The value of internet services to New Zealand businesses

Hayden Glass, Preston Davies, Eli Heffer, Gary Blick

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About the Authors

Hayden Glass is a Principal with Sapere who specialises in regulatory and competition economics and advocacy, particularly in the telecommunications and Internet markets. He has a background in law, economics, and commercial strategy, long experience in public policy debate on telecommunications issues, and a particular interest in the commercial and economic impacts of the Internet.

Preston Davies is an economist with wide interests including public policy, strategy, economic development and transport. Key areas where Preston has provided advice include Maori economic development, land transport, airport pricing, regional development, competition in the banking industry, regulatory reform, economic performance, economic impact assessment, electricity demand, biofuels policy, education, and health labour markets.

Eli Hefter is a Senior Consultant with Sapere, who specialises in public policy and regulatory economics. He has a background in law and economics and previously worked in the utilities industry, the Australian Treasury and as a parliamentary advisor.

Gary Blick has a background in public policy and finance, and in performance evaluation. He is qualified in economics, human geography and history, and experienced in applying economic reasoning to complex policy issues, in the development of economic and financial models, and in cost-benefit analysis. Gary has held policy and operational roles at the New Zealand Treasury, the Ministry of Health, and Statistics New Zealand.

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For information on this report please contact:

Name: Hayden Glass
Telephone: 021 689 176
Email: hglass@srgexpert.com
About Sapere Research Group Limited

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<tr>
<td>Level 9, 1 Willeston St PO Box 587 Wellington 6140 Ph: +64 4 915 7590</td>
<td>Level 17, 3-5 Albert St PO Box 2475 Auckland 1140 Ph: +64 9 913 6240</td>
<td>Level 6, 39 London Circuit PO Box 266 Canberra City ACT 2601 Ph: +61 2 6263 5941</td>
<td>Level 2, 65 Southbank Boulevard GPO Box 3179 Melbourne, VIC 3001 Ph: + 61 3 9626 4333</td>
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Summary

1. This report is about the economic impacts of the Internet for businesses outside the ICT sector.

2. Across the economy, firms that make more extensive use of Internet services are 6% more productive than average firms in their industry. This is a significant positive impact. According to Statistics New Zealand (2013a) labour productivity growth in New Zealand averaged 1.5% a year from 1996 to 2012. So one way of expressing it is to say that firms that use Internet services more extensively are four years ahead of the average in their industry in terms of business competitiveness.

3. We also look at the additional economic impact that might be available from greater use of Internet services by firms. We estimate that if firms currently making low use of Internet services became more like high-using firms, it could be worth an additional $34 billion in productivity impacts, initially for those firms and through them for the nation’s economy as a whole.

4. We have interviewed firms in four sectors to get a sense of how they are using the Internet and how the productivity differences we see in the numbers above come about. We talked to firms in the tourism and retail sectors, to dairy farmers and others in the agriculture industry, and to professional services firms. In all cases we were told that the Internet is already having substantial positive productivity impacts, and that there are more to come.

5. We present many examples in this report of how everyday firms are making use of the Internet. The impacts are very diverse. We talked to people who were using the Internet for precision irrigation on farms, for collaboration tools between engineers in different countries, for online accommodation booking systems, to provide an alternative to a physical law library, or to build online communities to attract customers into a retail store.

6. We also prepared one case study in each sector, designed to demonstrate the benefits and costs of Internet services and explain in more detail how they have come about. These studies are attached to this report.

Methodology

7. Our estimates of the impacts of Internet services on productivity are derived from Statistics New Zealand data from the Business Operations Survey, which collects information on business behaviour, capacity, and performance. The survey covers private sector firms that are “economically significant”, which means that they have six or more employees and GST turnover higher than $30k, and that they have been operating for more than a year. It also excludes organisations in government services, heritage and other non-profit activities.

8. The 2012 ICT module of the Business Operations Survey contains 19 questions, from which we choose five as our measures of whether a firm is a high-user of Internet services or not. The five questions ask whether the firm has a website, whether it makes
online purchases or sales, whether it has a fibre broadband connection, and what proportion of its staff has access to the Internet.

9. We asked Statistics New Zealand to combine together the answers to these questions for the 5,589 firms in the sample with information on the financial performance of those firms from its Annual Enterprise Survey. This enables us to compare the financial performance of firms that answer yes to these questions, with the performance of those that answer no. We then compare the productivity of employees in firms that answer “yes” with the average productivity for firms in the same sector.

10. As noted above, our headline estimate is that firms that make more use of Internet services are 6% more productive than the average firm in their industry. We do our calculations using two different methods to average the results across the five questions, and also excluding or including outliers, i.e., small sectors that have what look like unusually high or low results. These different methods give similar final numbers, with a range from 6-11% depending on the exact scenario.

11. Our comparisons are between the productivity of firms that make high use of Internet services with the average productivity of firms within the same industry. The productivity differences between high-using and low-using firms are much larger: high-using firms are on average 73% more productive than low-using firms. We compare with industry average productivity because we cannot be sure that all of this difference is related to firm use of Internet services: some of it could be because high-productivity firms are more likely to make use of Internet services for other reasons.

12. Our results are comparable with other studies, which typically find impacts in the 5% to 10% range. The most relevant previous work is Grimes (2012), which is a New Zealand study, also using Business Operations Survey data, to identify the impact that differing types of Internet access have on firm productivity. It concludes that firms with broadband are around 10% more productive than similar firms with dialup, with slightly bigger impacts indicated for rural than for urban firms.

**Figure 1: Estimates of productivity impacts overall**

<table>
<thead>
<tr>
<th>Productivity gain</th>
<th>12%</th>
<th>10%</th>
<th>8%</th>
<th>6%</th>
<th>4%</th>
<th>2%</th>
<th>0%</th>
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<tr>
<td>All industries</td>
<td>6%</td>
<td>9%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Excluding outliers</td>
<td>11%</td>
<td>10%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Average effect</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
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**Source:** Statistics NZ data, Sapere analysis; Grimes (2012)
13. Our method also lets us look at the difference in productivity between firms for each of our five questions across all industries. We see no or only small productivity differences for firms that have a website or make purchases online. This could be because these activities are now so widespread amongst the firms in our sample that any productivity benefits are already being captured in the industry average figures. The other variables show more substantial differences:

- Firms that make substantial online sales are up to 25% more productive than the average firm in their industry.
- Firms that have all or almost all of their staff online are up to 16% more productive, and
- Firms that use a fibre connection are up to 12% more productive.

14. We are more cautious about the second and third results because these large differences only show up using one of our two averaging methods. Impacts under the other method are positive, but much smaller.

The importance of the Internet to business

15. Sizeable impacts from the Internet are unsurprising since the Internet is now a crucial business tool. Because of its general purpose nature, its usefulness, and its ubiquity, the Internet has a very broad range of impacts. For example, on the customer-facing side of business, it can enable firms to find new customers, to improve business data gathering and market targeting, or to facilitate customer interaction with real-time online service. From an operations point of view, firms can get speedy and cheap access to sophisticated cloud-based business tools, transform their supply chains with leaner processes and access to a global talent pool for skills, or transform the nature of the firm itself with more diverse organisational forms enabled by speedy and cheap information sharing.

16. Studies into the impacts of all of these options abound. For example, survey research of 4,800 small and medium sized businesses across 12 countries by the McKinsey Global Institute (2011) reveals that those utilizing web technologies grew their revenues and revenues from exporting more than twice as fast as those with minimal use of web technologies. MYOB (2011) says that businesses with websites report stronger actual and expected revenue and sales performance than those without websites. Statistics NZ (2013) says that businesses that take online orders grow faster and export more. Deloitte Access Economics (2013) found that SMEs that are highly digitally engaged have revenues around 20% higher than those that are less engaged. And IBM (2013) predicts increasing performance gaps in the future between firms that are well advanced in their digital strategies and those that are not. We present a survey of relevant studies in an Appendix to this report.

17. Happily, New Zealand is in a good position from which to benefit from Internet use. The physical Internet infrastructure is increasingly good, and as the rollout of the UFB and RBI continues, New Zealand will have amongst the best network infrastructure in the developed world. New Zealand also rates well as a place to do business, scoring highly on global ratings of investor protections, free trade, government stability, lack of corruption, a generally business-friendly environment and for the quality of its
regulatory system, as well as the World Economic Forums’ Network Readiness Index, which seeks to measure a country’s readiness to take business advantage of the Internet.

18. We present a summary of the evidence on New Zealand use of the Internet as an Appendix to this report. New Zealand businesses are highly connected: 96% of firms say they have access to the Internet. Even in the Agriculture sector, one of the least connected, 91% of firms say they use Internet services.

19. Crucially though, how much positive difference the Internet makes to economic performance depends on how well firms make use of it, not just on whether they are connected, and in particular how much they use it to reorganise the way that they do things. Here the story is a little more cautionary.

20. As you can see from the chart below, the most popular use of the Internet by New Zealand business is for finance: 90% of firms are using the Internet for this, which we take to be online banking. Around three quarters of firms use the Internet to interact with the government (it must help that GST returns and other common tax processes are online), and about the same number use the Internet to buy goods and services.

21. Firms are much less developed in receiving orders online, with 45% reporting doing so in 2012 (most of which is by email), and only 11% reporting that online sales contributed 10% or more of total sales. Only 10% of firms report any sales to customers outside New Zealand, 19% allow ordering of goods and services via their websites, and 12% of businesses accept online payments.

Figure 2: Use of Internet services within economically significant firms

Source: Business Operations Survey (2012), Sapere analysis

22. This story of high connectivity to Internet services, but lower economic returns from use is reflected in our international rankings. The World Wide Web Foundation (2012)
recently ranked New Zealand as 7th in the world for our use of the Internet, ahead of Australia, Norway and Ireland. New Zealand also ranks in the top 10 for institutional infrastructure, reflecting the extent to which institutions, organisations and government support and promote web access. But our ability to extract economic value was rated significantly lower at 17th place, supporting our story that there are still gains to be made from increased use of Internet solutions in the New Zealand business community.

**Varying impacts across sectors**

23. Most of the economic benefits of the Internet accrue to firms outside the ICT sector, because the ICT sector accounts for only 5% of GDP. Internet use can make a big difference to business performance, so we think that the way that firms make use of the Internet is an important issue for economic policy. Almost every businesses can benefit substantially from Internet services: the panel beater that Crown Fibre Holdings hold up as a demonstration of the value of the UFB is a good example, with a 10-15% boost in the productivity of administrative work from the use of fast broadband.¹

24. Business use of the Internet varies widely by industry. The chart below shows the proportion of firms in each industry reporting that 80% or more of their staff use the Internet compared with the proportion of firms who report using the Internet at all. Overall nearly half of firms say that all or almost all of their staff use the Internet, but the proportion varies from under 20% in Agriculture or Construction, up to nearly all firms the three so-called “ICT-intensive” industries at the bottom of the chart.

Figure 3: Proportion of firms reporting that more than 80% of employees use the Internet by industry compared with use of Internet at all


25. We used our interviews to get a sense of why firms use the Internet and what they are doing with it, and we also looked at what official statistics can tell us about Internet use and its impacts in each sector. We chose tourism, retail, agriculture and professional services to have a set of diverse and important sectors outside of government. Firms in these sectors exhibit varying levels of sophistication of Internet use, with professional services firms all highly connected, and firms in the agriculture sector somewhat less advanced.

26. Regardless of their sector, all our interviewees told us that Internet services were increasingly important:

- In the tourism sector, interviewees told us that as well as marketing, Internet services are increasingly crucial to operations as they move to running their businesses on cloud-based booking systems and look to meet customer demand for instant responses. There is work still to do, with many operators still to get on board and some still dealing with multiple backend systems and complex channel relationships. We estimate that a tourism operator making more extensive use of Internet services is 12% more productive than the average tourism firm.

- Retailers are experimenting online but there is still much to do. Internet services are seen as important and effective for marketing and, for a small but growing number of firms, for sales. The competitive impacts of total price transparency enabled by online shopping and competition from online and overseas retailers are evident for retailers operating in some categories. We estimate that a retailer making more extensive use of Internet services is 7% more productive than the average retailer.
• Dairy farmers are already sophisticated technologically. Firms we spoke to said the Internet was important for gathering information on the farm to make good management decisions, as well as to share with suppliers and customers. Farmers are collecting a lot of data on their herds and on their production processes. Some are looking at services that can combine together data from around the farm into one view, or share it with services providers who can add value with benchmarking, forecasting or other assistance with decision-making.

• Professional services firms told us that the Internet was an indispensable foundation of their operations. Collaboration in professional services is made possible by the Internet, and the easy access to information online is crucial to business performance.

27. All interviewees said that Internet services boosted their business productivity. The impacts are very diverse.

• Some firms talked about direct cost savings from a technology-enabled process, for example, a tourism accommodation provider had moved to online booking, reducing costs, and letting customers make instant bookings at any time.

• Others said the Internet enabled more efficient uses of resources: farmers nominated some substantial impacts from farm-based information systems, e.g., a 30% reduction in fertiliser usage from precise information on application and soil makeup, or a 40% increase in the area under irrigation through more careful measurement of soil moisture and precise allocation of water.

• Some interviewees said the Internet enabled new business opportunities. We spoke to several retailers who had no physical stores, making savings on rent and minimising the amount of space they required by not having a physical shopfront. They told us that Internet services meant they could get started in business at lower cost and risk.

• Internet services can also save time. We spoke to a farmer who uses a wireless network to gather irrigation data every three hours at multiple locations across his farm. Previously that data was not practically available: it took an hour each time to visit all the irrigators.

• There was a clear trend amongst firms we spoke to towards greater use of social media, with typical marketing uses being to push events or promotions, or keep the brand at front of mind amongst followers. Some of the lawyers we spoke to, involved in the technology sector, had clients find them through Twitter and had never met face to face. For recruitment firms, LinkedIn was central to their operations.

• The Internet can give access to international markets. Especially among the tourism firms we spoke to, the Internet was enabling even small businesses to target international customers directly through their own websites and through listings with third-party agents. The move to broadband and mobile, and ongoing improvements in network speed have sharply improved the quality of the pitch to customers online.

• Many interviewees noted a better return on investment from marketing online compared with traditional print options. Online marketing has inherent advantages in being able to monitor clicks and receive information about the sources of sales. There are more options to measure the success of a marketing approach, and to refine the advertising so as to better target an intended audience.

• We also spoke to interviewees who used the flexibility of online sales to price dynamically, i.e., to change prices easily in response to falling inventories or growing
demand. Firms also said that Internet services made it easier to get improved analytics about business performance, letting them review the main metrics at any time, rather than just after monthly reporting, and from anywhere.

28. We were also told that there were many more opportunities for productive use of Internet services yet to be harnessed.

29. For example, tourism operators expected Internet services to continue to grow in importance as booking moves more online and several said they saw risks for operators who did not understand the important of Internet services and the growing clout of online travel agents in particular. In retail, all our respondents with an online store said it was their fastest growing channel, but (apart from the online-only operators) online was still a small minority of sales. One major chain thought that, despite extensive effort and very large investments, they were still only 1-2% of the way towards the frontier of what was possible. One service provider suggested that no more than 1 in 12 of New Zealand retailers were really doing a good job of integrating online and offline stores. “The others are just online by default or because they think they have to be, but it is costing them a lot, and it brings new hassles, they have to do it all themselves, and they are not sure whether it will work at all”.

30. The same was true for our agriculture sector interviewees. We were told that the next trend in on-farm Internet use is cloud-based data storage with the wider information sharing that that allows. Several of our interviewees were providing or looking to provide services that integrate farm information across the silos created by the tools of different service providers. These would give farmers a single view of more of their relevant on-farm data, and the tools to analyse it to make timely and more informed decisions. The essential objective is to use technology to increase the value of farm production without commensurate increases in inputs, and particularly without additional environmental impacts. “If farmers get the data collection and sharing systems in place, and get organised to use the information to manage the farm and make decisions based on it … there are substantial leaps in productivity available”.

31. There can be a tendency to emphasise the remarkable benefits of Internet services and to underplay their costs. True, getting connected to the Internet is relatively cheap: not one of our interviewees said that cost of basic service was a barrier. But there are real efforts and real investment required by firms in education, systems, training and process changes in order to take advantage of Internet services. For example, moving retail sales or tourism bookings online requires ensuring the infrastructure is in place, changing systems and processes, and training staff. We spoke to some interviewees that had got part-way online and seemed to be in the worst of both worlds, running both online and offline systems, with the latter being treated as the master, necessitating regular updates of the online inventory to reflect changes in the offline list.

32. Firms also told us about other barriers to change, including finding time to devote to learning how to use the tools that are available. These challenges may at heart be just the small scale of most New Zealand businesses, where operators have limited time to keep up to date with how quickly things are moving online and how that is changing the environment. Small operators might also struggle to justify investments in their own systems because the fixed costs of those efforts would not be recovered from savings on their modest volume of business. One tourism interviewee had multiple booking systems because they offered a diverse range of products, and it was difficult to find any
single booking system that would deal gracefully with the level of complexity. Similarly, it is difficult to find a service provider to give quality advice on IT options when the value at stake is so low.

33. Several interviewees said that other parts of the supply chain were the limiting factor. One hair products retailer had an e-commerce website, with client accounts and online payment, but 95% of her salon clients preferred to ring up and do transactions on the phone. One lawyer told us that, despite their highly-advanced digital internal processes, they still print out letters and sign them for some clients because they do not use email. One architect said that her ability to use digital tools was limited by the use of those tools by consenting authorities and by those constructing the building she designs. The local council required documents for resource consent applications to be submitted in paper form. So once the application is ready for submission, she emails the files to a printer, and then picks them up, organises them and physically submits them to the council. And this is despite the fact that the whole process of document creation before that is digital.

34. Network coverage and quality was consistently mentioned as a barrier for interviewees outside the cities and those in the rural sector. On the whole the view was that coverage was not too bad and improving, and there was positivity about the government’s Rural Broadband Initiative. There were still some particularly sore points amongst those who were very close to population centres but still had weak fixed broadband or mobile coverage. Several interviewees noted the importance of mobile coverage in particular, since that enabled connectivity and Internet use out of the office. Some had set up own solutions, e.g., farmers had small-scale wireless systems to connect the milking shed with the office, or were using satellite-based systems.

**What next**

35. Looking into the future is necessarily more speculative than looking at present impacts, but to get a sense of what the future might look like, we calculated the size of the productivity impacts if firms that presently make less use of Internet services became as productive as high using firms. We do this by taking the difference in value add per employee between high using and low using firms in each sector, and multiplying that figure by the number of employees working in low-using firms. We then total these numbers up across all sectors.

36. This gives a total impact of $34bn in productivity gains for low-using firms and through them for the economy as a whole. It comes from a combination of bringing more staff online, greater online sales, and rollout and takeup of fibre services. We also look at future impacts in tourism specifically, and consider what impacts the Internet might have in retail trade. New Zealand retailers are substantially less productive than those in Australia or the UK. If New Zealand retailers were able to close even half of the gap with Australia, on our numbers this would be worth around $3bn in improved value add for the sector as a whole.

