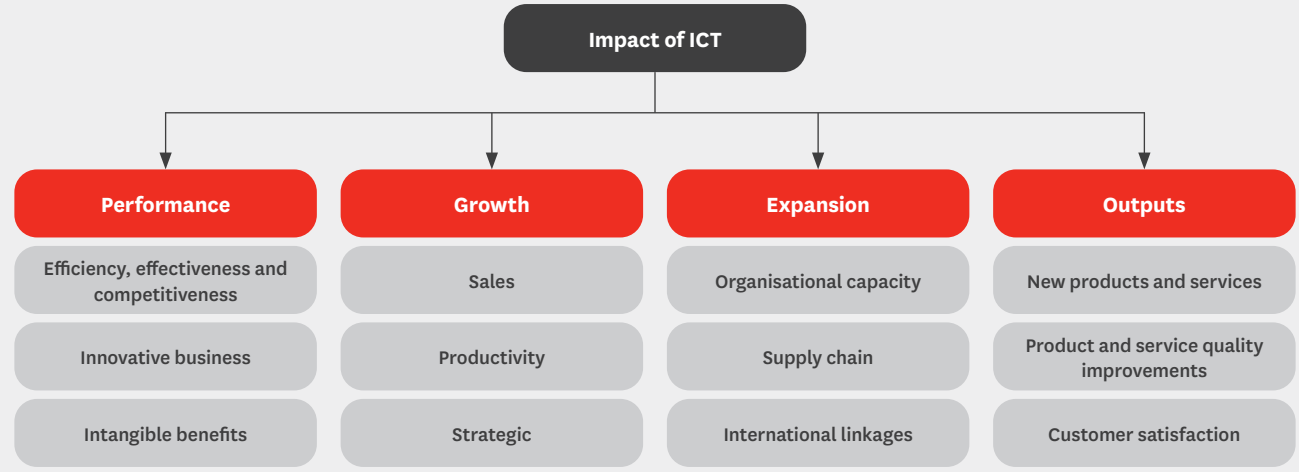
Figure 11: Linkage between competition and the adoption of ICT



Source: Westpac

Indeed, previous studies have found that firms that are high-intensity users of ICT are far more productive than low intensity users. Despite this, firms in New Zealand often underutilise the full potential of ICT to boost productivity, with construction, transport, postal and warehousing, agriculture, forestry, and fishing identified as having the greatest potential for productivity gains.

Figure 12: Beneficial impacts of ICT on firms in the wider economy



Source: Consoli, Westpac

Firms with high levels of ICT adoption are more likely to grow and less likely to go out of business than those that are not.

This continual need to boost productivity and maintain/improve competitiveness has been a boon to the ICT sector. For example, firms looking to improve their competitiveness have sought to reduce their large capital outlays on ICT by outsourcing what are often non-core activities to specialist providers. This has helped to drive demand for subscription-based cloud-based services, such as software as a service and infrastructure as a service. It is also been a key factor that has driven demand for computer design services, with downstream firms increasingly looking to maximise returns from existing and new ICT investments.

However, the "race to the top" has also had other consequences, with ICT firms increasingly finding themselves having to scramble to keep up with the ever-increasing demands that are placed upon them. According to an industry source this dynamic can often lead to risky behaviour by ICT firms looking to remain competitive.

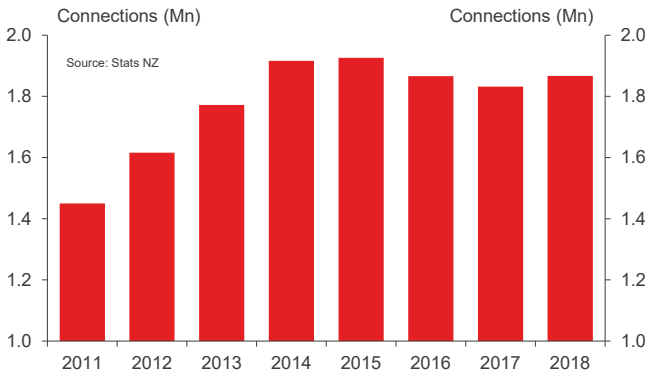
Downstream competition increases industry rivalry in the ICT sector, increasing opportunities for risk taking behaviour.

Product convergence and interdependencies.

ICT technologies are converging.

Mobile phones, for example, have gone from being no more than simple paging devices that used to offer voice and simple data messaging services to handheld tools, that allow easy access to the internet, email services, gaming, video, camera, and GPS navigation.

Figure 13: The number of active broadband connections in New Zealand



This convergence reflects the response of ICT firms to the increasing demands of consumers, which are driven by a) prevailing levels of technological development; and b) the ability of new digital technologies to deliver further efficiency improvements and a better quality of life.

However, demand for ICT product and services also reflects the interdependencies that exist between them. For example, demand for data storage, data processing and web hosting services in New Zealand has grown strongly in recent years in part because of the rapid growth in internet based

business-to-business (B2B) and business-to-consumer (B2C) applications. The increased popularity of B2B and B2C in turn has been underpinned by big developments in the telecommunications space, including the massive rollout and uptake of UFB, improvements made to the reliability of the 4G network, and more recently, the expansion of the 5G network in our largest cities.

Demand for ICT is positively correlated to emerging technologies that lead to complementary ICT products and services.

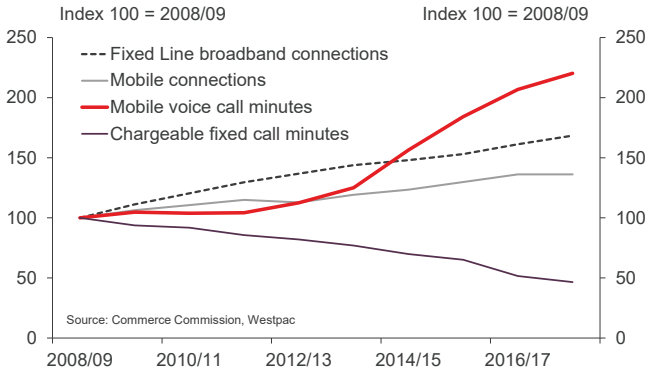
Similarly, demand for computer system design and related services is closely related to the need to maximise the return on investments made in ICT hardware and software. Many firms find that purchasing new technology is not the same as truly integrating that technology for improved results. Indeed, it is this second step that takes longer, but generates real economic benefits.

The necessity of large complementary investments is a well understood factor in the economics of technology.

In similar vein, demand for UFB capacity has accelerated in recent years because of the rising popularity of internet-based video subscription services such as Netflix and Neon, online gaming as well as communication services such as Skype and more recently Zoom. Firms and government entities have also been a key contributor to the rising demand for internet services, particularly for video conferencing and cloud computing services. The demand for capacity and reliable network connectivity will only increase as automated services become an essential part of everyday life.

Demand for UFB capacity also reflects the fact that it is one of the foundations for a new digital economy. Investments here generate potential in economic activity, digital inclusion, and social welfare. As household demand for desktop computers, laptops and tablet computers increase, so too does the potential market for fixed line broadband internet services. The same applies for mobile services that depend on the growth in handsets. According to the Commerce Commission, data use on wired networks has increased 49% on a compounded annual basis between 2010 and 2018, and 77% for data use on wireless networks. By inference, the price and availability these types of hardware are major drivers of demand for other ICT services.

Figure 14: Growth trajectory of telecommunication use by market segment mobile connections and use

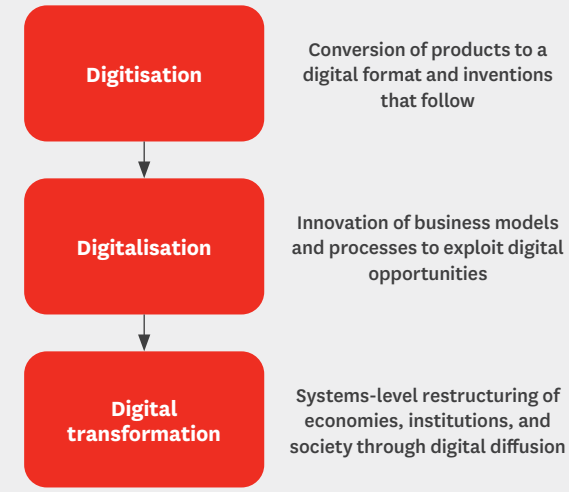


However, new emerging technologies can also result in substitution effects which reduce demand for some ICT products and services in favour of others. For example, household demand for traditional landline voice services over the wired telecommunications network has fallen in recent years as wireless telecommunications providers have expanded the geographic coverage of their 4G and more recently, 5G networks. This trend is set to continue in the future.

Digital transformation.

The shift towards a fourth industrial revolution (4IR), which envisages a state where the digital world is fused with the physical one, is driving demand for ICT products and services that incorporate or leverage off new digital technologies, such as cloud computing, IoT and AI.

Figure 15: Pathway to digital transformation



Source: World Economic Forum, Westpac

Previous technologies offered the promise of greater operating efficiencies from existing operating models. By contrast, new digital technologies are revolutionising how

things are done, replacing these old operating models with entirely new ones. For example, increased automation, robotics, sensors and IoT are some of the digital technologies that are fundamentally changing industry supply chains, enabling work in progress at each point in the value chain to be remotely monitored.

In some cases, this is leading to a blurring of the lines of distinction between different sectors and industries, with firms increasingly using digital technologies to diversity outside of their main industries. For example, media firms are moving into the ICT sector and vice versa. The same is true for vehicle manufacturers that outsource their manufacturing activities to others, while using ICT to focus on the design and marketing of vehicles.

Digital transformation is leading to other changes at ground level. Not only are supply chains being restructured, but factory layouts are also being ripped up and replaced, and new distribution channels are being created. The concept of the 4IR evolution has evolved from its early beginnings as solely a manufacturing initiative, to include smart transportation and logistics, smart buildings, smart healthcare, and even smart cities. For those that can afford it, this digital transformation is leading to new avenues for growth.

Firms are quickly discovering the value of digitising their environment and their operations.

Societal pressures.

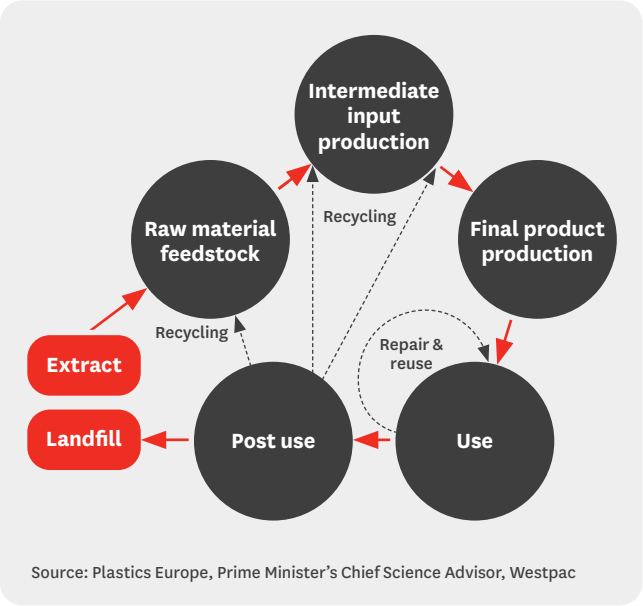
These new digital technologies, and the ICT products and services that leverage off them, are increasingly being used by firms to address the needs of customers who increasingly want to know more about the products and services they consume.

While price, product characteristics (including performance) and after sales service are still the most important factors that shape the purchasing decisions made by these customers, they are increasingly being joined by others. Indeed, today's consumers want to know more about the potential health impacts associated with consuming products; any ethical issues that might relate to production, such as those relating to the exploitation of labour; the impact of production on climate change; and broader environmental sustainability concerns.

To address these demands, firms are increasingly using ICT products/services that are able to leverage off digital technologies such as sensors, robotics, machine to machine learning, big data analytics, VR/AR, and cloud computing, to not only track and record the progress of products as they travel along the value chain, but also mitigate the impacts of any negative externalities that arise through the production process.

ICT infrastructure and services that enable real-time information management and sharing are also key to moving to a circular economy. Digital technologies are increasingly being used to rapidly develop new products and services that are biodegradable or can be more easily reused and recycled. Furthermore, these technologies are being used to improve the transparency of the product lifecycles, from production and processing to consumption, recycling, and use.

Figure 16: Typical product lifecycle within a circular economy

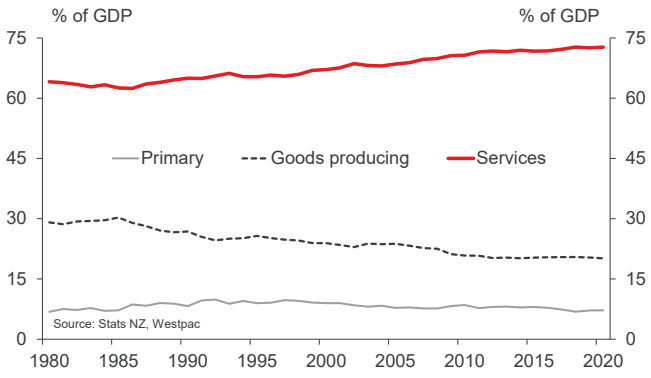


Source: Plastics Europe, Prime Minister's Chief Science Advisor, Westpac

Economic structure.