37. We conclude that the Internet is already making a substantial contribution to the productivity of New Zealand businesses. There is a very wide range of impacts across all industries regardless of their level of technical sophistication. Whether we are talking about a small retailer establishing an online store to boost sales, a dairy farm connecting
up its milking shed to beam data back to the office, or a lawyer using social media to better advertise to the high-tech crowd, the use of the Internet is hard-wired into an increasing number of New Zealand businesses.

38. That said, firms are still facing significant challenges in figuring out how best to take advantage of the Internet and whether it represents a threat or an opportunity. No one needs to be convinced any longer of the economic importance of the Internet itself, but there is still much to do in figuring out how best to take advantage of this relatively new business tool. As just one example, despite all the hullabaloo about online shopping, sales online account for only about 6% of total retail sales at present. We are only at the very early stages of e-commerce and businesses are still experimenting with how this new tool can be harnessed. There are clearly still substantial gains yet to be made from more effective use of Internet services. The policy question really is how best to bridge the gap between the present and the future.

39. This will require sustained progress on a wide range of fronts by all economic actors: government has a role but this is not fundamentally a market failure that calls out for government intervention so much as an opportunity that could be captured more quickly. Here we offer just a few thoughts that might help map some steps along the national journey, particularly aimed at business. The recently-released second report of the Productivity Commission in its ongoing investigation into the productivity of the services sector is also instructive on these issues (Productivity Commission 2014, pp113-139), especially in terms of higher-level policy for the government.

- **Leadership** – It is apparent from our work that influential economic actors like government agencies, banks, or milk companies influence firm use of Internet services because what they require or enable helps drive productive business behaviour. Within firms, interviewees told us that having a leader who is enthusiastic about technology was a better predictor of business engagement with technology than any other factor. There could be an important role for sector organisations in leading and encouraging businesses online, not just to get connected, but also to integrate use of Internet services into business processes and across supply chains. Leadership from sector organisations could help solve the coordination problem that was referred to by several of our interviewees, where their productivity is reduced by the non-digital processes of customers or suppliers, like the architect whose work is slowed up by the requirement to make physical copies of plans for local authority approval. Sector leaders can also help compensate for the barriers created by the typically small scale of businesses and the resulting fragmentation of approaches and limited sources of good advice.

- **Skills** – Encouraging those who are further along in the journey to talk to their industry colleagues who are further back is a slow but necessary process. This is also a challenge for service providers, who have a lot to do to educate small and medium enterprises about what Internet services can do for them, and how they can save time, operate more effectively, and connect better with their customers. Fundamental to this is the challenge of scale, with small businesses needing not complex option sets and detailed advice, but simple solutions to common problems that they can grasp and implement effectively. Larger firms will solve their own challenges: they are faster adopters and more effective users of ICT (Productivity Commission 2014, p118). But support for digital skills could help the many smaller firms we spoke to for whom a lack of skills and familiarity in the online environment is a real challenge.
• Beyond the ICT sector – The ICT sector is increasingly important to New Zealand’s prosperity, but the really major economic benefits from the Internet are being felt outside of the ICT sector as firms in every sector take advantage of Internet services and build them in to their business processes. Computers and Internet access are now used in nearly every business in every sector, regardless of what they are selling, their customers or their business model.

• Use, not just connectivity – There is a need to move from talking about connectivity to talking about use. Although troubles with coverage remain, and they are important to resolve, almost all businesses now have Internet access. Certainly Internet services can be improved with broader coverage, faster speeds, larger data caps and lower prices, but the real issue for productivity is how to get firms using what they already have more effectively. This is the substance of the next Internet policy challenge.
Industry level findings

40. In this chapter we discuss findings in the sectors of interest in detail based on what we learned from our interviews.

Impacts in all industries

41. Although the sectors are quite diverse, there were many common themes from the interviews. We explain these first, and then discuss the findings specific to each sector.

Positive impacts on productivity

42. Across all sectors, interviewees thought that Internet services boosted business productivity. The impacts were varied. Tourism operators providing accommodation or tours saw time savings from automation of the booking process, especially where this was combined with an online inventory management system so that information available to website visitors is always up to date. Retailers talked about the greater reach, measurability and flexibility of online marketing compared with print, as well as the benefits of online stores, and sharp improvements in the efficiency of operations. All the business services firms we spoke to relied entirely upon the Internet for their business processes and could not operate without it. Many of our farmer interviewees indicated that Internet connectivity and the easy sharing of data that it allows was fundamental to their operations.

43. To use a specific example, basic connectivity services that give farmers access to information and the ability to store and share data on stock or on-farm performance are widespread. Dairy companies use the Internet to deliver back to farmers information on the volumes and quality of milk that farmers delivered to them the day before. There are other methods to get this information, e.g., it is still printed on the milk docket that the truck brings when it visits the next day, or a farmer can get some of it by SMS. But interviewees we spoke to saw Internet delivery as superior: it is faster, more complete, and available over time in one place.

44. One farmer we interviewed said the Internet had “completely changed operations” compared with ten years ago. “The overall impact is to make decisions more quickly than before, and to enable more complete oversight of what is now a larger and much more complex business from the office”. If the weather forecast is solidly for rain, he can look at soil moisture readings from across the farm and see where to turn off irrigation and where to leave it on. Not only is the weather forecast more detailed and accurate than it used to be, but the soil moisture data is collected automatically every three hours from multiple sensors in different parts of the farm. The net effect of more sophisticated adjustments to irrigation based on weather data is savings in both water and electricity, and also better grass growth (too much water being both a waste and a bad thing for grass). This interviewee said his setup was “a bit more sophisticated” than the average farmer, but that farmers generally are headed in the same direction, particularly because so many more services are available exclusively online.
45. While interviewees were convinced there were positive impacts, it was more difficult to get a sense of their size. The initial impact from the introduction of new technology could be quite substantial: for those who had been using it for a long time, steady incremental improvements were more likely to be the claimed benefits.

46. We saw different types of impacts:

• Direct cost savings from a replacement process – For example, one larger tourism accommodation provider had moved to online booking and no longer needed three full-time scheduling staff. The cost of the property management system was a one-off payment of $5k upfront plus a further $5k per year. This compares with spend of $120k a year for the three salaries. A recruitment firm we spoke to used to have an annual trip to London to recruitment events to attract expats into roles back in New Zealand. Not only was this risky, since there was no guarantee that good candidates would come from it, it also cost $60k each time, an avoided cost now with new technologies. One law firm said that they had gone from generating 10k pieces of paper a day two years ago, to 2k-3k per day now, with most of what remains being property transactions that banks require to be in paper form. Just the avoided costs of printing are a significant saving for clients, as well as there being no need to store or dispose of all the paper.

• Savings from more efficient uses of resources – Farmers we spoke to nominated some substantial impacts from farm-based information systems, e.g., a 30% reduction in fertiliser usage from precise information on application and soil makeup, or a 40% increase in the area under irrigation through more careful measurement of soil moisture and precise allocation of water. Some law firms indicated that technology had brought about a change in the mix of staff, with a greater ratio of professional to support staff because professional staff now do more of their own typing and email, rather than dictating documents for typists that are then edited and sent. Even saving just a few minutes every hour and an hour or two of printing and organising for each court appearance could easily generate a 10% increase in productivity. There are also substantial improvements in productivity from greater useability of digital files, in particular the ability to instantly search within or across documents for particular words.

• New business opportunities enabled by the Internet – We spoke to several retailers who had no physical stores, making savings on rent and minimising the amount of space they required by not having a shopfront. They told us that Internet services meant they could get started in business at lower cost and risk. Other retailers were using online marketing and e-commerce to find customers further afield who could never have been reached with traditional print advertising. Some of the lawyers we interviewed were using social media to find clients. Folks we spoke to in the dairy sector were building businesses based on analysis of the Internet-enabled flow of information from farmers to their service providers.

• Change in the nature of costs – Internet services hosted in the cloud can be cheaper than firms maintaining their own infrastructure: one law firm said it paid $300 a month for its online law library versus $16k a year for the same thing in physical form. Moving to Internet services can also turn fixed costs into variable costs: one accounting firm said the move to cloud-based services meant it no longer had to buy accounting software and a server to run it on. Instead its clients exclusively used cloud-based accounting systems, for which they paid a monthly subscription. This has reduced
capex, risk and technical effort by the firm, and moved more customers to a monthly service rather than an annual service, with beneficial cashflow impacts.

Many more opportunities available

47. Across all sectors our interviewees said that there were still many opportunities for productive use of Internet services. In that sense, we can say that it is early days for business use of the Internet, despite some core technologies being available for the last 20 years.

48. Firms in Business Services were the clear standout from our interviews in terms of the sophistication of use of Internet services. There was a range of maturities amongst those that we spoke to, but most respondents rated their firm as more sophisticated than others in their sector, suggesting that there is scope for others to catch up that could generate positive economic benefits.

49. There are also potential new uses and new ways of operating. For example, some respondents noted that lawyers were not yet making much use of collaborative word processing or production tools. Other lawyers were discussing crowdsourcing of legal advice, standardised legal precedents, or automated contract generation that might speed up document generation and reduce the amount of specialised effort required to create common types of documents. An architect that we spoke to talked of using technology to improve sharing of information and integration between all of the people involved in the design and construction of a building. An accounting firm noted that cloud-based accounting services were still very new, and had a great deal of promise as ways to cut costs and improve business management.

50. Tourism operators also expected Internet services to continue to grow in importance in their sector. Several stated they saw risks for operators who did not understand the important of Internet services and the growing clout of online travel agents in particular. “The major online agents… are linking with social media and will increasingly dictate how tourism operators receive clients. The risk is that New Zealand operators will miss out if they can’t engage with social media. Most operators aren’t realising this.”

51. In retail, all our respondents with an online store said it was their fastest growing channel, but (apart from the online-only operators) online was still a small minority of sales. One major chain thought that, despite extensive effort and very large investments, they were still only 1-2% of the way towards the frontier of what was possible. One service provider suggested that no more than 1 in 12 of New Zealand retailers were really doing a good job of integrating online and offline stores. “The others are just online by default or because they think they have to be, but it is costing them a lot, and it brings new hassles, they have to do it all themselves, and they are not sure whether it will work at all”.

52. Similarly, most dairy farmers were thought to have some kind of Internet connection, and ensuring that new investments were technology-enabled was pretty standard, but extensive use of automation and sharing of information generated was still in its infancy.
“We have started but we are still pretty early on in things really”, said one service provider. Generally systems are being put in place for discrete, stand-alone reasons by farmers, and there is a lack of maturity in collecting and using data on a single farm, let alone starting to combine data across the silos and seeing what new possibilities that opens up. The next trend is cloud-based data storage with the possibilities for wider information sharing that that allows. Several of our interviewees were providing or looking to provide services that integrate farm information across the silos created by the tools of different service providers. These would give farmers a single view of more of their relevant on-farm data, and the tools to analyse it to make timely and more informed decisions. The essential objective is to use technology to increase the value of farm production without commensurate increases in inputs, and particularly without additional environmental impacts. “If farmers get the data collection and sharing systems in place, and get organised to use the information to manage the farm and make decisions based on it … there are substantial leaps in productivity available”.

Real effort required to move online

Getting connected to the Internet is relatively cheap: not one of our interviewees said that cost of basic service was a barrier. Many were using advertising-funded services to operate some of their business for nothing or next to nothing. Many interviewees said that websites have come down in price over time. Even where cloud-based services were about the same price as traditional offline options, they typically offered greater functionality.

Some retailers who were thinking about doing more online were clearly attracted by the idea that it would be a cheap way to boost marketing and sales. The no-touch customer who self-serves online is a persistent retail dream. We interviewed one online-only business who noted that they almost never see or talk to customers. Customers find their products and book and self-serve online, pay by credit card using Paypal, and receive their goods by courier. One clothing retailer said online sales were still a small minority of total sales, but “it’s fantastic when the shop is closed but you’re still selling things. We wake up and, that’s great, we just sold something. It can happen at any old hour.”

For most businesses though, and for those further along in the journey, the costs and difficulties are more obvious: to really take advantage of the possibilities of Internet services requires significant investment and effort.

For example, moving retail sales or tourism bookings online requires ensuring the infrastructure is in place, changing systems and processes, and training staff. We were told that retailers need to run their website separately from their offline store because it requires different skills and different people and different focus.

We spoke to some interviewees that had got part-way online and seemed to be in the worst of both worlds, running both online and offline systems, with the latter being treated as the master, necessitating regular updates of the online inventory to reflect changes in the offline list. One tourism interviewee was running multiple booking systems with a paper-based master across multiple sites. The additional costs and complexities of coordination in this business process were substantial, and the likelihood of a seamless booking experience for customers was reduced.
One larger clothing retailer said that the website had cost a significant amount to set up and only in the last 12 months would they be confident that it is getting a payoff. He thought retailers typically underestimate the costs of running a website. “For clothing, you need models and decent photography and proper design, plus someone steering traffic to the site and doing analysis of what is working and what is not, and people to run the warehouse and to pick, pack and send goods properly… All of this stuff needs constant work, and it needs to be done properly. In the long-run it is not the sort of thing that can be just slapped together”.

Social media powerful but not universally effective

59. All but our dairy sector interviewees mentioned social media, with many commenting that they were starting to use this medium. For some it was a way to keep customers up to date with new products, to see and engage with customer feedback, or to provide customer service. Some used it more directly for generating sales or bookings, pushing traffic to the website for fulfilment. Many planned to make more use of social media in the future, particularly connected with making their websites more mobile and tablet-friendly.

60. In the Business Services sector, social media gives new ways to show credibility online, to access a network of potential referrers, and to get customers. One lawyer told us that he had secured “tens of new customers” through Twitter, with one or two coming from a new contact publicly asking “Do you do this? And if so, can I DM you?”, referring to a private direct message that can be sent between users. Another lawyer uses Twitter to stay up to date with legal conferences around the world, which are live-tweeted by attendees who cannot be present: this gives anyone in the world with sufficient technology knowhow and interest the chance to get access to new papers and find out new ideas.

61. Views of the efficacy of social media varied dramatically. One retailer had started her business solely on Facebook and swore by it as a marketing tool. Others were sceptical that social media was actually a differentiator anymore or that it generated sufficient return for all the effort. One said, “I have a love-hate relationship with social media … It helps give credibility to everything and you have to have it, but I haven’t seen social media relate into sales yet”. Another retailer, with thousands of followers on Facebook, said there was an expectation from customers to use social media, but no return from doing so, and the costs of reaching more than a small proportion of those who had liked your page made it cost-prohibitive as a channel. One interviewee thought that social media was basically a waste of time overall, an expensive game that all businesses were forced to play but that benefitted no one overall. Echoing this view, one accounting firm characterised web-based marketing by professional services firms as being “somewhat like lemmings going over a cliff” in that everyone felt they had to do something, but no one was quite sure what to do, so they all copied each other. Online advertising was no substitute for word of mouth or traditional networking in terms of finding accounting or recruitment clients, according to people that we spoke to.

Some barriers to greater use

62. From our interviews there are some matters that slow down firm adoption of Internet services.
Openness to change

63. There were a range of views expressed about the extent to which culture, in the sense of long-established behaviours, would hold back business adoption of useful technology. One tourism operator said directly “technology skills seem overwhelmingly to be just a demographic issue, i.e., motel and BnB operators tend to be older and tend to have lower technology adoption”. Others argued that there was no age/technology barrier, but just a barrier based on interest, and on how competitive and business-oriented the firm is, with those that are more business-oriented more likely to be looking at all options to improve performance.

64. Interviewees in the rural sector said that more information sharing would require a substantial change in view by farmers, who would need to be convinced of the benefits of both systematically collecting relevant data and sharing that data more widely. “The majority of farmers do not see the collection of relevant data as being a priority for their businesses”. Several interviewees noted that there was a significant difference between farming with and without technology, and that this is in itself was a major cultural and operational change that some farmers had yet to grapple with.

65. Several interviewees referred to cultural challenges posed by Internet services for professional services firms also, and especially lawyers. The Internet brings a change in the nature of information: print is no longer an authoritative source, and information becomes searchable, permanent, non-hierarchical and dynamic. One interviewee contrasted the operating model of the legal profession with the operating model of technology companies, pointing out contrasts between the scope for collaboration in technology rather than structured decision-making in law, and open experimentation to find solutions by people who are merely interested compared with authoritative opinions from legal experts. Another noted that technology was changing the traditional formality and presentation of legal advice and making speed more important. As one example, it had become more common to email advice, with the content in the body of an email rather than being typed in formal letterhead or even in a separate digital document. Others noted that the proliferation of devices and wide sharing of data challenged the concept of an authoritative version of a document.

Skills

66. Many interviewees said that greater use of Internet services depended on businesses gradually learning what is possible, and making adjustments to processes to fit the new environment. Many pointed out that finding time to devote to learning how to use the tools that are already available to them was difficult for operators who were already hard at work running their businesses in the way they are used to. In all sectors most businesses are small and operators have limited time to keep up to date with how quickly things are moving online and how that is changing the environment. Bringing a new system on that involved rework or extra administration time was a tough sell for firms that were already struggling to keep across everything in the existing business. One interviewee said that the always on nature of social media and e-commerce made this even harder, with the need to be constantly changing and updating things. If one did not have these skills or the necessary time, then relying on people outside the firm to do it could be difficult and expensive.
67. Businesses consistently ranked fragmentation of IT service providers and the lack of availability of quality advice as a significant challenge. In the rural sector, interviewees noted that the sheer number of service providers involved with their own data storage options made it unlikely that all the software providers would integrate their solutions with each other’s. Even just putting in place the legal agreements required to share data between services would be an herculean task.

68. These challenges may at heart be just the small scale of most New Zealand businesses. Small operators struggle to justify investments in their own systems because the fixed costs of those efforts would not be recovered from savings on their modest volume of business. One tourism interviewee had multiple booking systems because they offered a diverse range of products, and it was difficult to find any single booking system that would deal gracefully with the level of complexity. Similarly, it is difficult to find a service provider to give quality advice when the value at stake is so low.

Leadership

69. We see a real role for industry leaders in championing the move towards productive use of Internet services. It is clear from our interviews that the improving the sophistication of businesses in the whole value chain is important to get maximum productivity benefits from Internet services. Large businesses find this easier to manage and have an important role in setting standards and encouraging change through the approaches that they adopt. Smaller firms lack the ability to influence suppliers and customers to the same degree.

70. We see these coordination difficulties in our study. For example, lawyers told us that court processes are also slowly moving online with electronic filing, but that there is still much more to do, including ensuring Internet access in courtrooms. One hair products retailer had an e-commerce website, with client accounts and online payment, but 95% of her salon clients preferred to ring up and do transactions on the phone.

71. “We still have people that we wish were not our clients”, said one business to business provider in another sector, because they require so much hand-holding to take advantage of new services, and limit the sophistication of what can be sold.