Demand for ICT is a function of the structure of the economy. Although ICT products and services are used in all sectors of the economy, some are more intensive users than others. As a rule, service sector industries such as finance and insurance, media and ICT are the most digitised sectors in the economy, while others like hospitality and construction lag far behind. Sectors like manufacturing and retail typically sit mid-table.

Figure 17: Sectoral contributions to economic activity in New Zealand



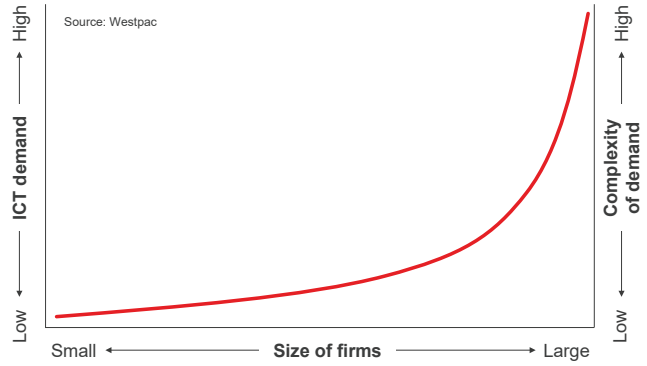
As the economy grows, and these service sectors make an increasing contribution to economic activity in New Zealand, so too will growth in demand for ICT products and services. Not only that, but growth in sectoral contributions will drive growth for different types of ICT products and services. For example, an expanding retail sector increases demand for data processing and web hosting services. By contrast an expanding food manufacturing sector, might increase demand for robotics and sensors to monitor developments along the supply chain.

Growth in the services sector is driving demand for ICT products and services in New Zealand.

Characteristics of firms.

The number of firms in operation, their relative size and complexity, and the sector in which they operate heavily influences demand for ICT. For example, firms generally establish fixed line telecommunications to facilitate internal and external communications. Growth in the number of these firms provides wired telecommunication providers with an opportunity to partially offset a loss in revenues from households who have shifted towards wireless communications.

Figure 18: Nature of ICT demand from firms



The greatest gains are not from the adoption of ICT, but rather how it is applied.

Increasingly, medium to larger sized firms and government departments are looking to outsource their IT functions as they become more aware of the potential savings to be made from switching from an in-house server. That is helping to drive demand for data processing and web hosting services, benefiting those firms that have the capacity to handle growing web traffic and transaction volumes, and are better positioned to perform these functions at lower cost.

Organisations that have complex ICT requirements are helping to drive demand for system design services and tailored software solutions. By contrast, smaller firms, with less complex requirements are often able to use standard off-the-shelf software and basic computer network setups.

Firms are becoming increasingly comfortable outsourcing their data management requirements.

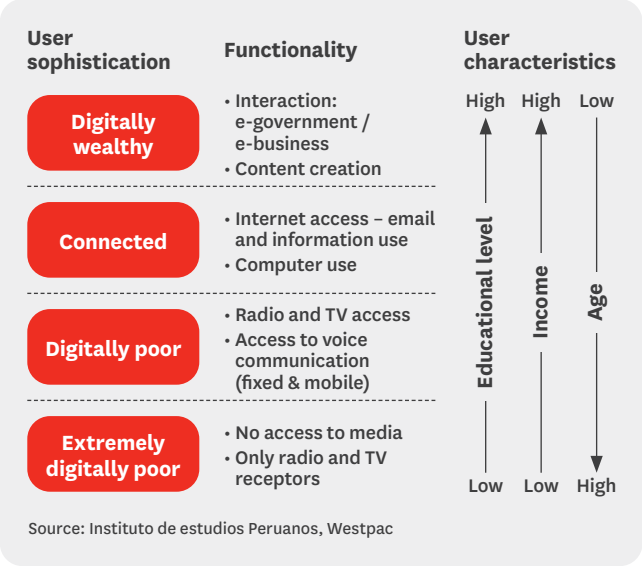
Population and household growth.

Population growth is a key demand driver in several ICT market segments. In recent years, net migration has made a strong contribution to New Zealand's population growth. However, with New Zealand's borders closed for the foreseeable future because of the Covd-19 pandemic, net migration has dropped to zero and population growth has slowed dramatically. This should slow growth in demand for ICT products and services.

A resulting slowdown in household formation is also likely to slow growth in demand for new housing, which in turn is likely to negatively affect demand for wired telecommunication and fixed broadband services.

Individual characteristics.

Figure 19: Factors that influence an individual's demand for ICT



The use of ICT by individuals outside of the work environment largely depends on factors such as age, income, and levels of education. Although there are exceptions, elderly people that have little income and have low levels of education levels typically consume less sophisticated ICT products than younger people with higher incomes and high educational attainment. The opposite also applies. Younger people with less income, but with higher levels of educational attainment

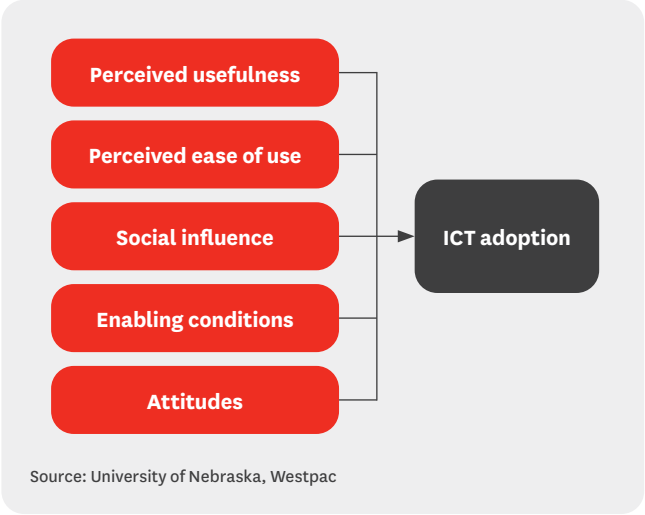
will tend to restrict their use of ICT products. One implication of this is that as the more ICT using cohorts age, there is likely to be a long period of increasing take-up of ICT products.