72. One architect said that her ability to use digital tools was limited by the use of those tools by consenting authorities and by those constructing the building she designs. The local council required documents for resource consent applications to be submitted in paper form. So once the application is ready for submission, she emails the files to a printer, and then picks them up, organises them and physically submits them to the council. Given the number of documents, it might take half a day to do this for each project. And this is despite the fact that the whole process of document creation before that is digital. More substantial savings would be possible if builders were more sophisticated users of Internet services. They could use tablets or smartphones and Internet services to consult on details of the construction of the project remotely. The savings just on travel time and the reduced need to visit the site, multiplied across all architects and all building sites would add up quickly.

73. To take this a little further, we note that there were 5,690 new dwellings consented in Auckland in the last year. With a saving of half a day per application, that is 2,845 days
or about 11 person years of work effort that could be saved just by the council being able to use a cloud storage service to get the digital files.

74. The normal processes of competition, experimentation and innovation will solve these types of challenges in due course. But more directed industry leadership, aimed at fast-tracking an upgrade of business processes through the supply chain could pay dividends. These types of efforts are already underway in some sectors. For example, we were told that Dairy NZ was working to develop standards that would improve the interoperability of systems for tracking and sharing data collected on the farm.

Network coverage and connectivity

75. Network coverage was consistently mentioned as a barrier for interviewees outside the cities and those in the rural sector. On the whole the view was that coverage was not too bad and improving, and there was positivity about the government’s Rural Broadband Initiative. Some tourism operators thought the speed of Internet services was a barrier to tourist use, and there were still some particularly sore points amongst those who were very close to population centres but still had weak fixed broadband or mobile coverage. A couple of tourism operators, in good coverage, noted that they had built free guest WiFi throughout their complex and that free WiFi was definitely a differentiator.

76. Several interviewees noted the importance of mobile coverage in particular, since that enabled connectivity and Internet use out of the office. Some had set up own solutions, e.g., farmers had small-scale wireless systems to connect the milking shed with the office, or were using satellite-based systems. One interviewee said mobile data was still too expensive.

77. The general point is that businesses will be reluctant to use a new service or to put any serious business reliance on it if it is not available and responsive. Poor coverage, slow speed or patchy connectivity is a barrier to greater Internet use, and bigger pipes with lower latency will encourage businesses to use new systems because they will spend less time waiting and have more ability to do things in the moment rather than waiting to get back to the computer.

78. As examples of this, a market research firm said that slow connectivity will deter users from filling in their tablet-based survey, and so they have developed an offline survey application that will transmit stored data when it gets into coverage. An architect told us that only recently has home broadband become fast enough in central Auckland to really support working from home when transferring large data files. A lawyer told us that there was still insufficient connectivity in rural areas for some types of file-sharing, for example, to do audio to text transcription. One retailer used Spotify to ensure that the music in all stores was the same, but found that this was eating up too much of the data cap for each store.

Limits of technology

79. There are also evident limits on what can be traded online and how. Many of our interviewees said that their customers wanted to be able to pick things up and look at them and try them on, and that photos could not do their products justice. Retailers
with an integrated online/offline strategy had an advantage in selling these types of products.

80. Professional services firms said that ultimately they were selling personal services and that there was still no substitute for face to face contact, although others indicated that they had reasonable business from clients that they had never physically met. One interviewee noted that cheap online multi-party video-conferencing solutions still seemed limited, being too hard to setup or of too poor a quality to be of great use. One noted that the lack of perfect interoperability between word processing applications was a regular annoyance, and another said the crucial issue with the use of all new applications was ensuring that they integrated well with the existing process. For example, one lawyer noted the difficulty of using SMS for client instructions, since it is not easy to store.

81. Several law firm interviewees noted barriers to the use of cloud services, particularly because storing data offshore might raise questions about which country's laws apply, and raise difficulties with enforcement of remedies against offshore entities. We were told that there are still some legal restrictions on documents that have to be physically signed, or where there is no practical digital alternative to physical signature, e.g., when a document has to be witnessed and the witness must see the original signee affix his/her signature. We were also told that the law governing co-operatives is outdated and does not easily support new organisational forms that are increasingly popular in the Internet age, like social enterprises.

82. More broadly, it was evident from many of our interviews that it is easier to attract customers online if they have already interacted with the business offline. One clothing retailer with an integrated offline/online strategy told us that his online sales were bigger in areas with an offline store: he reckoned customers were more willing to buy online because they knew that the firm was just down the road. Similarly, while many professional services firms worked entirely online and could not operate without Internet services, it was uncommon to have never seen the client. It seems that customers prefer physical interactions in order to establish a level of trust, but once established that trust is easier to maintain and can be transferred to online interaction. And for professional services firms in particular, meeting the client is important for the provider to establish confidence that one’s bills are going to be paid in due course.

83. One consequence of the fact that small businesses can look like big businesses online is that customers want to test the reliability of the information that is available online to be sure that they are going to get what they expect. One solution to this generic problem is online reviews. Our tourism interviewees talked about this in particular, because of the popularity of services like TripAdvisor that make it easy to see what previous visitors have thought of the service. Of course, these raise their own issues, because they can magnify the impacts of a single customer's opinion, but they do provide a way for small businesses to attract customers that otherwise might be less inclined to trust a firm they had not heard of with their business.
Tourism

Main points

- High and growing use of Internet services
- Online booking and automated inventory is the key technology for providers of activities, transport and accommodation. It opens the door to dynamic pricing, more efficient use of inventory, and savings in costs and commissions
- Internet services give much greater marketing reach, but increasingly require changes to operations to meet customer expectations of instant response
- Strong positive differences in productivity between high-use firms and industry average, particularly driven by online sales

High and growing use of Internet services

84. Our data shows that firms in the tourism sector are more engaged with online services than firms in other sectors. They are more likely to have a website, more likely to purchase goods and services on the Internet, and far more likely to make online sales. This last point is striking: firms in the tourism sector are about four times more likely than the average New Zealand business to be making substantial sales online. And larger tourism operators are generally more likely to be making significant use of Internet services.

Figure 4: Tourism firms compared with all firms

Source: Statistics NZ data, Sapere analysis

85. Of the tourism operators we interviewed, most reported that online sales accounted for more than 25 per cent of overall sales. Several businesses also noted that this has been a recent shift, and regardless of their current share of online sales, the common view among interviewees is that online sales were increasing in importance. One interviewee commented, “The Internet has changed way we do business – previously bookings were
by phone; now it’s increasingly via the Internet, either direct or through a third-party channel."

86. The Internet is also changing how businesses approach their marketing. Most of the tourism businesses that we interviewed reported a shift away from spending on print-based media, such as advertising in magazines or brochures, and towards online advertising. This can take various forms, including upgrading their own website, efforts to ensure that it more often appears in search engine results, purchasing advertisements with various online travel agents, Google AdWords, and social media sites such as Facebook. Printed material generally directs readers to a website for more information. One interviewee said, "There’s been a shift away from print. Before, we printed more brochures. It’s been decreasing over the last five years... the Internet has meant the print side of marketing is less about the details of services and more about selling the brand”

87. There were differences in the speed at which different firms were embracing this trend, with one saying all marketing was online, “Our budget has been 100% diverted into online: display advertising and Google AdWords have been ramped up”, and another moving more slowly, “We still have significant print-based business, but it has moved markedly in the direction of online”.

88. Part of this shift is just about going where the customers are. More extensive online enablement can also be a response to the degree of competition faced by some operators, including those providing accommodation, transport, activities and booking services. One interviewee commented that “The more competitive and business-like the operation is, the more likely they are to be looking at all options to improve performance, including the Internet. For a lifestyle business, there is not the same pressure to innovate.” Some businesses may be relatively less internationally focused, others rely more on walk-in sales rather than bookings due to the nature of their product, their size and their digital maturity

89. Better broadband availability and evident improvements in the quality of online services are also causes. Several interviewees commented that tourism marketing relies on glossy and emotive images to inspire potential visitors. One interviewee noted that these types of images previously took too long to download, and risked being a barrier to accessing a website, saying “Until about three years ago, you had to be quite careful with the photos and images used on websites... due to limitations from 14” monitors and 56k dial-up. Now every single tourism website is about big beautiful emotive imagery”. The prevalence of free Wi-Fi networks was also cited as an enabler: “There’s free Wi-Fi available and it means access is easier and cheaper, as people are using their phones. All the cafes in Queenstown have free Wi-Fi, and there’s the phone booth hot spot network too.”

The rise of online agents and booking engines

90. The Internet has enabled the rise of online travel agents. Some mentioned to us include Booking.com, Expedia, and Wotif. These types of agents have transformed traditional sales channels for accommodation operators in particular, but also for operators providing transport, tours, and other activities.

91. Under a traditional distribution model, travel agents were given an allocation of inventory (e.g., room nights) each month. Instead of agents passing back unsold due-to-
expire inventory, in the online model this inventory can be sold at a cut price online. Internet services make it easier to match supply with demand. Online agents have gradually become a significant sales channel.

92. There were mixed views about the commission-based model typically used by online travel agents. A couple of interviewees noted a preference for avoiding commission-based agents, instead opting for media companies that offered a subscription model for advertising and referrals to their website. Another interviewee commented that there were benefits from the commission model, since operators did not end up paying for ineffective channels. In this person’s view, operators needed to see commissions as a new and more targeted marketing expense, “We need to treat commissions as a marketing cost – but it’s incurred at the point of sale – instead of upfront, like traditional marketing.”

93. There are certainly savings available in commissions from moving from traditional wholesalers to an online booking system using third party booking engines. We were told that margins for traditional wholesalers might be as much as 25-30% of the total booking cost, with online third party engines at 10-15%.

94. There are further savings for firms that build their own online booking site and attract more customers to come to them directly, but building and maintaining one’s own site is costly, and so smaller operators will likely find it more efficient to use third party booking systems. Some operators told us that they offered better terms for changing bookings made to them directly, or other incentives to encourage customers to bypass the third party engines.

95. Accommodation businesses, such as hotels, motels and holiday parks, tended to use multiple online booking engines to get the greatest reach. Interviewees that we spoke with noted that as well as their own site, between five and ten different online booking engines would not be unusual. The booking engines are typically backed up with a channel manager – a subscription software service that coordinates sales and adjusts the remaining inventory across these multiple sales channels. The channel management function is typically integrated with a property management system, usually a cloud-based booking management system that displays sales and remaining inventory to the operator and customer in real time. They can also use this system internally, if they are taking bookings directly by phone or want to take account of walk-in customers.

96. Property management systems vary in scope and cost (both upfront costs and ongoing support fees), but can be integrated with front-of-house pricing schedules, invoicing and payment functions. They can also provide a source of improved analytics about the business.

97. Interviewee estimates suggested fairly widespread uptake of property management systems, for example, as high as 75% among motel operators and 50% among holiday park operators. The picture seems more variable among operators providing tours or activities. One operator commented that their products tend to be less standardised than, for example, a night of accommodation in a certain size of room or unit, and that this hinders use of multiple booking engines and a channel manager service.

98. Several interviewees identified time savings from automation of the booking process where this is combined with an online inventory management system. Some
interviewees commented that they like the fact that they can wake up to sales having been made overnight without them having to take a telephone call.

99. Cloud-based property management systems provide more flexibility for owners to manage their products and keep an eye on reservations from wherever they happen to be and in real time. They also enable some less obvious benefits to the bottom line. One is dynamic pricing: it is easier to quickly adjust prices in response to higher demand or to new information on upcoming events. The second is that forward business can be more easily booked and locked in, increasing the focus of the business on addressing non-peak periods.

**Much greater marketing reach and higher customer expectations**

100. The other major impact of the Internet is on marketing. Even small and medium-sized tourism business can target international customers through their own website and online listings with third-party agents. “The Internet gives people with small marketing budgets access to tools that only those with big budgets used to have”, said one. Another noted, “Online travel agents are an opportunity to distribute our product to far-flung markets that would be impossible to reach otherwise”. There is also a link with New Zealand’s broader tourism branding, “We’re selling a promise to people overseas. So the online environment is really important to introduce prospective tourists to what they can see and do in NZ.”

101. The flip side of greater accessibility to international travellers is demand from tourists for responsiveness. The people we interviewed saw this as a reason for businesses to use online sales channels and real-time booking engines in particular. One interviewee commented on the growth of independent travellers “who tend to book online at the last minute… the Internet plus the existence of online travel agents has transferred power to the consumer.” Travellers are increasingly expecting to arrange accommodation or activities immediately via online booking engines, “They want their booking confirmed now – not a back and forth email chain.”

102. It is clear that some categories of business are less likely to be using Internet services given the nature of their product, or the competitiveness of their business. For example, those less engaged with online services might be more traditional bed and breakfast operations that are run as lifestyle businesses, or motels run by folks that have had a prior career and are not looking for innovation in the way they deliver their services. One noted that accommodation services were more likely to be online-enabled than hospitality, which generally relies on walk-in business. But even there, there was scope for Internet services, noted one interviewee, “While people may be spontaneous in their choice of venue in the food and beverage sector, there are still opportunities to capture business by using the Internet (e.g. social media and the use of apps to find venues) but it comes back to the capability of the people in the businesses.”

**Strong positive differences in productivity for firms making more use of the Internet**

103. We estimate the difference in productivity associated with higher Internet use in the tourism sector to be 12 per cent. That is, on average employees in firms with greater
staff access to the Internet, that have a website, that buy and sell more using the Internet and who have a fibre connection are 12 per cent more productive than employees in the average firm in the tourism industry.

104. The estimated value-add per tourism employee in our sample is $141,285 per annum, which means that the 12 per cent figure equates to an additional $16,597 per employee per year in revenue from higher use of Internet services. The difference in productivity between firms that have high Internet usage versus firms that do not is a much larger 90 per cent.

105. The major factor in the 12 per cent difference in productivity comes from online sales and from fibre connectivity. This suggests there is scope to improve productivity by moving more tourism sales online and through the ongoing spread of fibre services.

106. On the other side of this point, a couple of interviewees saw bleak futures for tourism firms that did not quickly adjust to the online environment, and expected that lifestyle businesses would continue to be squeezed out by new operators offering professional tourism services that are well-marketed online. Some interviewees noted the importance of having one leader in the business who “really embraced technology and wanted to move things along”, saying that this was crucial in determining how open a firm was to the use of technology. One interviewee put the importance of Internet services to tourism operators in stark terms, saying “If you are not adapting to changes in technology and changes in customer purchasing patterns then … you are just not going to survive”.

**Retail trade**

**Main points**

- Slightly lower than average use, especially in online sales
- Internet services give firms greater reach but also bring greater competition, particularly for some types of goods like clothes or books
- Internet services can sharply improve operations including through inventory, point of sale, and better business information
- Visible positive productivity benefit for firms making more use of Internet services, especially driven by online sales

**Lower than average use in the sector, with smaller firms more likely to be selling online**

107. Firms in the Retail Trade sector are slightly lower users of Internet services than businesses as a whole. They are less likely to have a website, less likely to have most of their staff online, and less likely to use fibre, with bigger firms generally higher users than smaller firms.

108. On our numbers, it is highly unusual for retailers to be selling a lot online at this point, with only 3% of firms reporting that more than a quarter of their sales are made online, although retailers are heavy online purchasers. The most e-commerce enabled firms are
smaller firms. We see from other Business Operations Survey data that 27% of retailers allow ordering of their goods and services via their websites, and 18% accept online payments.

Figure 5: Retailers compared with all firms

Source: Statistics NZ data, Sapere analysis

109. Our interviewees were quite varied in their pattern of take-up of Internet services. There was no clear pattern among high users versus lower users in terms of the products they traded or their size, e.g. some sole traders were running largely or entirely on-line businesses, other sole traders were running a physical store with just a limited online presence. Even for firms in the same trade, e.g., clothing retailers, there were a wide variety of approaches. We interviewed online-only retailers, retailers who had started with an offline store and have now moved online, and also online retailers who had now got or were planning physical stores for greater customer interaction. One service provider said, “The Internet has created a lot of confusion for retailers. They think it is great to have this new channel and important to get on top of how to sell into it, but they do not really know how to do that yet.”

Internet services give access to much larger audiences ...

110. Overall our interviews support the messages from the data analysis above, i.e., use of Internet services is widespread but significant online sales and a sharp transformation of business processes is a work in progress. Amongst interviewees who were not online-only, online retail sales were low at this point, although growing quickly. There is a lot of uncertainty about how best to take advantage of the business opportunities presented by the Internet. All interviewees saw growth in online retail as a major trend, and there are some evident new competitive threats as a result of business moving online.

111. The main customer-side benefit for firms is in marketing, and being able to more cost-effectively reach a wider potential audience. All our interviewees had a website, and all recognised that, regardless of what they were selling, consumers turn to the Internet for
research. Said one clothing retailer, “no one comes in store without having looked online first”. Internet services enable retailers to find new customers and serve them at lower cost.

112. We spoke to several online-only retailers whose entire business obviously rests on Internet services. But even for the second-hand booksellers we spoke to whose model is more traditional retail, there is an upside in getting their more valuable books into large international book search engines, with online international sales now making up a small but not insignificant proportion of total sales.

113. Several interviewees said they treated the website as like the front door of the shop, and that spending on Internet services is like spending on the rent. “My website is a giant international brochure that allows people to find me”, said one homewares retailer. In her view the credibility of the website matters a lot, especially the quality of the photography. Many retailers were looking at rebuilding their websites to make them more enabled for social media, and also more easily used on mobile devices. Even the least sophisticated of our interviewees said that they could not ignore the Internet: it provided verification that their business existed; if they could not be found online, many potential customers would not find them at all.

114. Firms were doing a lot of different forms of online advertising, although few said that they were doing exclusively online advertising. Aside from a website, Facebook, Twitter and Google’s AdWords service to improve visibility in online searches seemed to be the most common tools. Some retailers did not want to expand beyond the most popular services for risk of spreading themselves too thinly.

115. Marketing strategies depended on where customers were. We spoke to one party supplies retailer who said her advertising was primarily online and targeting parents, but that her firm also ran print advertising in parenting and food magazines, and went to events, like lifestyle expos and food shows, and local markets to continue to lift brand awareness. One gift and homewares retailer said he continued to use print media for marketing but debated every year whether this was the year to give it up. At this stage it continues because his target clientele is still buying print media. Another homewares retailer told us her firm gave up print ads in 2008 when responses died up with the GFC, and that now all advertising was solely online. Another smaller retailer, selling a wide range of lower-priced items, cannot afford to invest in online marketing at the product level, because there is insufficient margin on any item to make it worthwhile. By contrast, one larger online retailer said it did only online advertising, and had two staff whose job was just to ensure that their name showed up in the top five online search results for most things that they sold.

116. Several interviewees noted that everyone is trying to get more attention online and it is harder to stand out. One had stopped buying AdWords because as the service became more popular, the words she wanted for her firm had become too expensive. Many interviewees mentioned the easier tracking of online advertising including email and ad campaigns as being a major plus. Said one, “online marketing increasingly gives more bang for the buck”, and several interviews referred to the inherent advantage of being able to monitor clicks and receive information about the sources of sales compared with more traditional advertising.
… but they also bring greater competition

117. Internet services increase retail competition by making it easy for customers to check prices across retailers. The additional competition brought by Internet services makes life more difficult for firms selling goods like clothing in competition with online retailers, or for firms that compete with digital download services.

118. For example, we were told that book sales have been hugely impacted by the move to digital, “the Kindle is so powerful in the market for cheap fiction. You can download thousands of books with nearly no effort, whether you are going to read them or not. Lots of bookshops have closed down”. Internet services have also changed the nature of consumption, shifting consumer tastes for entertainment online, for example.

119. We were also told that there has been a marked shift towards international online shopping in recent times. One clothing retailer said, referring to two major online retailers, “Two years ago no one had even heard of Asos or Eastbay. Now they are in everyday conversation”.

120. One interviewee said that she foresaw a gloomy future for retailers selling goods exposed to overseas online competition who did not have a strong brand or a point of difference. Bearing this out perhaps, we spoke to a jewellery retailer with a strong point of difference who saw no threat from the Internet. For that business the website and social media were channels for branding and advertising, and a useful addition to the print plus word of mouth model that had prevailed for a long time as the way to get work.

121. It was not clear in general in what circumstances online retail would add to total sales, whether it would just take share from another competitor or from the offline store, or whether it was additive to sales overall. Some interviewees said that they were just pursuing every angle that they could to generate more business, and expanding on the things that seemed to work. One interviewee took the view that online sales were not additive at all at the sectoral level, i.e., it was just boosting competition and shifting sales between competitors.

122. One larger clothing retailer told us that an integrated online/offline/telesales strategy was working, but that it had taken a long time to figure out how to get the different elements to work together rather than competing with each other. This interviewee also said that having an offline store in an area helps to boost online sales in that area: perhaps customers are more confident to shop online if they know that there is an offline store as well.

123. Another large chain told us that its online store had a clear, material and positive impact on total sales, that customers spent more online than in store, and that this was because the online environment could better meet customer needs, rather than just diverting business from competitors.

One retail service provider was cautiously optimistic about the overall impact of the Internet on retail. “Online is certainly taking away instore sales to some extent, but it is also an opportunity to capture customers who are browsing online. Comparison shopping is now so easy, consumers are price conscious and better informed, but they are willing to purchase online or come in store if they find what they want and they know that you have it.”
Internet services helpful for operations

124. The other major impact for retailers from Internet services is on their operations. Many interviewees said they were using Internet services for inventory management, procurement, accounting or pricing, or indicated that they were thinking about how to take advantage of these types of services in the future.

125. The general feedback was that “cloud software gives small guys big guys’ tools”, as one service provider put it. The freedom to monitor the company from anywhere and get an accurate picture at all times, and the leaner and lower cost operations that are possible with online systems were seen as particularly valuable. One retailer said her firm was “totally reliant on the Internet”. This was not because of the nature of her business, which could be done over the phone. Instead it was because she had built her business model on the efficiency of online ordering, and integrated cloud services in the back end.

126. The benefits of Internet services compared with paper systems or with closed computerised systems were marked for small businesses, according to those of our interviewees with significant experience of these tools. In particular, some services were cheap or free, and for paid services they could start small and scale the services over time as the business grew. There were time savings with integration between, for example, accounting and inventory systems, and potentially large savings in capital from avoiding physical POS systems. Some using cloud accounting services indicated that it was no cheaper or only slightly cheaper than their previous approach but that it generated far more valuable and up-to-date information.

127. Moving operations online also generates new costs and requires new skills. Several interviewees said that it was important to separate out offline from online operations because they required quite different people and quite different sets of skills, and that online services required substantial ongoing maintenance and effort. The costs for firms that maintain both online and offline systems can be high. One interviewee who was doing this now employed an inventory coordinator just to manage the data on what was in each store and in the warehouse. Another had entirely separate online and offline stores and, to avoid the additional administrative effort of updating the online inventory regularly, she would just set the quantity to zero in the online store in the hope that a customer would see that the product existed and would call up to check on availability.

128. To give some specific examples of a diverse set of impacts:

• Better business information – The second-hand booksellers we spoke to said that Internet services have entirely changed the sourcing and sales models for used books. There are now five or six substantial international search engines that can scour the world for any book that you might be interested in. This is obviously helpful for consumers, but it is also helpful for retailers because they can very easily see what is valuable and what is scarce, and use that information in deciding how much to pay for stock. Combined with a computerised inventory system, the retailer can be much more
selective about what stock they buy, because they know what sells, and this means
greater capital efficiency since stocks can be smaller.2

• Cloud-based accountancy – Many interviewees specifically referred to a move to cloud-
based accounting systems, and in particular Xero. All said that it had radically improved
their access to and usefulness of financial information, and that they could now do
more themselves without involving their accountant. Generally interviewees said it
saved them money relative to a traditional accounting approach, and also smoothed
expenditure since the subscription was monthly rather than an annual bill with the
annual tax return as previously. One said it was not necessarily a time-saver, because the
trade-off for lower accounting bills and better information was more time spent
fiddling with things. Another said it did not save any money because they were
spending about the same, but it did make accounting much faster and more useful. The
integration between Xero and other services came in for particular praise.

• Inventory management, POS systems, and online stores – Retailers had quite different
approaches depending on their scale. The bigger firms we spoke to had either built
their own systems from scratch, or bought an off-the-shelf system and modified it to
suit their needs. Some mentioned the virtues of Internet services as a way to ensure that
information on specials and other product changes were available in all stores at the
same time and at low cost.

Others mentioned cloud-based systems, like Vend, that serve as a point of sale, as well
as keeping track of inventory and managing customer loyalty. More sophisticated
retailers particularly appreciated the integration with online store software that meant
that they could have just one inventory, in stark contrast to firms with online stores that
still used paper processes or an unlinked computer system for inventory and faced
additional costs and complexities as a result. Some interviewees appreciated the need to
move inventory to a computer system or online, but had not yet addressed that
challenge.

129. The online-only retailers we spoke to talked about the benefits of saving on rent from
online operations. One noted that she would need a lot more space if she had an offline
business, because of the need to display things rather than just pile up the boxes. One, a
retailer of relatively high-priced homewares, said she used to have an offline store with
set hours but now was by appointment only because she felt stuck in the shop even if
customers were not coming in. One service provider noted that cloud-based software
could reduce the costs of getting started in business, since one could start online-only
and build up confident to get a store if that is working out. The online environment lets
small firms appear bigger and gives them a chance to demonstrate that they are tech
savvy and build their personality before getting into a bricks and mortar investment.
One retailer that we spoke to had done precisely this, beginning with marketing and
sales only through Facebook.

2 On this point we note with interest the chart on page 149 of Productivity Commission (2014), showing an
ongoing decline in the ratio of inventories to value-added in retail and wholesale trade as ICT investments
make inventory management more efficient.
Visible positive productivity benefit for firms making more use of Internet services

130. We estimate that firms making more use of Internet services in retail trade are seven per cent more productive than the average retailer. That is, firms that have greater staff access to the Internet, that have a website, that buy and sell more using the Internet and that have a fibre connection generate seven per cent more revenue net of costs than the average firm in the retail sector.

131. Estimated value-added per employee in retail trade is $46,742 per annum. This means that the seven per cent figure equates to an additional $3,272 in value add per employee per year.

132. The main driver of this productivity difference is online sales. Even though only a small proportion of retailers have substantial online sales, those that are selling online are very productive. Note that on these numbers we cannot tell whether it is the online store itself that drives productivity, or whether the online store is boosting offline sales. This would require more detailed analysis, but the figures say that there is scope for significant further gains as retailers move more sales online.

Dairy/Agriculture

Main points

- Generally low use relative to other industries, but still high connectivity
- Significant positive impact available from connection and easy data sharing, with many potential applications
- Organisational changes enabled and encouraged by developments in Internet services
- Productive use at an early stage, but significant future potential apparent

Generally low use but high connectivity

133. As noted above, there is no single dairy sector in the industry statistics. We look at two separate parts of the picture to draw together a view on the numbers: the Agriculture sector, and the Food Product Manufacturing sub-sector. Here we focus mostly on the Agriculture sector, i.e, on-farm productivity.

134. The Agriculture sector is the least connected of the sectors we studied on almost all measures. Firms in the Agriculture sector are less likely to have a website, less likely to have most of their staff online, less likely to purchase goods or services on the Internet, and less likely to have a fibre connection, this last point is unsurprising given the urban footprint of fibre. Firms in the customer-facing part of the value-chain are a bit more connected but still low users relative to other sectors. Firm size appears to matter a lot in respect of Internet usage, with larger firms more likely to be substantial users of Internet services.

135. Note, however, that almost all firms even in the agriculture sector have Internet connections. The data suggests that they are just not making much use of them.
Many potential applications

136. There is an important distinction, made by several of our interviewees, between use of technology and use of the Internet.

- Farming often involves the use of high-technology, for example, farmers might invest in highly-automated milking systems that are engineered to both speed up milking and reduce the amount of labour required.

- Farming can also involve use of the Internet: for example the milking system could include technology that automatically tests the milk from each cow at every milking and uploads that information to a service provider’s datastore over the Internet. The farmer can access that data from his/her computer (and soon his/her smartphone), run reports to analyse the information, and make decisions about what to do on farm as a result.

137. Interviewees gave us a very wide range of applications of technology and Internet services like this that are in use to varying degrees on New Zealand farms today. We report some of them here, primarily to demonstrate the remarkable reach of high-technology into farming and give a sense of how Internet services can improve agricultural productivity. The general point is that automated information gathering from a range of systems plus sharing of that information around the farm and further afield can lead to better and more timely decision-making.

- Soil moisture monitoring – One interviewee we spoke to has installed a sensor network that calculates soil moisture at various locations on the farm (at two different depths), and then sends this data wirelessly to a service provider every three hours. The farmer can look at the data whenever he likes online, and make decisions on how much water to apply based on it. Previously he had fewer monitoring sites on the farm, and he would have to go around with a handheld computer to each site to download the data, and then sideload it on to his PC. Because it took an hour or so to do this, he would do it less often, meaning less valuable data.
• Irrigation – Variable rate irrigation enables farmers to apply different amounts of water in different parts of the farm depending on the water holding capacity and moisture readings of the soil. The effect is to enable irrigation only onto the places where it is necessary, minimising waste and cost and avoiding nitrate runoff. These types of systems can also have a use in establishing compliance with water resource consents.

• Animal tracking – The Livestock Improvement Corporation’s Minda software was mentioned to us by many interviewees as the standard way to record and track cow health and cow movements on dairy farms, and to share that information online. There are mobile options that let users put information on particularly animals into their phone while out on the farm that can be combined together with other data.

• Milking systems and testing – There is a range of smart technology that can be built in or added later to dairy sheds; both labour-saving devices and methods to collect data and send it back to a computer for reporting and analysis. For example, smart technologies can detect early warning signs of mastitis, an udder infection that reduces the quantity and quality of milk production using automated testing during milking, and enable treatment much earlier. These systems can be linked to gates in the shed and enable automatic drafting of animal of interest based on rules set by the user.

• Farm management – Closed farm management systems abound. A farmer might have, for example, NIWA data for weather information, LIC holding data on the herd, Fonterra with data on milk production, and Ballance with grass growth information. Several of our interviewees were focused on how to encourage more sharing of information between different applications, and helping farmers to put together a more comprehensive view of their farm by combining together the data held for them in different information silos. The obvious way to do this is by moving to cloud services and trying to encourage information exchange between applications. This also enables other helpful uses of data, like benchmarking that would enable farmers to see how what they are doing compares with others, and what their results look like by comparison with those in similar situations. Better data sharing could also boost efficiency by reducing the need to enter data more than once.

• Remote farm monitoring and governance – The combination of automated data gathering and information sharing using Internet services means that farmers can see a range of information easily from other parts of the farm, and wherever they happen to be. For example, a farm manager is able to check data on pasture cover, rain forecasts, irrigation plans, and milk production for multiple sites at the same time. S/he can benchmark between areas easily and make well-informed decisions more quickly.

138. There are also some stand-out individual examples of uses of the Internet and their benefits. Fonterra’s Global Dairy Trade is one example: a twice-monthly online auction run by a subsidiary of Fonterra that sets a world price for various commodity milk products, and through which Fonterra trades, we were told, much of its total milk production. The benefit of this market is price transparency, which enables Fonterra and other participants to manage a set of commercial risks, including being sure that they are not pricing their products too cheaply in bilateral arrangements. Fonterra can shape its supply contracts to its customers to reflect what it has learned about the value of its core product by a process of open price discovery enabled by the Internet.
Organisational changes

139. The scale and complexity of farming operations and the variety of systems that can be automated mean that technology becomes both necessary and inevitable at some point. Simply moving from paper-based to online storage of records on the number, condition and output of stock does not necessarily result in a fundamental change in productivity, but it allows decision-making to be quicker, better informed, more reliable and more transparent. The impacts of any individual good decision may be only modest but they are cumulative, and over time better systems lead to sustained better performance.

140. Many interviewees pointed out that technology and Internet services enabled bigger farms run by fewer people by reducing the number of things farmers need to keep track of themselves. Beyond some point (several interviewees suggested that this point was about a 300 cow dairy herd), computerised data gathering and Internet-based transfer and storage of information about each cow made possible what was difficult or impossible for paper-based systems and humans without computer assistance.

141. Adding to that point, if a farmer wants to use information-based management systems for soil moisture, water use, fertiliser control, grass growth, animal health, and milk production, s/he is going to find that only automation plus Internet-based information systems will make this possible.

142. Interviewees also mentioned that wider information sharing on the farm enables corporate farming structures, because these need wider sharing of more information and involve multiple people in governance. Farm workers can use Internet services to store and share data, and people who are not on the farm can log in to the applications to see progress, or access reports on Dropbox or other cloud storage services.

143. It was pointed out to us several times in interviews that, to get a benefit from Internet services, farmers needed to be able to use the information to influence real world decisions on the farm and in an appropriate timeframe. For example, if a farmer is not going to separate out his/her cows into several different mobs and treat them all differently, then very detailed milk test information on each cow may be more distracting than instructive. But, as noted above, a system that automatically picks up early signs of mastitis at milking, and enables automatic drafting of affected animals for treatment could easily fit within farming systems and pay quick dividends.

At an early stage, but strong future prospects

144. Together the combination of farm automation and Internet-based data sharing holds significant promise in boosting on-farm productivity. There might also be efficiencies in the supply chain, for example, by providing information on weights of animals to transport operators and the freezing works, or financial risk management improvements if regular data on farm performance was shareable with banks. Some of our interviewees noted that Internet services were also central to delivering on the promise of an integrated supply chain, i.e., giving consumers information at the point of sale on where their product came from.

145. Several interviewees noted the positive social impacts of Internet services. Having Internet access on a farm changes the mix of people who work there by making it easier
to attract younger people, and removing a barrier that might previously have stopped some people from working in rural areas.

146. Interviewees expected the benefits to vary greatly from farm to farm (although no one suggested a farm that Internet connectivity would not help at all, and some interviewees talked about a developing technological divide. On one side would be large farms, owned by the operator or by a corporate, that are well advanced technologically, well managed, and where the owners have an interest in technology for better management or to generate better returns. On the other side would be smaller farms, less technically advanced. Generally dairy farmers were thought to be more technologically sophisticated than drystock farmers, perhaps because they have more information than sheep and beef farmers by virtue of seeing their animals more frequently. Even on dairy farms though, advanced use of Internet-based services was seen as rare at this stage.

147. There was a consistent message that mass adoption by farmers required a proven technology that demonstrably generated improved profit on the farm, and that could be put to work in a practical way to fit within existing farm process. It also helps if the technology solves a problem that the farmer is facing at the time, i.e., the idea has some pragmatic, early payoff. Service providers told us that their main sales pitch was the labour saving benefits of technology, rather than a vision of transforming farm operations. Some service providers had bold targets for takeup and growth; others anticipated ongoing slow growth in adoption by farmers.

148. Interviewees nominated a number of factors that could drive faster takeup of on-farm Internet services.

• Business case – The most obvious is if a clear payoff can be convincingly demonstrated from use of technology. This implies tipping point effects: as more farmers adopt a particular solution, it becomes easier and easier to sign up new customers.

• Tag-along impacts – As more sophisticated technology is built in to farm equipment, this speeds up adoption by default, i.e., farmers end up with the technology on farm without having to do any more. One example given to us was GPS steering technology in tractors, which has increasingly become standard, meaning farmers do not need to make any incremental investment to have the option to use it on their farm. Similarly, milk companies provide online information on the milk they collected the day before. This helps to bring farmers online and helps them to see the benefits of information sharing technology.

• Environmental pressures – Better information on farm resource use, in particular being able to measure more exactly the use of resources in different parts of the farm and demonstrate compliance with regulatory requirements, was regularly mentioned as a driver for technology adoption. This may be particularly an issue in environmentally sensitive areas or where dairy farms are a relatively new activity.

• Farmer demand – If farmers see scope to improve their productivity from information sharing, then they could drive service providers to enable it. For example, if farmers see gains in being able to pool their data across multiple applications into a single view, or to compare their numbers with other farms in similar situations, this will drive market pressure on providers to integrate their services together.
Aligning the numbers and the interviews

149. Overall our numbers show that the combined impact of Internet services on the Food Product Manufacturing and Agriculture sub-sectors is neutral, meaning that we can see no impact on productivity in the dairy sector as a whole from Internet services. We see an unexpected large negative impact of high Internet usage in the Agriculture sector but this is offset by a large positive impact in the Food Product Manufacturing sector.

150. The negative result in the Agriculture sector is unusual, since it is difficult to understand why using Internet services would sharply reduce on-farm productivity. The interviewees we spoke to certainly do not provide any support for the view that farmers making substantial use of Internet services are less productive than their less-connected brethren. Based on our interviews, we might expect to see some small positive impacts, and predict more substantial positive changes for the future.

151. We have three possible explanations for the divergence, all of which come down to limitations in the data:

• Isolating the dairy sector impact – For confidentiality reasons we have not been able to get figures that just relate to dairy farming. Instead we have used figures at the broader Agriculture sector level, reasoning that those figures would be a reasonable proxy for dairy farming. In fact from interviews we hear that dairy farmers are more advanced than at least drystock farmers in their use of Internet, indicating that the Agriculture numbers may be less reliable. Our Agriculture figures include other types of livestock farming, as well as horticulture. Figure 7 shows the breakdown of the sample by firm type.

![Figure 7: Breakdown of firm types in Agriculture sector](image)

Source: Statistics New Zealand

• Large, low productivity, non-dairy firms dominate the numbers – Statistics New Zealand looked in more detail at what was driving the results in Agriculture. They reported that the 20 largest businesses in the Agriculture sector account for more than 50% of the employment but only 31% of the value-add, i.e., the largest firms are much
less productive than the average firm in the Agriculture industry. Many of these businesses have high usage of Internet services, and a fair number of them are horticulture businesses.