Digitally wealthy people are relatively young, educated and earn a high income.

Adoption intention and behaviour.

At a micro-level, the acceptance and use of ICT is primarily a function of performance expectations, ease of use, social influence, enabling conditions and attitudes towards technology in general. Performance expectations and usefulness are relevant to the context in which ICT is used, be that for business or personal use. Ditto for ease of use, which refers to the level of effort that is required to use technology.

Figure 20: Behavioural factors that influence ICT adoption



Source: University of Nebraska, Westpac

Enabling or facilitating conditions refer to factors in the operating environment that may promote or inhibit the use of ICT, while attitudes refer to positive and negative feelings about using technology, including an assessment of one's own ability to use ICT. Attitudes may also refer to technology being a fashionable accessory, with branding a key point of difference. While ease-of-use is the dominant factor in the initial adoption of ICT, usefulness is the overwhelming determinant of whether use is sustained.

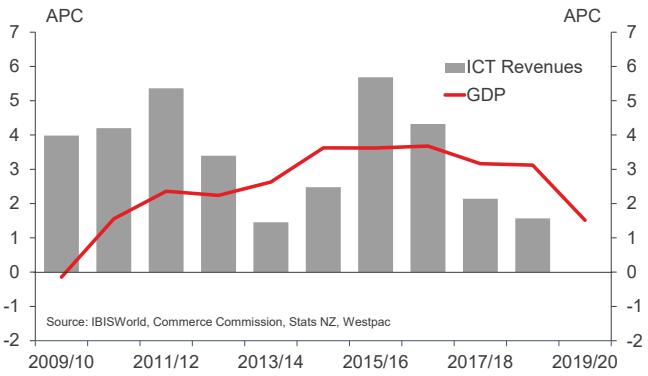
Non-monetary "soft" costs and the benefits of use appear to be at least as important as the financial cost of adopting ICT.

Cyclical factors.

Economic growth.

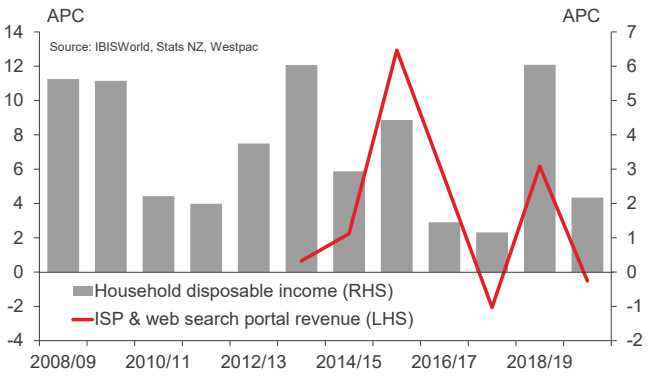
When economic conditions improve, firms and government entities typically spend more on ICT hardware, software, and services. This largely reflects the improved financial position of firms in an economic upturn, enabling them to spend more. For government, the increased tax take associated with strong economic conditions, allows for more liberal ICT expenditure.

Figure 21: Economic growth versus changes in demand for ICT



That said, during an economic crisis, spending on ICT typically contracts, with hardware usually identified as the first option for rapid spending cuts as firms look to protect short-term profitability.

Figure 22: Household disposable income versus ISP revenues



The same is true for households. When the economy expands and incomes rise, individual consumers spend more on personal computers, peripherals, and mobile devices (especially those packed with functionality).

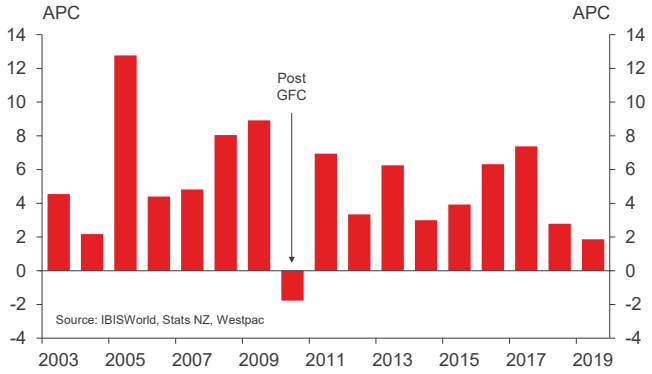
Rising household incomes are also likely to fuel demand for data-dependent services, such as access to the internet and subscription-based internet streaming services and multiplayer video gaming.

Disruptive events.

Shocks or disruptive events can significantly affect demand for ICT products/services.

Ordinarily, one would have expected the economic recession associated with Covid-19 to have led to a decrease in demand for ICT, much like the GFC.

Figure 23: Revenues generated from providing computer system design service



But that has not happened. Indeed, indications are that demand has held up reasonably well since the advent of Covid-19, with many firms initially spending more on ICT products and services to ensure that they could continue to do business, albeit remotely.

Demand for computer hardware and communications software, for example, shot up early on as social distancing and remote working became the norm. Ditto, for cloud-based software services and other computer design services that could be provided remotely. That includes automated software testing services, with an industry source suggesting that demand had grown strongly. Meanwhile services over the telecommunications network (wired and wireless) surged, with broadband traffic accelerating by as much as 85% and traditional voice services up 70%.

However, not all market segments were boosted by Covid-19. Traditional processing services, for example, have struggled, facing increased competition from cloud-based services. Pandemic related uncertainties have also resulted in many ICT projects, especially those requiring a physical presence, either being deferred to a later date or cancelled. Especially vulnerable are likely to be those in the initial phases of development and/or those procured by firms operating in sectors hardest hit by the pandemic. That includes firms in transport and logistics, hospitality, accommodation, and some parts of the retail sector, which have gone into survival mode.

One key impact of Covid-19 is that it has accelerated the pace at which digital solutions are being adopted, as downstream firms look to minimise the disruptive impacts caused by the pandemic. This is leading to new ICT products being developed. One example is the new Credit Management System that Air New Zealand uses to handle flight cancellations as a result of lockdowns due to Covid-19. According to an industry source, there are several examples where new ICT solutions have been introduced in the healthcare sector.

Covid-19 is accelerating the pace of digital transformation that was already underway in New Zealand.

Table 5 on the following page provides a summarised assessment of the impacts of Covid-19 on demand for ICT products and services by market segment.