- We may not be measuring the right things – Our variables for measuring use of Internet services may not be that helpful when thinking about the impact of Internet services on on-farm productivity. The questions do not get directly at the use of Internet services for business operations, and the marketing side of farming is just not relevant for dairy farmers; that part of their business is taken care of by their milk company.

Two of our five measures are related only to the marketing side of business, i.e., whether a firm has a website or not, and whether it makes more than 25% of its sales via the Internet. A third, whether a firm has a fibre connection, is clearly limited in its relevance to farms, given the footprint of fibre services, but would not in itself explain why firms with fibre connections would be less productive. On the other two questions, we do not have enough information to know whether having a high proportion of staff with Internet access on a farm or making online purchases are especially crucial to farm productivity.

We were told in interviews that use of the Internet in operations is important to farms: data collection is crucial and Internet access for on-farm decision-making and sharing of data is very important in some form (i.e., to the office) and very useful in others (e.g., mobile coverage on farm). A different set of questions that asked what technologies were deployed on farm, and the level of automation and information sharing that farmers were engaging in might be more insightful.

152. Overall we remain somewhat perplexed by the result in Agriculture and think that it would reward further investigation. An econometric approach with firm-level Business Operations Survey data might have more latitude in investigating the impacts without falling foul of confidentiality rules. But there are only a small number of dairy farms in the Business Operations Survey population and sample, so another approach might involve a specific survey of farmers to better understand their technology use and its impacts.

**Business services**

**Main points**

- Very high users of Internet services
- Internet services central to operations and business performance
- Ongoing gradual transformation of business processes due to Internet services
- New organisational forms enabled, including smaller firms, home workers and more diverse networks

**Internet services central to operations, less so for marketing**

153. Professional services firms are very high users of Internet services, by far the highest among the sectors we studied. Practically all firms have a website, they buy online, and
most or all of their staff have access to the Internet at work. Nearly half of firms report having a fibre connection, and this is the only metric where big firms differ substantially from small firms. Very few professional services firms are selling their services online to any extent.

Figure 8: Firms in Business Services compared with all firms

Source: Statistics NZ data, Sapere analysis

154. The professional services firms we spoke to were using Internet services for their operations and internal process, rather than for marketing. For client-facing activities, the website was the most important, and the most important impact of the website was to give information to clients and potential clients, particularly on who works in the firm and what they do. Several interviewees noted that the most visited page on their websites were the staff personal bio pages: the website allows clients to look inside the firm and see who the people are. LinkedIn provides a similar functionality, both for clients to check out the firm and vice versa. Some respondents noted that one reason why the bio page was the most popular could be because there was little other content of interest on the site.

155. From what interviewees told us, use of Internet services is central to the way that professional services firms operate. The Internet provides tools for connectivity and speedy information transfer that have transformed the way that business is done, and Internet services are strongly integrated into business processes. The impacts are extremely diverse. We give some everyday examples for illustration:

- Law firms told us that Internet services have transformed basic legal research, where online services enable access to a broader range of specialist legal resources than a conventional law library and enable staff to find information faster. There is less delay: new articles are available instantly as opposed to waiting for a journal to be published and delivered, and staff now do research work themselves, rather than relying on law clerks as in the past. Access to legal information via the Internet also makes it easy to research relevant material and approaches when confronted with novel legal questions or the need to compare approaches in different countries.
• Law firms also said that Internet services have transformed basic legal transactions. For example, land conveyancing can now be completed online via a LINZ portal without a physical meeting or printed documents, speeding up and simplifying the way land sales and purchase is done. The Companies Office website now enables easy online setup of and research on companies, freeing up the search clerks who used to go physically to the Companies Office to search and copy the records, and enabling companies to be established quickly and painlessly.

• A recruitment firm explained how Internet services are central to finding candidates and clients. One result has been a transformation in the speed of the process. Before the Internet, advertisements were handwritten and delivered to the newspaper for creation and publication in the weekend press. The following week, CVs would arrive in the post. Now the firm can advertise the night before and secure potential candidates the next day. Online video conferencing services mean the firm can easily get a look at a candidate earlier in the process. The improved understanding of candidate quality and fit reduces risks, saves time and improves matching.

• A market research firm told us that it was now possible to do real-time customer satisfaction surveys in store, reducing costs by two thirds and multiplying by ten the response rate by simply enabling customer feedback using a tablet at the point of sale and offering a modest incentive. Managers can be alerted immediately to poor customer feedback, and get a way to easily gather real-time feedback about service quality across stores.

• A market research firm said that online qualitative market research brought significant advances over traditional offline focus group discussions. In particular, it enables a group to be brought together from different countries or different parts of the country much more cheaply and easily than alternatives. The online environment also reduces bias, because everyone can type at once without talking over each other online, and responses from one person can be easily hidden from the others until their responses have also been posted. There are also many research firms mining social media data to gather information on how customers feel about products without asking them directly. And firms can build online communities directly to consult on particular issues and get a better sense, more cheaply, of what customers and potential customers think.

• An engineering firm said new collaboration tools have had a big impact on their design process. Whereas previously the process was to create a design, gather comments on it, review the design and then finalise, now all the designs are in the cloud and they are able to be changed all the time with much more flexibility on timing and the process for accepting changes. This brings some extra costs, since those in the process have to deal with more change. But designs can move much more quickly than before, they are more flexible to changing demands, and the client gets a better quality product at the end.

• A firm of consulting economists told us that the Internet has massively reduced the costs of searching and securing data and relevant economic literature, although it does not obviate the need for the user to have sufficient expertise to know where to look in the first place. The Internet also facilitates simple work-arounds, e.g., to find the free working paper version of a published paper, that is of tangible value every day.

• An accounting firm told us that the move to cloud-based accounting has halved the production time for completing a set of accounts. Previously, they used a PC-based accounting system, which meant they had to deal with the difficulties of receiving
digital files from clients and loading them into the accounting software in the firm before processing them. As well, there was a separate set of data from banking records that had to be reconciled. Now both client and accountant are looking at the same set of data, which is already reconciled with bank records enabling faster and more accurate operations, and fewer outstanding issues that need to settled with clients.

156. Generally interviewees said it would be impossible to operate at all without technology and the Internet. Revealingly, one respondent noted that the firm’s business continuity plan was focused on the loss of premises rather than the loss of Internet, and the plan revolved around how to get access to the network again from another location rather than how to deal with the loss of the network itself.

New organisational forms possible

157. It was apparent from interviews that some firms were using Internet services to make their existing business processes more efficient, e.g., replacing post with email, or printing with digital creation, while others were looking to alter the way that they operated more fundamentally. Especially comparing the different law firms, some were looking to use Internet services to entirely change their approach to the creation and dissemination of legal advice, for example, a one-person law firm operating in a cluster with other non-law firms, others were essentially using Internet services to make the existing production processes much more efficient, for example, moving to a paperless process for the production of advice.

158. Law firms that we spoke to consistently told us that Internet services make smaller firms possible by lowering the fixed costs of operation. In particular, access to legal research online means that a law firm does not need to invest in a law library to do quality legal research, but can combine together free services with subscriptions to online services to access legal resources. This gives small firms the access to legal information that used to be only the preserve of larger outfits. This was said to be one enabler for strong growth in boutique law firms that may have split out from larger firms to do bespoke work in particular areas, for example, on IT contracts, or mergers and acquisitions. It was also said to be crucial for one-person firms, which would not exist were it not for the more variable cost structure enabled by Internet services, and the plethora of free legal information.

159. All interviewees talked about how Internet services enable working remotely, including from home. Some firms we spoke to indicated they had reached the point where work processes were identical whether people were in the office or not, raising the question of whether people needed to come to an office at all. And the expectation is that Internet services will continue to allow more flexibility for where and how staff work, for example, different mixes of work during the day or week, and more staff working less than full time.

160. One engineering firm we spoke to said that Internet services had transformed firm collaboration, enabling them to construct virtual teams across countries quickly and effectively in response to client demand. This means that they can bring in specialist skills from overseas that are not available in New Zealand, or sell the skills of New Zealand-based staff to clients in other countries without the need to physically fly people around. This enables them to do things faster and at less cost. It also allows them to take advantage much more effectively of cost differences throughout their
network. In the previous model, services were delivered in the client’s country, by people in the client’s country. So for example, Australian projects would have been delivered by Australian staff in Australia. With new collaboration tools and more effective virtual teams, the firm can now do projects in Australia where much of the design work is actually performed by people in lower cost locations.

161. These types of collaboration tools and flexibility are also a factor in being attractive to potential employees, and are making it easier for clients to get information about what is going on their project. Several interviewees told us that clients like the near instant communications that are now possible with Internet services, and better access to the people who are actually working on their project. One lawyer, for example, noted that previously if an email from the file was required to be forwarded on, it would be printed, scanned and posted. Now it is right in front of him, and he can send it on instantly in response to a client request, and because it is instant he does it more often.

Pressure on existing business practices

162. Most interviewees noted the Internet is moving the boundary between what professional services firms have historically done, and what they clients can now do for themselves. There is an interesting theme about the current limits of Internet services in these stories.

163. As one example, legal services have not yet been replaced by crowd-sourced legal advice or contracts automatically drafted online, even though client access to legal information online continues to improve. But exactly what lawyers do and where the value lies in their advice is changing, and the firms we spoke to were using Internet services extensively in the way that they create and deliver their advice or services to clients. Some saw a bifurcation in the market, with the industry split into firms providing high-level bespoke, niche legal services that are not capable (yet) of being commoditised, and those providing services that are commoditisable, who generally need to rely on volume or a particular geography that secures them a stable client base.

164. More generally, clients have much greater access to legal information and resources online, even if it is not reliable, perfectly relevant, or customised to their situation. This puts the acid on lawyers to define the value they add much more acutely. For all professional services firms, the access that clients have to information at their fingertips, and the ability to self-serve using Internet services, means that many professional services firms have to work at being “up to the minute” instead of just being “up to date”. One law firm interviewee talked of a future where clients, informed much more fully by online resources, set the requirements of what they want from the lawyer, and give him/her detailed tasks rather than ownership of the problem to solve.

165. Paradoxically, the demand for advisory services and sophisticated advice rises as people need to overcome the problem of having too much information, and they may not have the specialist skills required to take full advantage of the self-service options presented by Internet services. A consulting economist said that firms that have the ability to do sophisticated analysis and can find clients who have sophisticated problems can prosper in this new world. In recruitment, we were told that HR departments can now run their own internal recruitment and conduct their own basic searches just using LinkedIn and online advertising. This means recruiters need to have a different approach or a
different network of contacts available to them in order to add value and maintain a role.

166. The ability to deliver services at a distance means that there is also more competition possible from international firms that previously would not have considered the New Zealand market a priority, although clearly there are regulatory barriers in case of cross-border trading of some services. This is the quid pro quo for New Zealand firms also being able to compete in overseas markets. The replicability of services and easy access to economic and statistical information, for example, means that economic consultancy services can now be provided to New Zealand clients from nearly anywhere.

Productivity impacts

167. We cannot discern in our data an impact of Internet services in the Business Services sector. When we compare the productivity figures for high using firms with other firms, the numbers do not show any clear pattern. Mathematically the positive productivity impact from some variables (staff Internet access and fibre connectivity) outweighs a negative impact from other variables, meaning productivity in higher using firms is 10% higher than that for lower using firms, but there is no consistency in the numbers. And when we compare the productivity of firms that make more use of the Internet with the industry average, the apparent positive impact of the Internet disappears, and this result is driven by a very small number of professional services firms that are, unusually, making a high proportion of sales online.

168. We think that the most likely explanation is that our method is just not suited to isolating the impact of Internet services for professional services firms. This means our numbers are more noise than signal in Business Services. Given the interview results, we would expect to see significant, stable, and positive productivity impacts from Internet services.

169. What could be going on is two things:

• Measuring the wrong things – Our variables of use may not be ideally suited to getting at the way that professional services firms derive value from the Internet. In particular, the five variables we have from the Business Operations Survey are not strongly focused on operations, which is what our interviewees told us they mostly used the Internet for. Measuring collaboration with other staff, ease of contacts with clients, and straightforward access to online information sources would require different questions more suited to the business processes of professional services firms.

• Already highly advanced – We explain in the technical appendix that our method has a survivor bias, i.e., it cannot detect productivity differences if there are no firms around still using older processes. This might be a factor in Business Services firms: we see very high levels of more sophisticated Internet use, and so the productivity benefits that have been gained have been gained by all firms and are no longer obvious by comparison. It is not clear at all to us what a professional services firm that did not make heavy use of the Internet would be doing or how they could survive. This points to the importance of contextualising productivity benefits: once all firms are doing it, the apparent benefit disappears.
Future scenarios

170. In this chapter we consider some scenarios for how the impacts of the Internet might play out in future. We look at the contributions to firm productivity if firms with relatively less intensive Internet use were to increase their uptake, and then consider more speculative impacts that might come about in response to larger changes.

Getting to the frontier

171. We think there is scope for further productive use of Internet services by New Zealand businesses. We can see productivity differences in the figures between high-using and low-using firms, and so our first scenario just calculates the impact if firms making lower use of Internet services were to become more like their higher-using brethren.

172. To do this we take the average amount of value added per employee among the low using firms for each of the five variables that we use to define use, and increase it to the average level of value added observed among the higher using firms. For each of the five variables we then multiply these new rates of value added per employee by the number of employees in the low uptake firms. We perform this calculation for each industry and then aggregate the results. In a small number of unusual cases, where current value added is higher among low-uptake firms, we assume no change, that is, we assume these firms would not make business decisions that worsen their productivity.

173. Mathematically this is the equivalent of moving the average productivity performance in each industry to the level of the firms making the most use of Internet services at present. In an economic sense we are calculating the impact of low using firms moving to the production frontier defined by high using firms.

174. The aim of these tests is to obtain insights into the additional value added, in aggregate, that these lower using firms would generate if they adopted the Internet-use characteristics of their higher using counterparts. In essence, we are treating the low-uptake firms as though they are high-uptake firms, and examining the impact on their overall value added numbers. This is necessarily suggestive rather than definitive, but it helps to bracket what might be seen as possible future impacts.

Staff Internet access and online sales offer the most potential

175. The potential impacts on aggregate value added among low uptake firms are shown in Figure 9. In line with the results presented earlier, the greatest gains are linked with the variables relating to access (i.e., having more than 80% of staff with Internet access) and sales (i.e., having more than 25% of sales online), followed by connectivity (i.e., having use of a fibre connection).

• For the access variable, we estimate an increase of $13bn in value added among those firms that have fewer than 80% of staff with Internet access. This equates to value added being 37% higher than is currently the case among these firms, a substantial boost in productivity.
• For the sales variable, the increase is $10bn, or an increase of 16% of the value added among firms that currently have 25% or less of their sales via the Internet.

• For the connectivity variable, the impact is an increase of $6bn in value added, or a 24% increase in productivity for firms that do not have a fibre connection at present. This result may be optimistic, given than even after the UFB is completed, fibre services will not be available everywhere. But we treat it as indicative of the levels of impacts available rather than an estimate of the value of fibre in itself.

• The other variables, whether a firm purchases goods via the Internet, and whether a firm has a website have much lower impacts. These are $3bn and $2bn, respectively, equating to increases of 51% and 75% in productivity for the lower using firms.

176. If these increases are a reasonable estimate of the impacts of more productive use of the Internet, and they flowed directly into GDP, combined gains in value add of around $34bn would equate to 16% of New Zealand’s 2012/13 GDP.

Figure 9: Potential increase in value added from low using firms increasing their Internet use

177. We can do an industry level breakdown of our numbers to take a closer look at the productivity changes. The manufacturing sector accounts a sizeable share of the increase in value added among lower using firms (39%). This is driven by the size of the sector (i.e. manufacturing involves 27% of the employees in lower using firms across all sectors), and by the differential in value-add per employee as compared with higher using firms.

178. The gains in manufacturing are followed by potential gains in the sectors of mining (22%), electricity (14%) transport, postal and warehousing (6%), and agriculture, forestry and fishing (4%). The first two are typically outliers in our data: modest
employers with small differences in value add between high using and low using firms, but with very large value add figures overall.

**Figure 10: Access – estimated value add from having more staff online by industry**

Source: Statistics New Zealand data, Sapere analysis

179. Looking at Internet-based sales, much of our modelled increase in value added comes from transport, postal and warehousing, and finance and insurance, New Zealand’s largest sector by GDP and a major employer. Figure 10 gives a breakdown of the aggregate gain in value added from lower using firms increasing their online sales to match their more productive counterparts.

180. It is interesting to see these modest impacts in retail trade. They reflect the relatively small differences in data in productivity between firms making high use of Internet services and others.

181. We have also done a similar calculation but in a different way. Instead of summing across variables, we apply the greatest productivity differential from any variable in each industry to each employee in that industry. This is equivalent to all employees being as productive as the data says is possible for that industry, given current usage and resources, and may be a better relation to the economic concept of the productivity frontier. This method results in an additional productivity boost of around $42 billion for the economy as a whole, doubling productivity per employee in firms presently making low use of Internet services.
Looking across the retail and tourism sectors

182. We look specifically at impacts for lower using firms in the retail and tourism sectors, if they were to perform at the level of their higher using competitors. In both sectors online sales offers the most potential, although fibre connectivity matters equally for tourism.

183. Among retailers, growth in online sales could lift value added by $510 million or 28%, which much lower contributions of 9% and 5% available from greater fibre connectivity or getting more staff online. There were negligible effects for the website and procurement variables, as can be seen in Figure 12. These numbers are not enormous, largely because the productivity benefit for a retailer making high use of Internet services is only $3k per employee per year on our numbers.

184. In the case of tourism, the potential to increase aggregate value added is higher because the difference in value add per employee in higher using firms is a much larger $17k on our numbers. As Figure 13 shows, we found the highest impacts in value added arose in the connectivity and sales variables – an increase of more than $1 billion for each variable. These represent increase increases in aggregate value added of 176% and 95%, respectively.
Figure 12: Retail sector – potential increase in value added from low using firms increasing their Internet use

Source: Statistics New Zealand data, Sapere analysis

Figure 13: Tourism sector – potential increase in value added from low using firms increasing their Internet use

Source: Statistics New Zealand data, Sapere analysis

Discussion

185. We are using differences in productivity associated with increasing online sales and moving to fibre connectivity to essentially proxy for the boost in productivity that
might be available to firms that make less use of Internet services today becoming higher users in the future. From our interviews, the impacts of the Internet are large and widespread, and so gains might plausibly arise in a large number of ways, including the ability to reduce costs, e.g., via online sales channels, or making use high-speed broadband to enable more cloud-based approaches to information storage, retrieval and sharing, or to boost revenues, e.g., via more efficient marketing, or additional sales through online channels.

186. Among the sectors, the gains are most likely to come from within manufacturing sector both due to the sector’s enormous size, and also relatively large existing productivity differences between firms that make lower use of Internet services today, and their higher using cousins.

187. A number of assumptions underlie these estimates: we are taking a very straightforward approach in order to generate a ballpark estimate. In particular we assume that the productivity of firms that make more use of Internet services is due to their Internet use and that this higher rate is achievable by all lower use firms.