Table 5: Summary of Covid-19 impacts on demand for ICT products and services

Market segment	Impact of Covid-19		Comment
	Immediate	Longer term	
Hardware			
Mobile phones	Positive	Negative	Rising demand initially as the need for connectivity sharply increases. Demand to weaken once purchases have been made.
Laptops and tablets			
Peripherals			
Software			
Applications	Positive	Slightly positive	Rising demand for cloud-based software to offset drop in applications that require onsite deployment.
Customised software	Negative	Slightly negative	Falling demand for customised software development as large ICT projects are either deferred or cancelled. Some offset provided by mission critical projects and those that support business continuity.
System Infrastructure	Slightly negative	Negative	Falling demand for system infrastructure software, especially that which requires onsite implementation. Some offset may come from work to ensure the upkeep of existing systems software with urgently deployed collaboration tools.
Software as service	Positive	Positive	Rising demand for cloud-based software, particularly for collaboration tools that facilitate remote working.
Services			
Managed services	Neutral	Slightly positive	Rising demand for cloud-based web hosting services set to offset the impact of more firms reviewing existing managed service contracts.
Project based services	Negative	Slightly negative	Falling demand as ICT projects are deferred or cancelled. Hardest hit are likely to be larger projects, which require a large physical onsite presence.
Support Services	Positive	Positive	Rising demand as firms look to delay capital expenditure on hardware, thus placing a bigger reliance on support services to ensure the continuous operation of their ICT systems.
Infrastructure as a service	Positive	Positive	Increasing demand for offsite cloud-based infrastructure services to be underpinned by ongoing remote working requirements.
Telecommunications			
Enterprise services	Positive	Slightly positive	Increasing demand from firms that require greater connectivity given more working from home.
Small business services	Neutral	Slightly positive	Increasing demand for connectivity to be initially offset by the closure of SMEs in industries most affected by Covid-19.
Consumer services	Slightly positive	Neutral	Increasing demand for voice, teleconferencing and video streaming services to initially offset the impact of rising income constraints due to growing unemployment and weaker wage growth.

Supply drivers.

The supply of digital computing and telecommunications has increased exponentially in accordance with Moore's law. That reflects the massive increase in demand for processing power, the interconnectedness of ICT products and services, levels of investment in research and development and the availability of skills in the sector.

Interconnectedness/interdependence of ICT.

ICT products and services are interconnected with each other. Advances in one area of ICT are almost always matched by advances in other areas. For example, until relatively recently, AI in the form of machine learning was performed using high powered computer chips which were costly, and as such largely restricted to data centres. However, recent advances in computer chip technology has helped to dramatically reduce the costs of producing chips, putting AI within the reach of a broader range of users, including households and individuals.

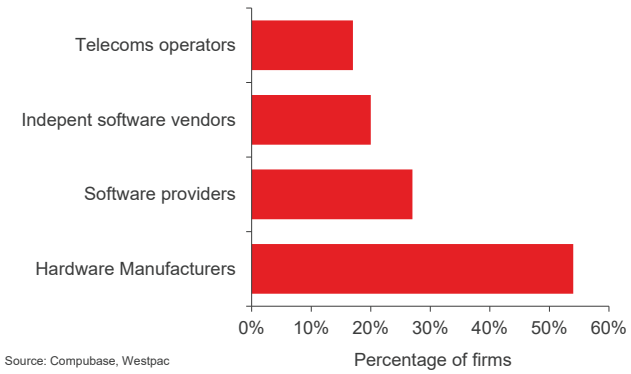
Meanwhile, advances in digitalisation have led a shortening of development lifecycles and an acceleration in new ICT products and services that incorporate digital technologies, such as AI, IoT and virtual/augmented reality (VR/AR).

Many of these digital technologies also have the same set of vertical dependencies: That is, each requires relatively sophisticated digital devices and excellent network connectivity to work properly.

Access to hardware and software.

As a rule, firms in New Zealand do not face shortages of ICT products (or services). End consumers, especially large firms, either go directly to vendors (both local and foreign) or to local distributors/wholesalers/retailers to access what they need. ISPs that provide access to the internet and computer service design firms also procure through these channels.

Figure 24: Use of distribution channels by ICT suppliers



Source: Compubase, Westpac

Distributors import and distribute products locally through a network of resellers. Traditional distribution support areas include the marketing of ICT products and services, supply chain management, education, and support on behalf of vendors.

Distributors act as intermediaries between vendors and value-added resellers or systems integrators.

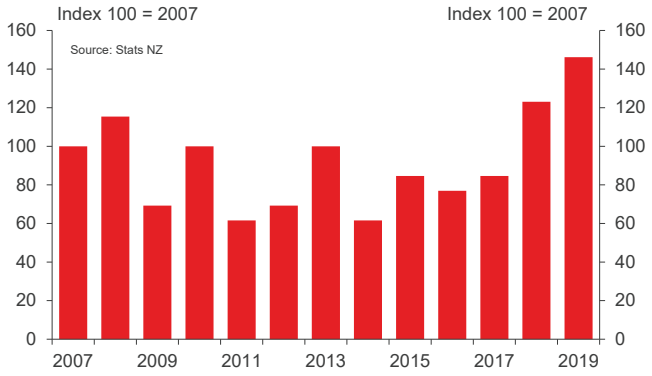
While not normally a problem, supply chains are still vulnerable to disruptions caused by events such as Covid-19. China, the initial epicentre of the pandemic, and a key manufacturing location of some of the world's largest ICT firms, including IBM, Intel, Apple and Qualcom, looms large in this regard. Severely curtailed activity in that country during the first three months of 2020 affected supplies coming into New Zealand, forcing some local distributors and wholesalers to draw down on inventories to satisfy local demand.

Some local distributors pre-ordered supply early to offset the risk of curtailed manufacturing activity in China.

One industry source suggested that there have been occasions in the past where production defects have forced delays in product shipments. That is particularly true for components, such as CPU processors. During times of strong demand, ICT hardware and software imports into New Zealand have also been delayed because of offshore manufacturers focusing on larger, often more profitable markets, rather than the relatively small New Zealand one. While most distributors operating in New Zealand actively manage their inventories, some can be caught short, especially if local downstream demand for their products rises sharply.

Mergers and acquisition activity can also result in supply chain disruptions, resulting in cancelled and unfulfilled orders. The global ICT industry has a long history of mergers and acquisition activity with firms looking to acquire economies of scale, new geographic footprints, complimentary technologies, and skills to achieve their strategic goals. Examples include SAP purchasing Qualtrics for US$8bn and IBM acquiring Red Hat for $33bn.