188. The approach employed here only focuses on the direct effects of higher value added among lower using firms. It does not consider the probability or magnitude of dynamic effects across an industry or the wider economy. For example, higher value-add across the economy could be expected to raise the price of labour, thereby giving firms an incentive to reduce their levels of labour in favour of more capital-intensive means of production.

189. We have not speculated on a pathway or timeframe for the realisation of the productivity gains. Given the timeframes involved in moving from low broadband takeup to today’s high broadband takeup, and the generally gradual nature of changes in industry organisation and production, it might be thought to be long-term game.

Longer term effects

190. We also want to get a sense of the economic impacts of ongoing improvements in productivity for both high using and low using firms.

191. Interviewees that we spoke with generally felt that their own business and their wider industry was not yet at an advanced stage of maturity in terms of the possibilities for making greater use of the Internet. Even firms making heavy use of Internet services said this. One large retailer said that its operations, despite being highly sophisticated, were only capturing 1-2% of what they thought the total online opportunity was. Respondents in Tourism and in the Dairy sector said that they thought they were just getting started in those industries. Firms in Business Services had adopted the Internet and were integrated it into their businesses, but even they felt that there was more to do.

192. Forecasting future Internet-related growth scenarios is inherently speculative. Few studies have attempted such forecasts, and those that have do not consider usage by firms directly. The two studies available, Micus (2008) and BCG (2012) suggest that the contribution of the Internet economy to GDP in the G20 countries and the EU economies would grow by 29 per cent and 54 per cent respectively, in less than ten years from the study date. For the UK, the figure is about 49 per cent.
193. Looking at New Zealand data, we see predictions for no growth in real terms at a total revenue level in the telecommunications market (Commerce Commission, 2013), and 5% growth in the “entertainment and media” market (PWC NZ, 2011). The latest TIN100 report reveals revenue growth in recent times of 3%, equivalent to 34% growth if sustained for a 10 year period. The ICT sector at present is 5% of GDP (MBIE, 2013). A 50% increase over 10 years, in line with the studies mentioned would imply a reasonably modest 4% growth per year, increasing GDP by 2.5 percentage points or about $5bn. In that light, Micu and BCG seem quite moderate in their claims about future ICT sector growth, although 4% is somewhat faster than TIN100 growth in recent times.

194. We note that overseas studies say that much of the impact of the Internet will occur in retail, where we see relatively modest productivity differences for high-using firms at present in the data for this study. Labour productivity levels in retail in New Zealand are about 60 per cent of those in Australia, which in turn are around 75 per cent of the UK level (NZPC 2014). There is evident scope for catch-up, and retail is predicted to play a large part in growth of the Internet economy’s contribution to GDP in the UK. If New Zealand could close half of the gap in retail productivity with Australia, the productivity benefit would be in the order of $3bn just in the retail sector, or a 20% lift in retail sector output overall. We would start to see more substantial positive long-term economic impacts in this type of scenario.
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Appendix – How important is the Internet

195. This chapter looks at the importance of the Internet and particularly at what we know about New Zealand business use of the Internet.

The remarkable prevalence of Internet services

196. The OECD (2012) says:\(^3\)

“the full impact of the Internet on our economies remains far from clear, even as the available means of communicating and connecting to information continue to expand rapidly. What is clear is that the Internet is becoming a key economic infrastructure, revolutionising businesses and serving as a platform for innovation.”

197. Certainly the Internet accounts for an increasingly large swathe of economic and social activity. The Boston Consulting Group (BCG) suggest that by 2016 there will be 3 billion Internet users globally, up from 1.9 billion in 2010, and in the G-20 countries the value of the “Internet economy”, shorthand for the sum total of the value-add of goods and services traded via the Internet, will reach $4.2 trillion, from $2.3 trillion in 2010.\(^4\)

198. In New Zealand Internet usage is even more popular than other countries on some metrics.

199. Figure 14 shows the enormous increase in the uptake of fixed broadband Internet service over the last decade. New Zealand’s current fixed line broadband uptake per 100 inhabitants is 28 compared with an OECD average of 26.\(^5\) To convert the OECD number to a household penetration number, one needs to multiply by the average household size. For New Zealand (household size: 2.6), a score of 28 converts to broadband being available in nearly three quarters of homes at present.

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\(^3\) OECD (2012), p.20
\(^4\) Boston Consulting Group (2012), p. 3
\(^5\) Note that the connections per 100 inhabitants measure that the OECD prefers is a slightly odd metric that shows countries with larger households (like New Zealand) in a worse light than a simple percentage of households measure would.
Figure 14: Uptake of broadband connections in New Zealand

Source: OECD broadband portal
http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm

200. Figure 15 shows the number of fixed lines that have broadband. You can see a huge increase in broadband uptake from 16k in 2001 to 1.24m in 2012 as Internet usage has taken off, and dial-up connectivity has become less important.\(^6\)

\(^6\) Note that the 16k figure for 2001 is an underestimate, since it excludes cable modem broadband connections on the TelstraClear network in Wellington.
Figure 15: Growth in broadband lines over time


201. New Zealand’s broadband uptake rate is still growing quickly by comparison with other OECD countries. This is partly a reflection of the fact that there are still 150k households using Internet over slow dial-up connections: these households are clearly Internet users but not yet converts to superior but more expensive broadband connectivity.

202. Mobile devices are the most popular way to access the Internet. A March 2013 survey revealed that 48% of New Zealanders owned a smartphone, compared with 66% who owned a laptop, and that nearly half of smartphone users use it every day to access the Internet. In 2011 the majority of mobile Internet use was still on netbooks and laptops, but smartphone use was predicted to overtake them due to the vast increase in the amount of data used on these devices. The volume of data transferred over mobile networks is doubling every year.8

203. These big increases in usage of the Internet rely on improvements in network quality and availability:

- Chorus reported in 2009 that nearly 80% of fixed lines were capable of broadband speeds above 10Mbps. The replacement of copper with fibre in the fixed access network, through “cabinetisation” as well as the government’s UFB and RBI initiatives, will have improved the proportion of high-speed lines since then.9

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7 Commerce Commission (2013), page 40.
8 Commerce Commission (2013), page 33.
9 Note that customers do not always buy the fastest plan that could be supported by their line, and there are many other variables that influence speed, but higher speed connections are taking in a larger share of the overall number of connections, and around 75% of connections were faster than 2 Mbps in 2010.
• The slowest peak download speed on UFB is 30Mbps, with a 200Mbps option under discussion. The UFB aims to reach 75% of homes and businesses by 2019 with fibre services. For the 10% of households within the footprint of Vodafone’s cable TV network, speeds of 100Mbps are already available.

• Mobile networks have also expanded and improved in recent times. All three operators have built new networks, and the government’s RBI initiative is funding an increase in coverage from 154 new and 387 upgraded sites, taking mobile population coverage to a reported 98% of the population.

• The speed of mobile broadband has improved radically. The first 3G networks were launched worldwide in the early 2000s, with headline speeds of 384kbps. Today New Zealand operators have deployed HSDPA networks, with peak download speeds above 40Mbps and are rolling out LTE networks, with current peak download speeds around 100Mbps, and building or planning nationwide deployments.

• Satellite options for the most remote customers have also improved, with another satellite coming on stream from Eutelsat, meaning that satellite services now cover nearly 100% of New Zealand homes and businesses. The few exceptions are those premises with very restricted visibility of the relevant part of the sky. Retailers report that customer numbers have roughly doubled in recent years, although growth has slowed very recently, likely due to competition from the RBI-funded copper and mobile network improvements.

204. The reason that these networks are necessary is because, for most of the population and practically all businesses, Internet services are now used every day for a wide range of activities, including internal communication, marketing and sales, internal management of the business, and ordering and paying for products. Internet services are taking over part of the telecommunication role that has historically been played by other services, including fixed and mobile phones.

205. It is easy to forget what an enormous change this is, and how quickly it has come about. Consider that:

• TradeMe, New Zealand’s most popular online marketplace, started in 1999. It attracted an average of 740k visitors every day – around 21% of the adult New Zealand population – in November 2013, engaging with 2.5m listings.

• Skype, a popular Internet-based telecommunications service, was first available in August 2003. By 2011 it carried 145bn minutes worldwide – around a third of total global call minutes. Telegeography, a consultancy, reckon that Skype is responsible for most of the growth in international calling minutes in recent years.

• Facebook, the world’s most popular social network, was founded in February 2004 and presently reports more than a billion active users around the world. More than half of

10 http://www.digitl.co.nz/248/chorus-faster-ufb/
all Americans now say that they have a social networking profile (Facebook is the most popular), and around a fifth of Americans report using social media several times a day.

- YouTube, a video-sharing website, was created in February 2005 and bought by Google in 2006. It reports that more than 1 billion unique users visit its service each month, watching over 6 billion hours of video, and uploading 100 hours to the service every minute.\(^\text{13}\)

- Netflix, a US-based video on-demand service, started its subscription-based online distribution in 1999. As of September 2013, it reported only 40m subscribers worldwide, with 31m in the United States, but between them, YouTube and Netflix now account for more than half of all downstream Internet traffic on fixed networks at peak times in North America.\(^\text{14}\)

206. There is also growing use of online shopping. A PWC study estimated that in 2012, 1.9 million New Zealanders made online purchases, spending on average $1,659 online during the year, with 81 per cent of respondents expecting to spend the same or more online during the following year.\(^\text{15}\)

207. The Retailers’ Association (2013) says that 55% of the population and fully 70% of 25-44 year olds had shopped online in the previous 12 months. The online market for physical goods is worth around $3.3bn, or 6% of total retail sales, with off-shore purchases accounting for somewhere between a quarter and a third of sales. Digital downloads account for another $1.6bn, giving a total online sales value of around $5bn, split reasonably evenly between onshore and offshore.

208. Around a third of shoppers buy clothing, shoes and accessories, and books or magazines online. Outside of core retail, buying leisure flights or event tickets, and booking hotels or rental cars are all very popular online purchases. PWC say that nearly a quarter of spend on electronics, 22% of spend on clothing, footwear and accessories, and 12% of spending on books and magazines is made online. The most common reason for shopping online is to get a better deal, but also a better product range, and more convenient shopping hours.

209. The broader point is that services that did not exist or were in their infancy a few years ago are now an unremarkable part of daily life. Car registration or paying tolls, online banking, reading the news, online commerce, social media, streaming music services or online video options are all activities that were difficult, unusual or impossible until relatively recently. More than 30% of those filling in the 2013 New Zealand Census filed their forms online, up from 7% in 2006.\(^\text{16}\) There is now discussion of enabling online voting in local elections, partly as a response to apparent voter apathy.\(^\text{17}\)

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\(^{14}\) [http://www.theguardian.com/technology/2013/nov/11/netflix-youtube-dominate-us-Internet-traffic](http://www.theguardian.com/technology/2013/nov/11/netflix-youtube-dominate-us-Internet-traffic)


\(^{16}\) Commerce Commission (2013), page 39.

210. According to the latest release of the World Internet Project, 80% of New Zealanders are online every day at home for at least an hour, and nearly 70% of users say they have used mobile Internet in the past year. Almost everyone under 40 is online, with only 1% of under 40 year olds being non-users, and only 5% of the population says that they have never used the Internet.\footnote{Gibson et al (2013), page 3.} Total time online in 2006 was 7 hours a week. By 2012 this had risen to 12 hours.

211. As a source of information, 81% of the population rated the Internet as important or very important, much higher than television (47%), radio (37%), or newspapers (37%). Overall nearly three quarters of the population think that the Internet is either important or very important to daily life.

The difference made by the Internet

212. The most straightforward economic understanding of the Internet is as a device that allows rapid and inexpensive sharing of information.\footnote{For a simple graphical treatment of the economic effects of the Internet, see Infometrics (2012).} The economic treatment of the Internet suggests that it increases productive efficiency (through reduced costs of discovery and use of information), and improves the matching of what is produced to society’s preferences (i.e. an allocative efficiency effect).

213. A reduction in the costs of sharing information could have a range of economic benefits for firms including reductions in operating costs as sharing information on performance gets easier, an expansion in market demand for existing products and services as new customers are found online, or opening up the possibility of entirely new products and services enabled by the rapid and low cost information sharing capabilities of the Internet.

214. Because the Internet is a general purpose technology, innovations in Internet services result in further rounds of innovation in sectors that use Internet technologies. The use of Internet services can allow widespread and significant economic improvements even for companies that are not engaged in providing services over the Internet directly.


“At bottom, the Internet represents a new and highly powerful way to communicate information more rapidly, cheaply, and with greater flexibility. This should allow firms to reduce their transaction costs of locating and purchasing required supplies (including labor); to enhance the efficiency of producing and delivering goods and services (through lower inventories, enhanced cooperation among designers of new products and services in different locations, whether inside or outside the firm); and to reduce the cost and improve the effectiveness of dealing with customers. In addition, to the extent that the Internet promotes transparency, it should enhance competition in many (but not necessarily all) markets, and thus intensify pressures on firms to adopt the cost-saving improvements facilitated by the Internet.”
Breaking this down a little more, a report from the Boston Consulting Group lists the customer-side benefits for SMEs from the Internet as follows:\(^{20}\)

- **Geographic expansion** – Internet use enables SMEs to compete across a wider market place and access customers that may be out of reach due to distance or other impediments.

- **Enhanced marketing** – Internet use enables greater reach and larger audiences for marketing purposes, and also facilitates improved business data gathering and hence business planning. To this we would add that social media can also allow the identification of much smaller market niches of those who will be interested in a product or service, rather than just enabling much wider spread of general messaging.

- **Improved customer interactions** – Internet technology (particularly social media) allows for real-time interaction with customers and improved targeting towards customer needs and preferences.

- **Use of Cloud services** – Internet use provides SMEs with access to sophisticated cloud-based services and business tools including customer relationship management, information management and customer payments. Importantly, use of the Internet and cloud services allows SMEs to access these services quickly and at low and scalable cost.

- **Improved staff recruitment** – The Internet allows SMEs to potentially recruit from a global talent pool at lower cost and more efficiently than traditional recruitment channels.

To this list we would add a set of benefits on the operations side:

- **More efficient advertising and sales** – Online advertising is more measurable in its visibility and impact than print or other traditional forms, and the audience can be much more tightly controlled. An online store can give a firm a channel to market with much reduced commissions relative to normal wholesale options (although of course they face the costs of setting up and running the site).

- **Better management information** – Internet services can give SMEs an integrated view of operations and business performance more easily. The Internet can allow firms to collate and share information on business performance at low cost, and enables structured benchmarking against similar firms in ways that were previously impossible.

- **Leaner processes and more efficient production** – An online store can enable the “no-touch customer” for some types of businesses, i.e., a customer whose entire interaction with the firm is enabled online, and who has no contact with staff. SMEs can run their business using the same tools that their customers see, and eliminate double-processing or multiple data-entry steps along the way. Better information on sales and stocks means more efficient use of capital, and better purchasing decisions from suppliers.

- **New organisational forms** – The radically lower costs of creating and sharing information using the Internet enable different ways of doing business. SMEs can more easily link multiple offices, or have employees working from home or remote locations.

\(^{20}\) The Boston Consulting Group (2012), p. 15
with greater connectivity. They can improve collaboration within the firm with tools that are built on a create/share/edit model, rather than the traditional create/edit/share. They can build less hierarchical models for business that involve freer flow of information and wider dispersion of decision-making powers.

218. We can think about a technology maturity scale or journey for firms, starting with connection, moving through basic uses, and into more advanced uses.  

- Firms that just getting starting might be thinking about basic Internet connectivity, moving phones to VOIP, integrating email into customer service or supplier communications, and where relevant, setting up a brochure website and basic social media visibility. The focus is on figuring out whether or how the Internet can help.
- Firms making more sophisticated use of services could be using social media for customer marketing and service, analysing data on website performance compared with other channels to figure out where the best returns lie, looking to ecommerce to generate low or no-touch sales, setting up basic cloud services to run systems and to collect and analyse data on their operations, or simplifying the backend by moving towards one system for online and offline operations. Firms know at this point how Internet services fit into the mix, and are working at making them useful.
- Firms making advanced uses of the Internet might be looking at big data, at open data, at using analytics software to analyse and improve their business performance, or at migrating some or all of their operations into the cloud to enable much greater staff collaboration and customer visibility. Firms at this point are looking to use Internet services for sustained competitive advantage, and Internet services are more fully integrated into the business model.

219. In the end, while the Internet has the potential to transform business productivity, whether it does or not depends on firms. Varian et al (2002), page 16:

“What this short list of potential improvements should indicate is that the Internet represents a powerful tool for improving the efficiency of the firm…. [T]he gains that firms – and thus the economy as a whole – can reap from the Internet depend overwhelmingly on the extent to which firms use the Internet to reorganize the way they do business.”

Some characteristics of business Internet use

220. Given that consumers are embracing the Internet, it is no surprise that business use of the Internet is also very important: 96% of economically-significant businesses reported having access to the Internet in Statistics New Zealand’s Business Operations Survey in 2012, and 69% had websites that they used to communicate with customers, up from 64% in 2010.

21 The World Internet Project (Gibson et al, 2013) does something similar with home users, categorising them into ‘never users’, ‘ex-users’, ‘low-level users’, ‘first generation users’ and ‘next generation users’ in order of sophistication.
221. The Business Operations Survey also reveals that the most popular use of the Internet within business is for finance: 90% of firms are using the Internet for this, which we take to be online banking. Around three quarters of firms use the Internet to interact with the government: it must help that GST returns and other common tax processes are online. Around half of businesses use the Internet to share information internally or for recruitment. About 40% use it to share information outside their organisations.

222. Firms seem very comfortable using the Internet to buy goods and services, with 77% of businesses reporting doing that in the 2012 survey. Email is the most popular means of making these transactions, twice as popular as online ordering.

223. Firms seem much less developed in receiving orders online, with only 45% reporting doing so in 2012, and only 11% reporting that online sales contributed 10% or more of total sales. Only 10% of firms report any sales to customers outside New Zealand.

224. This low level of online sales is unsurprising given other Business Operations Survey results: only 19% of businesses allow ordering of their goods and services via their websites, and only 12% of businesses accept online payments.\textsuperscript{22}

\textsuperscript{22} We note that New Zealand ranks very highly compared with OECD peers in our use of e-commerce in the latest OECD Internet Economy Outlook but we suspect that this is in part due to definitional issues: in New Zealand online sales and purchase includes transactions initiated by email with payment completed offline. In our view using email in this way offers only modest productivity gains over similar methods such as initiating transactions by phone or fax. This definitional difficulty may explain why firms report being high users of online sales options, while simultaneously reporting that they are unlikely to allow online ordering or payment on their websites.
Figure 16: Use of Internet services within economically significant firms

Source: Business Operations Survey (2012), Sapere analysis

225. Bear in mind that the Business Operations Survey covers businesses with six or more employees. We might expect lower prevalence of web-enablement amongst smaller firms. We can see that 95% of firms with 6-19 employees use the Internet as against 99% of firms with more than 100 employees.