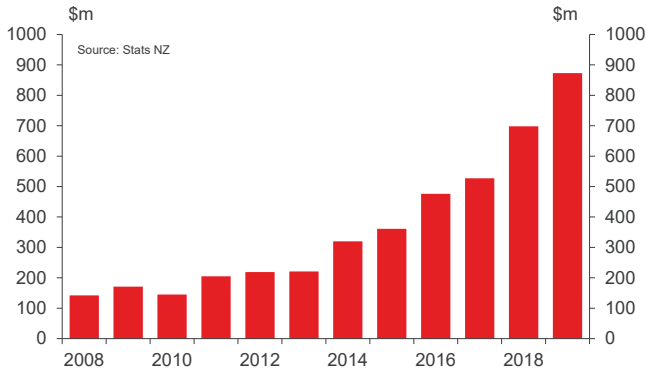
Figure 25: Mergers and acquisition intentions of computer system design firms



Research & development and investment.

ICT firms are the biggest investors in research and development (R&D) in New Zealand. In large part that's because R&D investments in ICT firms generally has a larger effect on their revenue performance compared to non-ICT firms, and that effect tends to be bigger for smaller firms. Simply defined, R&D activities enable firms to obtain new knowledge to develop new systems and processes, and/or innovations in products and technologies, which can then be used to increase operating efficiencies or create new revenue generation possibilities.

Figure 26: R&D investment by computer system design firms



R&D by computer system design services firms in New Zealand stood at just under $0.9bn in 2019, while spending on new innovations by other manufacturing, which includes hi-tech manufacturing, was worth about $0.3bn. About 42% of computer system design firms and 28% of telecommunication service providers invested in R&D in 2019, and together they accounted for about 60% of all R&D spending in New Zealand.

Between 2008 and 2019, ICT investment in R&D increased by a whopping 500%, with ICT component manufacturing, software development, cloud computing and web design services being the key areas of growth. Most of this investment has been driven by competitive dynamics in the sector and the need to deliver new products and services that encompass advances in new digital technologies.

Investment in R&D by computer system services firms has grown by about 20% a year over the past decade. That is more than twice the New Zealand average.

Some of this growth will also have been underpinned by government initiatives designed to encourage the uptake of digital technologies, with the end objective being to improve productivity levels and overall competitiveness of the local economy. Initiatives include tax incentives (recently boosted to support firms during the Covid-19 pandemic), favourable loan schemes (including those from Callaghan Innovation, which focuses on promoting commercialisation of high value manufacturing), grants for start-up ventures, growth grants, and grants for specific projects.

The New Zealand Government has committed to raising investment in R&D to 2% of GDP over 10 years.

ICT investment in R&D has also been boosted by increasing levels of foreign direct investment, attracted by the growth potential of a fast-growing ICT sector. New Zealand's stable political and regulatory environment, and well-developed communications infrastructure make this country one of the best places in the world to do business and develop new technologies. According to the Technology Investment Network (TIN), private equity and venture capital funds invested about $1.1bn in technology firms in New Zealand 2018, up 28% on the previous year. Most of this investment has been targeted at high-tech firms that are heavy ICT users rather than ICT firms themselves. Angel investments, which target new technology start-ups, were worth $0.1bn in 2019.

Figure 27: Foreign and outward direct investment into and by computer system design firms

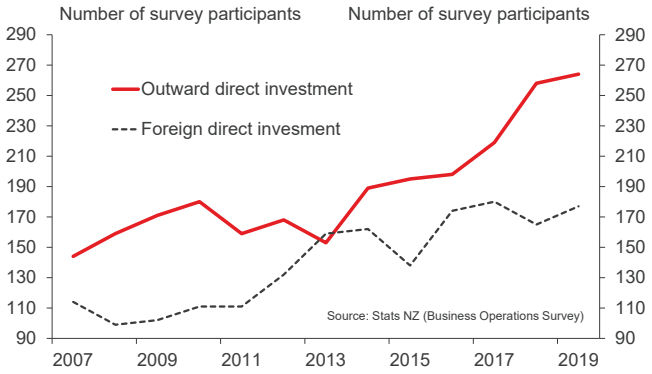
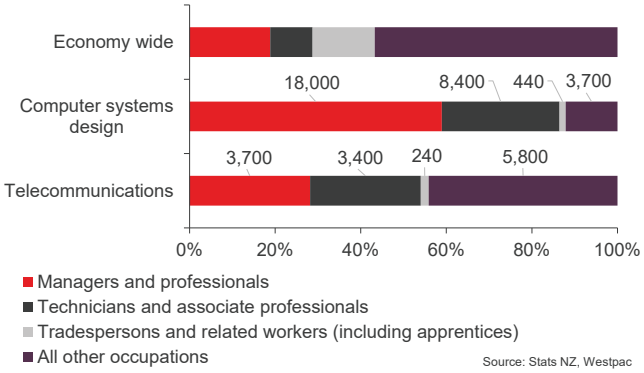


Figure 28: Composition of employment in the ICT sector versus economy as a whole



Foreign direct investment in ICT is significant. According to the Business Operations Survey (BOS) undertaken by Stats NZ, about 20% of computer service design firms domiciled in New Zealand had some form of overseas interest or ownership in 2019, with this percentage having edged higher since 2012. Meanwhile, outward direct investment has also grown, with many of New Zealand's larger ICT firms having gained footholds in offshore markets. According to BOS, just over 21% of computer service design firms domiciled in New Zealand had offshore interests, compared to 19% in 2015.

New Zealand firms are expanding internationally through the acquisition of foreign firms with complementary products and skills.

That said, ICT investment in R&D in New Zealand still lags that of other countries. Globally R&D in the ICT sector amounted to $240bn in 2019, about 55% of this was made in the US, with growth largely being driven by the major global technology companies. Overall R&D investment in New Zealand only amounts to about 1.4% of GDP, while in Australia this figure is closer to 2.1%. The average in the OECD is 2.3%. In part this reflects the fact that ICT activity occurs disproportionately in a few global cities that benefit from economies of scale, notably San Francisco. To that extent, New Zealand's ability to participate in the ICT revolution is limited by its small size.

Access to skills.

The supply of ICT products and services also depends on having the required quantity and quality of human capital. According to Stats NZ, highly skilled and highly paid managers, professional and technical staff make up about 54% of people employed in the telecommunications sector and about 86% of people employed by computer systems design firms in New Zealand. About 30% of these are on fixed term contracts. That compares to the average 28% recorded for all firms operating in New Zealand.

Unfortunately, these are also job categories that are in short supply in New Zealand. Based on Stats NZ's Business Operations Survey, the proportion of firms in New Zealand that find it difficult to access managers, professionals and technical staff in the telecommunication services and the computer systems design market segments rose from 33% in 2009 to 54% in 2019. Difficulties also extend to finding tradespeople, particularly in the telecommunications industry. By contrast, computer system design firms report less difficulty finding tradespeople. An industry source estimates that the industry is short of up to 5,000 people. Given this, and the relatively high proportion of contractors that operate in the sector, its perhaps not surprising that median salaries are about 80% higher than the national average.

16 of 57 codes on the New Zealand immigration long-term skills short list are ICT-related.

Covid-19 will have made it harder to find skills and for two reasons. Not only has the pandemic drastically reduced the number of skilled people entering New Zealand, it's also accelerated demand for new digital technologies, which in turn has expanded the skillset required to operate in the sector. As a result, firms are increasingly looking for people that not only have strong technical skills, but also a broader range of softer relationship skills. Having a strong business acumen is an increasingly sought-after competency.

The typical half-life of technical ICT skills is two years.

Basis for competition.

ICT firms compete along a continuum. Some firms compete on price, providing commoditised services and products to their customers. Others focus on delivering customised solutions. Then there are firms that provide both. As a rule, these firms are typically larger, reflecting the technical capacity required to deliver different products and services to diverse customer groups.

Summary.

Many smaller firms that operate in the ICT industry, many of whom are sole proprietorships, compete on price. They deliver a relatively narrow range of product/services to customers usually within a defined geographic area and face strong competition from firms that have similar characteristics. With limited room for differentiation, these firms face tight margins and are much likely to feel the squeeze during challenging economic times.

Larger firms that also deliver commoditised ICT products and services are also likely to struggle during times of economic hardship, although the impact on margins is likely to be less than for their smaller counterparts. There are two reasons for that. The first is that they are likely to compete with a handful of other larger firms when delivering these products and services and secondly, they operate at scale, running large volumes over a fixed cost structure.

However, firms that provide differentiated products and services can still extract margin. Irrespective of size, these firms compete on their ability to tailor solutions to meet the needs of specific customers. They largely compete on the ability of their staff to leverage off the tools/IP that is available to them.

Data processing and web hosting services.

Simply put, data processing involves the capture of raw data and using computer processing power to standardise and analyse information, summarise key trends and provide deeper analytical insights. Data processing is both time consuming and resource hungry, and for most companies operating outside of the ICT sector, a non-core activity. In an environment where data volumes are growing and competition is intensifying, companies are increasingly looking to outsource this activity to specialist firms that have invested heavily in data centres infrastructure to handle massive data volumes.

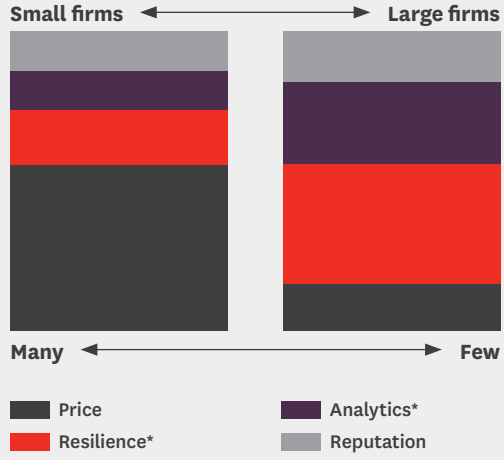
Firms that provide data processing essentially compete on a combination of price, the complexity of solutions provided, as well as the resilience of these services/solutions to power failures, natural disasters, and/or other unforeseen events. Data centres operated by data processing firms are typically classified according to the quality and reliability of their service hosting capabilities.

Only large industry firms can provide the requisite levels of security and reliability that enterprise and government clients require.

As a rule, larger data processing and web hosting firms that provide cloud computing services, including those based offshore, typically service large institutional customers and government entities in New Zealand. Competition is based on proven ability to deliver resilient and secure services (with backup power to ensure minimal downtime).

These firms also compete on their ability to tailor solutions to the specific needs of their customers. Analytics and the ability to provide deep insights while leveraging off proprietary IP are key differentiators, with data processing and web hosting firms also competing on the technical competencies of their staff. Margins are further enhanced by economies of scale associated with the processing of large transaction volumes over a fixed cost structure.

Figure 29: Competitive dimensions in the data processing market segment



* Dependent on intellectual property and human capital

Source: Westpac

Local firms that provide data processing services compete with offshore providers. These firms, which include some the world's largest companies, such as IBM, ORACLE and SAP, compete by leveraging off their low-cost foreign labour, while still having a local presence for revenue generation. As a one stop shop, they leverage off their reputations and global branding. However, having an offshore presence is sometimes a disadvantage, especially where customers place a high value on minimising network latency (the time taken for data to travel from one designated point to another across the network).

Dominant industry firms tend to attract and retain the most lucrative outsourcing contracts with large corporate and government clients.

Smaller data processing firms focus on smaller to medium-sized companies operating in New Zealand. Most have entered this market segment by developing their own cheap server facilities, or by leasing server capacity from the data centres operated by the major firms. Like their larger counterparts, the ability to deliver resilient and secure services is an important consideration, although their performance thresholds tend to be bit lower. Most provide a commoditised service offering. They target the low-cost end of the market and as such compete on price.

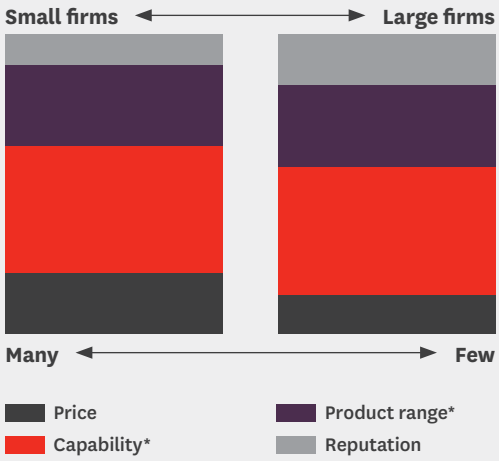
For firms that provide web hosting or cloud-based services, such as software as a service or infrastructure as a service, the key focus is on having as many customers as they can and for as long as possible. That reflects the need to recoup relatively large capital investments made upfront through subscription revenues. Competition is largely determined by the functionality of the service being offered, scalability and price. For many customers, subscribing to cloud-based services is often a more cost effective and flexible option than physically owning ICT products/infrastructure that provide similar services. Scalability refers to the ability to provide services to additional subscribers at a low marginal cost.