226. A recent survey from MYOB (2012), an accounting firm, supports this point. It reports that only 35% of New Zealand businesses had a website, compared with 69% of firms with more than six employees according to the Business Operations Survey. Nearly 90% of the businesses in the MYOB sample have fewer than five employees. MYOB also report that only 14% of their mostly small business sample were making use of cloud solutions that could help reduce their costs and improve their productivity.

227. The Business Operations Survey also includes information on the benefits firms claim from their ICT investments.
Figure 17: Business outcomes from ICT (2012)

Source: Business Operations Survey (2012), Sapere analysis

228. There is a very wide range of claimed benefits, the most prevalent being improved customer responsiveness, better access to customers, and more efficient operations. Note also the 17% of firms who reported that they got none of the listed benefits from their ICT efforts.

229. Business use of the Internet varies widely by industry. The chart below shows the proportion of firms in each industry reporting that 80% or more of their staff use the Internet. Overall 44% of firms surveyed in the Business Operations Survey say that 80% or more of their staff use the Internet, including almost all (96%) of firms in the large Professional, Scientific and Technical Services industry.

230. Tourism is not reported separately in these figures but from figures we requested from Statistics NZ we can see that tourism firms have staff access around the average, with 40% of firms reporting that all or nearly all of their staff use the Internet.
Figure 18: Proportion of firms reporting that more than 80% of employees use the Internet by industry compared with use of Internet at all


231. This basic ordering of the industries is fairly consistent across different measures of ICT use, sophistication or maturity. The firms making the most extensive use of ICTs are in the so-called “ICT intensive industries” (the bottom three on the chart above). And there is a wide dispersion of adoption or sophistication across industries.

232. Note that the “low-tech” industries on these measures, primary production, accommodation and food services, and construction, are still highly connected: 91% of firms in the agriculture, forestry and fisheries sector say they use the Internet, and 98% of construction firms. And relatively lower use of the Internet does not mean lower technical sophistication necessarily: a dairy farm, for example, can have high levels of automation and technical sophistication without making extensive use of Internet services.

233. Our survey of the situation is that Internet services are central to the operations of New Zealand business but that there is still much to do to integrate Internet services into firms’ methods of operation. We see a high level of connectivity, but relatively low levels of sophistication in use of Internet services in many sectors. We characterise this trend as businesses being highly connected in all industries, but not heavy users, in the

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23 Compare this list with Grimes et al (2012) ranking of ‘knowledge intensity’ (pages 21-22) by industry sub-sectors, where Finance and Insurance, and Health Services are the most knowledge intensive, and road transport, food retailing and some agricultural services are the least. ‘Knowledge intensity’ is the proportion of total staff in a sub-sector who are ‘managers, professionals, technicians or associate professionals’.
sense of integrating Internet services entirely into their business processes in many sectors.

234. This dichotomy of high use of Internet services, but apparently low economic returns from use is reflected in our international rankings. The World Wide Web Foundation (2012) ranked New Zealand as 7th in the world for our use of the Internet, ahead of Australia, Norway and Ireland. New Zealand also ranks in the top 10 for institutional infrastructure, reflecting the extent to which institutions, organizations and government support and promote web access. But our ability to extract economic value was rated significantly lower at 17th place, suggesting that there are still gains to be made from increased and improved use of Internet services in the New Zealand business community.

235. This is not to say that offering online payments, for example, is central to the operations of all businesses. Internet services have quite different impacts on different sectors and different types of firms, and will drive different responses, and we can see this from the variances in Internet use between firms in different industries. A retailer may have or be thinking about an online store or computerised inventory; a tourism operator may be looking at upgrading to an online booking system; and a diary farm will already have data on all of its cows online, but might be thinking about how to share that data to get more value from it.
Appendix – Previous studies

236. In this appendix we look at previous studies of the impacts of the Internet, and some other data that provides benchmarks for the impacts of the Internet in New Zealand.

Four groups of studies

237. There is a growing body of economic literature that provides some empirical insights into the economic impacts of the Internet. Generally the studies so far are of Internet production, e.g., the value of the ICT sector, or of connectivity, e.g., the impacts of broadband uptake on GDP growth, but we have also found some studies that are broadly comparable with the approach we took in looking at the impact of use of Internet services at the firm level.

- There are some studies that look at the productivity benefits of Internet connectivity or use for firms. These are most directly relevant to our study. Varian (2002), Micus (2008), and Grimes (2012) are examples. We note that it is no longer in serious debate academically that use of Internet services generates productivity benefits overall.24

- There are several studies that look at the impact on GDP growth of increases in broadband penetration, generally finding that broadband penetration improves economic growth. Choi and Yi (2009), Czernich et al (2011) or Koutroumpis (2011) are examples. Crandall et al (2007) conclude that increasing broadband penetration increases employment.

- There are studies focused on estimating the economic size of the Internet, focused on measuring output in highly Internet-related activities. McKinsey Global Institute (2011), Deloitte (2011), and Indecon (2013) are examples. The McKinsey report, for example, estimates that the Internet accounts for as much as 6.3% of GDP in the most advanced developed nation, Sweden. Oulton (2010) concludes that the main economic boost from computers and the Internet comes from use of the technologies rather than their production.

- There are also a range of other benchmarks worth considering, including measures of the size of the ICT sector, the ICT-intensive industries and studies using consumer surplus or other measures to establish the value of Internet services.

238. We talk about each of these sets of comparators in what follows.

The productivity impacts of the Internet for firms

239. The first set of studies are most relevant to our work. They are generally trying to isolate the difference that the Internet makes to business productivity.

24 See ICTNET (2012) for a good overview of the literature
240. Varian et al (2002) draw on data from a large survey of businesses in the USA, UK, Germany and France to estimate the impact on productivity growth arising from firm cost savings due to use of Internet services. On the basis of the survey data, the study concluded that cost savings due to full implementation of Internet business solutions could contribute 0.43 percentage points of the future annual productivity growth rate in the USA from 2010, and up to 0.11 percentage points in the three European countries, around 53 and 36 per cent of productivity growth in the USA and the European countries, respectively.25

241. Micus Consulting (2008) provides an evaluation of the impact of broadband Internet on productivity and growth in the European Union. Building on their own estimates of firm-level productivity improvements from broadband, the report estimates the additional contribution to GDP through employment growth and labour productivity gains resulting from improved broadband use at 0.71 percentage points. This effect would be substantially higher if adoption of broadband and e-business solutions by firms in the EU was growing more quickly.26 The authors also refer to an American and a British study based on datasets from 2000 and 2001 that show productivity impacts of between 5% (in manufacturing) and 10% (in services firms) from more intensive use of e-business or e-commerce within companies.

242. Statistics NZ (2013a) looks at the contribution of IT to labour productivity growth in New Zealand from 1996 to 2012 and concludes that firm investments in IT were the largest driver, accounting for about a third of the total change in labour productivity in that period. Conceptually similar, Colecchia and Shreyer (2001) estimate the contribution of ICT to business growth from 1980 to 2000 across nine developed countries.

243. There are also several other studies that look at particular business outcomes from use of Internet services.

- Survey research of 4,800 small and medium sized businesses across 12 countries by the McKinsey Global Institute (2011) reveals that those utilizing web technologies grew their revenues and revenues from exporting more than twice as fast as those with minimal use of web technologies.
- Analysis and research by MYOB says that businesses with websites report stronger actual and expected revenue and sales performance than those without websites.27
- Statistics NZ (2013b) sees a strong connection between ICT use and business growth, with businesses that take online orders growing faster and exporting more.
- In a report prepared for Google Australia, Deloitte Access Economics found that SMEs that were highly “digitally engaged” experienced an increase in revenue of around 20% over those businesses that were less engaged. “Digitally engaged” was defined as how SMEs use the Internet and their level of digital marketing. A high level

26 MICUS (2008), p. 102
27 MYOB (2011), p. 1
of digital engagement the business makes use of all digital technologies including for search engine optimisation and search engine marketing.\(^{28}\)

- Cap Gemini (undated) find positive associations between digital maturity and a range of financial performance metrics.
- IBM (2013) predicts increasing performance gaps in the future between firms that are well advanced in their digital strategies and those that are not.

244. The most relevant comparator we found is Grimes et al (2012), a New Zealand study that uses firm-level Business Operations Survey data to identify the impact that differing types of Internet access have on firm productivity. The data allowed the authors to control for a range of factors (including the firm’s own lagged productivity) that might influence a firms’ choice of broadband access.\(^{29}\)

245. The most important finding is the estimated impact on firm productivity from differing Internet access types (i.e., no broadband, slow broadband or fast broadband): firms with broadband are around 10% more productive than similar firms with no broadband, with slightly bigger impacts for larger firms.\(^{30}\)

246. Interestingly, the authors conclude that there is no additional productivity effect from the adoption of fast over slow broadband, i.e., the speed of broadband does not matter. But they also note that this result should be treated with caution owing to potential data limitations (for example, the data may reflect a lack of business understanding of their Internet connection type, or may not yet fully reflect the productivity benefits of high speed broadband), and the possibility that their distinction between cable and other broadband types may be a poor representation of differing Internet speeds.

### Sizing the Internet

247. The next set of studies focus on estimating the total economic value generated by the production of Internet-related goods and services.

248. McKinsey Global Institute (2011) is a wide-ranging report which seeks to estimate the magnitude of the Internet on the world economy and highlight the Internet’s impact on growth, jobs and prosperity. To measure the impact of the Internet on the global economy, the authors used three different approaches: a national accounts approach to calculate the contribution of the Internet to GDP; a statistical econometric approach to explore the links between the Internet and economic growth; and a survey approach to gain empirical insights at the firm level.\(^{31}\)

249. On the basis of the countries considered in the study (13 countries representing 70% of global GDP), the authors estimate that the Internet contributes, on average, 3.4% of

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29 This technique was pioneered by Rosenbaum and Rubin in the early 1980s and is essentially a leading method to estimate treatment effects that mimic experimental results, using non-experimental techniques. Rosenbaum and Rubin (1983)
30 Grimes et al, (2012)
GDP. In addition, they also present positive findings on job creation, economic modernisation, living standards and economic growth. The size of GDP contribution of the Internet varies sharply between firms in the sample, from 0.8% of GDP in Russia to 6.3% in Sweden, and overall had accounted for 21% of total GDP growth in the 2007 to 2011 period.

250. Deloitte (2011) estimates the direct impact of the Internet on Australia’s economy at around 3.6% of GDP using an expenditure approach. The biggest component of this contribution is household consumption of Internet services (2.6%), followed by capital investment by telecommunications firms (1.2%), and spending by government on ICTs (0.9%). These increases are offset by a reduction of 1.1%, reflecting net exports.

251. Indecon (2013) presents the results of an assessment of the macroeconomic impacts of the Internet and digital sector on the Irish economy. Using various national data sets, the study takes an expenditure on GDP method to establish the value of the Internet and digital sectors for household consumption, business investment, government expenditure and exports. The authors conclude that the Internet and digital sectors contribute between 4.1 and 4.8 per cent of Ireland’s GDP in 2012. As with other studies focused on the economic impacts of the Internet, the report also notes there is a paucity of data, and that the pervasive nature of the Internet means measuring the impacts is difficult.

252. Oulton (2010) explores the growth impact as a result of the “ICT revolution” across 19 OECD countries. He estimates the contribution of ICT production in each country. More importantly for our purposes, he shows that the GDP impacts of ICT are generally much larger from use than from production in the long run, i.e., that the main impact of the Internet is not from Internet or ICT firms, but instead from firms in other parts of the economy making use of ICT services. This implies that use of the Internet outside of the ICT sector adds economic value at least equivalent to the size of the ICT sector in any country.

253. PWC (2013) looks at how to speed growth in the Australian tech economy, concluding that the tech startups have the potential to contribute A$109 billion or 4% of GDP and 540,000 jobs in the next 20 years.

The Internet and GDP growth or employment

254. The third set of studies look at the connection between growth in broadband penetration and growth in GDP.

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35 Indecon (2013), p. 38
36 Oulton (2010), p. 19
255. A study by Choi and Yi (2009) explores the effect of the Internet on economic growth using World Bank data from 207 countries over the period 1991 to 2000. It seeks to test the hypothesis that economic growth is positively related with the use of the Internet, with data starting from the point in time at which Internet connectivity started to spread. Using an equation where growth is a function of the Internet, investment expenditure, government expenditure and inflation, Choi and Yi estimate that every one percentage point increase in the ratio of Internet users to the total population increased the growth rate over the sample period by 0.057 percentage points.

256. Czernich et al (2011) study the effect of broadband takeup on economic growth in 25 OECD countries over the period 1996 to 2007. Recognising there is a two-way relationship between economic growth and broadband diffusion, the approach undertaken controls specifically for reverse causality between growth and diffusion. The use of this control variable allows for the isolation of a causal effect of broadband uptake. The authors estimate that a ten percentage point increase in broadband penetration raised annual per capita growth by 0.9 – 1.5 percentage points over the sample period, i.e., an impact about twice as strong as that of Choi and Yi using earlier data.37

257. The authors point out that their definition of broadband for the purposes of the study is rough since on the OECD definition any bandwidth over 256 kbps was considered broadband. They also argue that the results are limited by the timeframe in question: a longer sample period and better understanding of the role of broadband would allow for improved long-run estimates of the effect of broadband on growth.

258. Koutroumpis (2011) draws on economic data for 15 countries in the European Union for 2003-2006. Using an econometric model the study estimates that the average impact in each country of broadband takeup on GDP growth is 0.63 percentage points. On the basis of an average annual growth rate in the sample of 4.08 per cent, the modelling suggests that 17% of economic growth can be attributed to broadband takeup.38

259. The study also finds evidence of a “critical mass phenomenon”: where broadband penetration exceeds 20 per cent (roughly equal to half the population having access to broadband), the returns are materially higher. This impact was observed for Denmark, Finland, the Netherlands and Sweden, where the estimated contribution of broadband takeup to GDP growth was between 0.92 and 1.06 percentage points, or roughly 25-30%. The author noted that there was very little detailed information about broadband usage as compared with broadband subscription.


37 Czernich (2011), p.507
38 Koutroumpis (2011), table VI
261. At more local level, BERL Economics (2011) provides an estimate of the economic benefits of broadband for the Bay of Plenty and Auckland regions. The regional economic assessment estimated that under a “delayed roll-out scenario”, where fast broadband deployment and adoption is not achieved until 2015, regional GDP would be lifted by 5.5–7% by 2025.39

262. Crandall et al (2007) consider the effects of broadband on employment and output. Utilising broadband penetration data (as measured by the number of broadband lines per 100 people) for 48 states in the USA, along with data on GDP and employment, the authors estimate that for a one percentage point increase in broadband penetration, there is a 0.2 – 0.3 percentage point increase in employment for non-farm private employment.

263. There are various studies of the relationship between takeup of mobile or fixed-telecommunications services and overall economic performance. For instance, Gruber and Koutroumpis (2011) connect a one percentage point increase in mobile penetration with a 0.2 percentage point increase in growth from a dataset of 192 countries over the period from 1990-2007.

264. There are also numerous studies on the economic impacts of ICT and the Internet more broadly. Katz (2012) provides a review of studies for the ITU. ICTNET (2012) is an excellent overview of the more academic studies done to date, e.g., Spiezia (2011), which explores the issue of ICT use and innovation, finding support for the hypothesis that ICT acts as an enabler of innovation, particularly in the areas of product development and marketing.40 OECD (2012) summarises the various types of economic impacts, and the results of many macro-economic studies.

**Other benchmarks**

265. Our final set of studies are those that look at broader methods of estimating impacts than those based just on official statistics or firm productivity. We add to these studies a set of benchmarks that are based on GDP or revenue data, as well other work that is relevant but does not fall under any other heading.

266. There are studies that assess the value of Internet services based on how consumers value them rather than on how much they have to pay for them. These are well summarised by The Economist,41 and the debate about whether they provide a better measure than GDP is explained by Bloomberg.42 They include estimates constructed from market data, from surveys, or from estimates of time-savings made possible by Internet services.

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39 BERL Economics (2011) , p. 26
40 See Speizia (2011)
267. For example, in an early paper, Crandall (2001) estimated the consumer welfare benefit from universal broadband deployment in the United States at between $272 and $520 billion a year. More recently, the Boston Consulting Group (2012) estimated that in the G20 economies, the average contribution of the Internet economy to GDP in 2010 was 4.1%, with Australia having a contribution of 3.3%, just above France, Germany and Canada, all around 3%.

268. Boston Consulting Group has also estimated that consumer surplus derived from the Internet is US$1,430 per person. This reflects the value that consumers believe they received above what they pay for hardware, software, and Internet services and access, noting of course that many consumer services are funded by advertising and free to users.

269. Closer to home, Miller (2012) estimated the direct GDP impact of the UFB build at $5.5bn (around 2.6% of 2012 GDP) over 10 years, and the consumer surplus derived from health, education, business and agriculture services that would be deployed over the network at $32.8bn over 10 years. The estimated $9.1bn positive impact for agriculture was said to come from “online dairy farm management, online dairy herd management, automated farm data collection and analysis”.

270. IAB (2010) estimate consumer benefits from web services in 22 European countries plus the United States at 100 billion Euros in 2010, around three times the revenues of the advertising services that fund web services.

271. Greenstein and McDevitt (2012) focus on quantifying the size of the “broadband bonus”. Drawing on estimates of willingness to pay for broadband services and changes in producer revenue, the authors establish estimates of the additional economic value (the “broadband bonus”) from the uptake of broadband Internet for 30 OECD countries. For New Zealand, the estimated broadband bonus in 2010 was around US$830 per capita, having grown extremely quickly from 2006 when it was estimated at just US$42 per capita. The authors note the approach taken is likely to underestimate the true economic value because the study does not take indirect or spill-over effects of the Internet into account and these could be quite substantial.

272. There are also various studies of the impacts of particular business practices made easier in the Internet age. For example, a study exploring the use and application of “data-driven decision-making” found it make companies 5-6% more productive. A McKinsey study reveals some benefits for firms who take advantage of big data in an appropriate way. MYOB, an accounting firm, estimates that SMEs save on average 10 hours a month of data entry by ensuring their accounting software downloads bank transactions automatically. Access Economics (2010) estimate the impact of telework enabled by the NBN on the Australian economy. Booz and Co (2012) look at the

43 Greenstein and McDevitt (2012), p. 17, Table 13
44 Brynjolfsson, Hitt and Kim (2011)
45 McKinsey Global Institute (2011b)
impact of digitisation on economic growth across countries. Brynjolfsson (2011) says that digitisation is increasing the rate of innovation in the economy.

273. In a similar vein, the Internet Association (2013) looks at the positive impact of the Internet on part-time work in the United States, Hathway (2013) explores the impacts of the high-tech sector on United States job creation, Etsy (2013) measures the economic impact of Etsy, an online marketplace, and the flexible work that it enables. Airbnb (2014), an accommodation marketplace, has a set of studies estimating the economic impacts of its services in various countries and cities. Deloitte (2012) estimates the gross revenue enabled by Facebook in Europe at 32 billion Euros, with an economic impact of 15 billion Euros, accounting for 232k jobs. BCG (2014) see larger positive economic impacts in countries with lower “e-friction”, a measure of constraints on online economic activity.