Computer system design services.

System design service firms plan, design and test new computer systems for customers that are looking to use ICT to achieve a range of strategic, tactical and operational goals, from improving operational efficiencies to seeking out new opportunities. In this respect, computer system design firms are enablers of technology.

As a rule, a handful of large computer system design firms, such as Datacom, IBM, Dimension Data and Oracle, compete at the top end of the market for the business of large institutional customers and government departments.

Figure 30: Competitive dimensions in the computer systems design market segment



* Dependent on intellectual property and human capital

Source: Westpac

Most computer system design firms compete on their ability to deliver solutions tailored to their customer requirements. In simple terms, they compete on the ability of their human capital to leverage off the IP they hold. Reputations are key points of differentiation. Price is also a major consideration, although many larger customers are willing to pay a premium for services that will make a meaningful benefit to their organisations.

The same dynamics are evident among smaller computer service design firms that principally service small to medium-sized firms. The key difference is that smaller firms tend to operate in specific product/services niches where they have developed competencies and the necessary IP. In turn this allows them to extract margin.

To remain competitive, computer system design firms must continuously invest in new products/services, as well as in the skills and competencies of their staff. With technology changing at an ever-faster pace, the cannibalisation of product/service offerings is the key to preserving market share and margin. This requirement is likely to ramp up as more digital technologies begin to operate at scale.

Rapidly changing technology is contributing to shorter ICT product lifecycles.

Computer system design firms also face substantial competition from ICT departments that operate within large firms and organisations. The decision to insource is usually based on several factors, including prevailing operating conditions, as well as the costs and benefits associated

with this course of action. Competition in this regard is limited given the specialised expertise needed to undertake computer system design work.

Telecommunications – wired and wireless.

Firms that provide wired telecommunication services deliver voice and data services via landlines, microwaves and/or satellite linkups, while those that provide wireless telecommunication services focus on operating and maintaining transmission and switching facilities to deliver direct communications.

Wired telecommunications.

Firms that provide wired telecommunication services differentiate themselves on the products they can offer, network service performance, and price. Faced with competition from wireless or mobile communication providers, which has led to a drop in landline voice services, wired network operators have responded by introducing new digital subscription based streaming services that can be accessed using fixed line broadband. Examples include Spark's partnerships with Spotify, Netflix, and the introduction of Spark Sport.

Wired telecommunication firms are moving out of traditional services and are becoming digital service providers.

By moving into digital streaming services, wired telecommunication firms are effectively moving into the space traditionally occupied by digital television services. Wired telecommunication firms compete on the content and the flexibility of the products/service they can provide. In response, digital television services have upped their game and have also start to deliver streaming services.

Digitisation has contributed to a blurring of the lines of distinction between the wired telecommunications and other sectors.

Key here is the impact of the New Zealand's UFB rollout, which has led to improved internet speeds and reliability of service. This in turn has led to an acceleration in demand for online content and other data services.

The ability to maintain the quality and reliability of fixed line copper and fibre networks is key to the prosperity of wired telecommunication firms. However, that depends on New Zealand's main infrastructure provider, which is a natural monopoly. The industry is highly capital intensive and requires continual investment in infrastructure/products/services to increase subscriber growth.

Achieving efficient scale is necessary in to be competitive in the wireless telecommunications sector.

Wireless telecommunications.

Wireless operators primarily compete on price, geographic network coverage, the reliability of services they offer, and the range of physical devices available for sale. They trade heavily off marketing and branding, and the reputation they have developed over many years. While there is some scope for differentiation through product bundling and mobile plans, products/services sold by wireless communication providers are mostly commoditised.

Mobile prices reflect the time of day a service is provided, distance covered, charges per time unit and networks used to provide that service.

Revenue growth is driven by subscriber growth, with mobile service providers favouring long-term contracts that offer certainty with respect to revenues and generate higher average charges per unit than those generated from prepaid subscribers.

Competition has intensified in recent years, with the industry's three major mobile providers having invested heavily in the coverage of their respective 4G networks. This is likely to continue in the future as investment in ultra-fast 5G networks gathers pace. Investment in new technology is a critical success factor in this market segment and major barrier to entry for potential new entrants.

In addition to each other, mobile service providers also compete with resellers or mobile virtual network operators (MVNO) that focus on the low-cost end of the market. Mobile service providers compete less on price in this sub-segment, and more on their ability to bundle different products together and provide related support services.

They also compete with wired telecommunication providers, successfully taking market share away from voice services. In large part that reflects the ease of use and convenience of mobile phones, as well as the increased capacity, improved reliability, and reduced latency of the 4G network.

These factors have also enabled wireless operators to grow their data service offering. However, these services do not

compete head-on with data services provided over the fixed line network. In large part that's because internet speeds over the 4G network are typically slower than broadband, and as such should be regarded more as a complementary service. That is likely to change once the 5G network is fully rolled out and affordable devices are made available.

Internet service providers and web search portals.

ISPs compete on price, customer service, product bundles and branding. Pricing for internet plans are generally determined by download speeds, download data limits, and other associated services. As competition between ISPs has intensified over the past five years, the price of internet access plans and packages has declined while data limits have increased.

ISPs also compete on packages. Typically, this involves bundling broadband and/or mobile access together with retail electricity services and selling them as a package to households. These bundles have become an important tool for ISPs looking to differentiate themselves from their competition. That said, firms in this space still compete largely on price, service delivery and convenience.

Branding is also an important competitive tool that allows industry operators to expand their customer base, as well as help retain existing clients. Companies that focus on improving their reputation and brand through the quality of service and value for money they provide generally boost customer loyalty.

The rollout of 3G and 4G mobile telecommunication infrastructure over the past decade has not only improved mobile network coverage, but also resulted in faster download speeds and reduced levels of latency, leading to more competition among ISPs. Although generally slower, some 4G mobile services can have faster internet speeds than some entry-level fixed line broadband plans, making mobile carriers an affordable alternative.

The affordability of mobile services has increased in recent years, as the number of mobile internet connections have reached scale, effectively reducing the cost of data. In turn these have allowed more business applications to move into mobile. That includes services like internet banking. As the 5G network is rolled out over the next five years, mobile download speeds are expected to increase sharply and have similar speeds to most fixed-line broadband plans in New Zealand.

As a result, competition among ISPs is likely to increase in the future, as more consumers opt for 5G wireless broadband over wired broadband plans. Those ISPs that offer a range of value-added services, such as online streaming on demand, are likely to prosper.

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