274. Some other data points relevant to measuring the Internet include:

- Total domestic revenues for the telecommunications industry were $5.22 billion in 2011/12 and shrinking slowly over time in real terms (Commerce Commission, 2013). This counts telecommunications services and basic Internet access, but not the value of Internet services themselves (except those provided by telecommunications operators), television, music, games or print media.

- PWC (2011) estimates total revenues in the “entertainment and media” market at $5.2 billion in 2011, and growing 5% a year to $6.7 billion over the period from 2012 to 2016. This measure excludes telecommunications in general but includes Internet access, television, print, films, music, games and radio, as well as advertising on these platforms.

- The revenue from New Zealand’s high-tech industry (based on figures from the TIN100), is currently around $7.3 billion. This represents the total combined revenue of New Zealand’s 200 largest export-focused companies in the ICT, high-tech and biotech industries, some of which are providers of Internet-based services. 47

- “ICT-intensive industries” is shorthand for three service industries that make particularly high use of ICTs; Information Media and Telecommunications, Finance and Insurance, and Professional Scientific and Technical Services. They account for around 22% of 2010 GDP, and 16% of jobs.

- The recent MBIE (2013) report focuses primarily on “computer system design”, a sub-sector of the Professional Scientific and Technical Services industry. This sub-sector comprises around 9,600 firms and employs around 22,350 people, with around 50% of these jobs being located in Auckland.

- The OECD defines the broader “ICT sector” as a subset of medium-high to high technology manufacturing, plus some “knowledge-intensive services”, like telecommunications, Internet service provision, computer system design, and software publishing. 48 Notably it includes telecommunications services, but excludes Internet publishing and broadcasting. Overall the ICT sector accounts for 5% of New Zealand

47 Data sourced from TIN100 Summary, available at http://www.tinetwork.co.nz/index.php/tin100/summary
48 MBIE (2013), pages 15 and 90
GDP, and in 2011 employed just over 73,000 people (3.2% of New Zealand’s total workforce). It is growing strongly over time, with growth in the number of firms over the period 2002 to 2012 averaging 4.2%.49

Summary

275. The table below shows benchmarks from previous studies. Some caution is required since they are prepared on different bases and for different purposes, but they do give a sense of the relative size of relevant impacts. We have expressed all the values as proportions of New Zealand’s current GDP in order for illustrative purposes, noting that it is not technically appropriate in all cases.

Table 1: Summary of benchmarks

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<thead>
<tr>
<th>Benchmark</th>
<th>$NZ bn</th>
<th>Percentage of 2012 GDP</th>
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<tr>
<td><strong>New Zealand</strong></td>
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<tr>
<td>Telco market (Commerce Commission, 2013)</td>
<td>5.2</td>
<td>2.5</td>
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<tr>
<td>Entertainment and media market (PWC, 2011)</td>
<td>5.5</td>
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<tr>
<td>UFB build (Miller, 2012)</td>
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<tr>
<td>Value of broadband (Greenstein McDevitt, 2012)</td>
<td>7</td>
<td>3.3</td>
</tr>
<tr>
<td>TIN100 (TIN, 2012)</td>
<td>7.3</td>
<td>3.5</td>
</tr>
<tr>
<td>ICT sector (MBIE, 2013)</td>
<td>10.6</td>
<td>5</td>
</tr>
<tr>
<td><strong>Overseas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McKinsey (2011, Various)</td>
<td>7.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Deloitte (2011, Australia)</td>
<td>7.6</td>
<td>3.6</td>
</tr>
<tr>
<td>BCG (2012, G20)</td>
<td>8.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Indecon (2013, Ireland)</td>
<td>9.4</td>
<td>4.4</td>
</tr>
</tbody>
</table>

**Sources:** As noted

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49 MBIE, 2013, ICT sector report, pages 26, 28
Appendix – Technical matters

276. In this appendix we explain some key terms, discuss how we have gone about our study, outline the key features and limitations of our method, and present the detailed results.

Our approach to measuring impacts

277. The OECD notes that “measuring the Internet and its economic and social impacts presents a number of significant data challenges.”\(^50\) There is no single, universally accepted method and “it is virtually impossible to pin down a single proxy that could consistently illustrate the development and intensity of use of the Internet.”\(^51\)

278. In general the measurement of ICT impacts is difficult because both input and output quantities and prices are hard to measure, and because ICTs are General Purpose Technologies that change how other goods and services are produced. ICT usage is especially intense in the services sectors, which are notoriously poorly measured.

279. The impacts of firm adoption and use of computers and Internet services also take time to be realised. Micro (firm) level impacts can show up relatively quickly, but it takes some time for these impacts to flow through into macro (industry or national) data.

280. We would also argue that even impacts at the micro level might be hard to spot: few of our interviewees were structured planners when it came to ICT investments or had any quantitative idea of the payoffs from investments.

281. There are also some questions of terminology that influence exactly how the counting is done when calculating the impacts of the Internet. Hayes (2011) looks at methodological issues associated with measuring the impact of broadband. A recent OECD literature survey and conference on how to measure the “Internet economy” concludes there are three possible approaches (OECD 2013).

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\(^{50}\) OECD (2013), p.9.

Direct impact

282. Approach one measures the size of the “Internet economy” as part of GDP. The analyst adds together the GDP generated by those parts of the economy that are closely related to the Internet. This is a conservative measure since it only captures effects that can be separated out of specific sectors of the economy.

283. There are range of possible benchmarks one could use as the definition of the “Internet economy” under this approach. The term may, for example, refer to a cluster of sectors (e.g., all firms in the “ICT-intensive industries”, or the “ICT sector”), a set of outputs (e.g., all producers of digital products in any form) or a set of inputs (e.g., all goods and services that involve heavy use of Internet services).

284. The difficulty, as noted in a recent study, is that it is hard these days to think of industries that do not feature digital inputs or outputs. As we have seen already, In New Zealand 96% of “economically significant businesses” say they use the Internet for business purposes.

Dynamic impact

285. The second approach looks at the impacts that the Internet has on firm-level behaviour including on productivity and through that to GDP. Unlike the first approach, this assessment is not restricted to ICT production or to particular industries, and instead applies across the economy. But like the first approach, it can be based on official statistics.

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52 National Institute of Economic and Social Research (2013), page 9.
53 “Economically significant businesses” refers to the sample of the Business Operations Survey, which includes firms that employ more than five people and have GST revenues greater than 30k a year.
286. Our methodology is most closely aligned with this approach, endeavouring to measure the impacts of the Internet on all industries and hence the impact on productivity growth and eventually on GDP growth. As described by the OECD, this approach evaluates “the contribution of the Internet to the net growth of the economy as measured by official statistics”. We use this estimation as an adjunct to targeted firm-level interviews in specific sectors to try to explain how these impacts come about.

**Indirect impact**

287. The third approach tries to account for the indirect impacts of the Internet. The analyst might consider the effects of the Internet on consumer surplus, the utility that end-users get from services less what they pay for them, or how the Internet contributes to overall social welfare gains, and looks at the impacts on economic welfare beyond that measured by official statistics.

288. These approaches can overcome some of the limitations of GDP measures, particularly in the case of Internet services that are provided to consumers for free. Traditional approaches to valuation would assign no economic value to free services, but clearly they are highly valued by those who use them (as well as by the advertisers who primarily fund them).

289. We will give some relevant benchmarks for the various impacts of the Internet from these different methods later in this report, when we discuss previous studies.

**The parts of the economy we are looking at**

290. We are looking across all industries to determine if there is any difference in employee productivity between firms that use the Internet heavily, and those that do not, regardless of what the firms actually produce.

291. We were asked to look at the private sector impacts of Internet services, and so there is no discussion of government use of Internet services in this report.

292. Our study focuses on technology use by firms that are not in the ICT sector but that are using the Internet in their production processes. We want to figure out what difference Internet use makes to their productivity. The ICT sector in New Zealand accounts for 5% of GDP. It gets a lot of attention, and rightly so given its importance to our national prosperity and particularly our prospects for growth. But it is important to realise that most of the economy is not ICT firms. If we want to talk about the impacts of the Internet, then we need to look beyond the ICT sector itself.

293. We also know by definition that the Internet is important to firms in the “ICT-intensive industries” by definition, so our primary focus is on other areas, although we do include Business Services as one of our focus sectors, which is part of one of the ICT-intensive industries.

294. In thinking about which sectors to focus on particularly we wanted a mix of levels of sophistication of ICT use and a mix of location between Auckland and other places. We also wanted to choose industries of reasonable size (measured by contribution to GDP and hours worked), and those that would have some relevance outside the country, i.e., areas where New Zealand results could be compared with those from other places meaningfully. As noted, we wanted to focus on private sector activities rather than government services, and we also were influenced by data quality and availability issues after discussions with Statistics New Zealand and others.

295. With this set of criteria, we came up with a list of six focus sectors, within which we were able to interview firms in the top four with the resources we had available.

- Tourism (noting that this is not a separate sector in itself, but is instead made up of parts of other sectors),
- The dairy sub-sector in the Agriculture industry,
- Retail trade,
- Business Services, a sub-sector in the Professional, Scientific and Technical Services industry,\(^{55}\)
- High-value manufacturing, and
- Transport, postal and warehousing

\(^{55}\) In the ANZSIC classification this is technically called “Professional, Scientific and Technical Services (except Computer Systems Design and Related Services)”. We use the term Business Services for convenience.
### Table 2: Background data on sectors of interest

<table>
<thead>
<tr>
<th>Sector</th>
<th>Size</th>
<th>Knowledge intensity</th>
<th>Internet usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism</td>
<td>Modest contribution to GDP (4%), solid employer (7%)</td>
<td>Varied (high for air transport, low for food retail)</td>
<td>40%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Major contribution to GDP, employment, and goods exports</td>
<td>Medium (17&lt;sup&gt;th&lt;/sup&gt;)</td>
<td>14%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>Medium contribution to GDP, large employer (i.e. low productivity)</td>
<td>Varied but generally low to moderate</td>
<td>51%</td>
</tr>
<tr>
<td>Business services</td>
<td>Major contributor to employment, GDP and services exports</td>
<td>High (6&lt;sup&gt;th&lt;/sup&gt;)</td>
<td>96%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Major contributor to employment and GDP, New Zealand’s largest industry</td>
<td>Varied (high for knowledge intensive, low for wood and paper product)</td>
<td>22%</td>
</tr>
<tr>
<td>Transport, postal and warehousing</td>
<td>Solid contributor to GDP and employment.</td>
<td>Varied (high for air transport, low for road)</td>
<td>27%</td>
</tr>
</tbody>
</table>

**Source:** As noted, Sapere analysis

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**Coverage of the Business Operations Survey**

296. The Business Operations Survey (BOS) collects information on the operations of New Zealand businesses. This information is used to quantify business behaviour, capacity, and performance. The survey gives insights into business activities, barriers, and motivations, and effects behind New Zealand business operations. The BOS includes biennial modules on Information and Communications Technology (ICT), or innovation module and a contracted module, which is open to organisations to put their own questions forward.

297. The BOS has a population of almost 36,000 firms and seeks responses from a stratified sample of over 7,000 firms that have six or more employees and GST turnover higher than $30k, that have been operating for more than a year, and that are not outside the

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56 Meehan and Conway, (2013)
57 Sourced from Grimes, Ren and Stevens (2009)
58 This is the proportion of firms in industry reporting that staff usage of Internet is 80% or more from the Business Operations Survey 2012
survey scope (i.e. public administration, heritage and other non-profit activities). As a result of the statutory requirements, “the BOS has a considerably higher response rate than comparable surveys internationally.” Of the 7,000-odd firms surveyed out of a 36,000-odd population, around 80 per cent responded in the latest survey year.

298. The 2012 ICT module contains 19 questions, summarised as follows:

- Businesses use of the Internet (e.g., activities undertaken, staff access, online interaction with Government)
- Extent of Internet orders and purchases
- Extent of Internet sales, both inside and outside of New Zealand
- Internet connection types (plans to use fibre, considerations driving connection choice, broadband connection types)
- Website features
- Activities undertaken by firms to lift ICT outcomes
- Internet security (i.e. the extent to which firms have experienced a cyber-attack, causes, and security measures taken)
- Plans to upgrade (including plans to use of fibre-to-premise, reasons not to)
- Outcomes of ICT use (e.g. efficiency, responsiveness to customers)

299. While quite extensive, there are some limitations to the BOS questions. In particular, they include nothing specifically on use of cloud services, an important current trend, or on other more advanced uses of Internet services. The questions are general, and do not enable analysis of particular uses of Internet services that might be of special relevance, e.g., distinguishing sales by email from web-based transactions. There are also a significant number of firms that are not covered in the BOS (i.e. that have five or fewer employees and/or do not generate sufficient turnover to qualify).

Our measure of economic impact

Labour productivity preferred measure

300. The measure of economic impact used in this study is labour productivity, where productivity is understood most simply as the ratio of output to input. Labour productivity is the most common measure of productivity and is defined as firm value added (output) per employee (input) and reflects the effectiveness and efficiency of labour in the production and sale of firm output. \(^{60}\)

301. Value-added was chosen as the best output measure as it:

- measures the real output/net wealth of an organisation;
- is practical/measured in financial units, allowing aggregation of different output;

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59 Grimes, Ren and Stevens (2009), p. 35.
60 SPRING Singapore (2011)
• is relatively easy to calculate (through an organisation’s profit and loss statement);
• applies equally to manufacturing and services sectors; and
• is conceptually similar to a well-known and understood national output measure, GDP.

302. On the input side, employee numbers was preferred (over hours worked for instance) due to ease of data availability.

**Specific definitions**

303. The key components of our value-add per employee measure are defined as follows:

- Value added is calculated as total sales plus additions to fixed assets minus total purchases, and at various levels of aggregation using Annual Enterprise Survey (AES) data from Statistics New Zealand. In simple terms it measures the value of output less intermediate consumption (the costs of production). Support for the use of AES data to calculate labour productivity is provided in Dixon (2004) and Grimes et al (2009).
- The input measure is rolling mean employment (RME), which is the twelve month moving average of the monthly employment count, derived from employer monthly schedule data provided by Inland Revenue.

304. Our key interest is to determine what (if any) difference higher Internet use makes to labour productivity. To do this we compare value-add per employee for firms with higher Internet usage to the average for firms in the same sector. We cannot isolate completely the role that Internet usage plays in any difference. The intent is to establish whether an association exists in the available data.

**How we measure Internet use**

305. Among the 19 BOS measures are some that provide indications of the value of Internet services to firms. We focussed on five:

- Employee use of the Internet – in particular whether or not 80 per cent or more staff in a firm use the Internet
- Website presence – whether or not the firm has a website
- Purchases via the Internet – whether or not the firm purchased goods/services using the Internet
- Sales via the Internet – whether or not the firm made 25 per cent or more sales via the Internet
- Connection type – whether or not the firm used a fibre connection.

306. The rationale for the measures and standards used was a combination of pragmatism and relevance.

- For staff use of the Internet, 80% was chosen as the threshold as it represents a substantial commitment to Internet use, and in fact most staff have access to the Internet in most firms.
In addition to whether or not a firm has a website, the BOS collects data on website features (including information provision, information collection, online payment, ordering activity and after-sales service). We decided against using this data. It would have led to complexity in the analysis and restricted access to financial information for confidentiality reasons.

Online purchase is a binary variable: either purchases were made or they were not. This reflects the question asked of survey respondents.

For sales made via the Internet, we first categorised firm responses in binary terms (were goods/services orders received via the Internet) and then for those firms who responded positively, we asked Statistics NZ to categorise the proportion of sales relative to total sales in bands (zero, 10% or less, 25% or less, 50% or less, more than 50%). The 25% standard was chosen so as to allow sufficient data to be made available while also setting the bar high enough for sales via Internet to be meaningful as a proportion of total sales.61

The fibre broadband variable was thought to be a fair representation of significant usage, but likely also reflects location and business type, given the availability and fixed nature of fibre services.

The dataset

307. In total, there are 5,589 firms in the sample, with nine types of financial information for 19 industries and our five Internet-related variables of interest, with a further split into yes and no responses.

308. The tourism sector is separated out from the totals, since it is made up of components from other sectors, and we have disaggregated data for some sub-sectors, meaning there are 28 industry sectors or sub-sectors for which we have data in total. The disaggregation is as follows:

- Manufacturing
  - High value manufacturing
  - Medium-high value manufacturing
  - Medium-low value manufacturing
  - Low value manufacturing
    - Food product manufacturing
- Agriculture Forestry and Fishing
  - Agriculture
  - Other agriculture, forestry and fishing
- Professional Scientific and Technical Services
  - Other professional scientific and technical services

61 Advice was received from Statistics New Zealand that so few firms had sales via Internet of 30 per cent or greater that suppression of data for confidentiality reasons would be prohibitive.
The sample data is not weighted up to national level. Figure 20 gives an indication of the extent to which particular industries are over or under represented in our sample, i.e., it effectively shows the proportion of firms that have responded to the Business Operations Survey within each industry relative to the proportion in the Business Operations Survey population as a whole. Ratios above 100% (to the right of the chart) indicate over-representation, those to the left the opposite. The Mining and Electricity, Gas, Water and Waste Services sectors are the most obvious outliers in over-representation, while the Accommodation and Food Services and Retail Trade sectors appear under-represented.

**Figure 20: Sector representation in sample**

### Calculating the estimates of impact

310. High-level estimates (i.e., at the division level of the industry classification) were derived by a three-step process:

(a) We calculate the difference in value-add per employee between high-usage and low-usage firms for each sector for each of the five Business Operations Survey variables
(b) We average the results across the five variables to generate an average difference for each industry.

311. Table 3 shows schematically how these first two steps work.

<table>
<thead>
<tr>
<th>Table 3: Calculation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each sector</td>
</tr>
<tr>
<td>Firm answers yes</td>
</tr>
<tr>
<td>For each of the questions</td>
</tr>
<tr>
<td>Average across questions</td>
</tr>
</tbody>
</table>

Source: Sapere analysis

312. The third step is to average these averages across industries to determine a single difference. We use both a weighted average (controlling for the size of the industry) and a simple average (without that control). The former is a better measure of the overall economic impacts; the latter a better measure of the average impact in any industry of Internet services.

313. The aggregated nature of our data does not allow us to control for firm-specific characteristics that might influence firm productivity. Most importantly, it does not allow us to be sure that the difference in value-add that we see between firms that are high-users of Internet services and those that are not is caused by the differences in use of Internet services. It may be, for example, that the firms that most likely to make extensive use of Internet services have higher productivity for other reasons. We try to control for this effect by looking not at the (often large) differences in productivity between high-using and not high-using firms, but instead looking at the productivity difference between firms that make high use of Internet services, and the average firm in the same industry.

314. We also note that there may be interactions among the variables, i.e., firms that have a fibre connection might also be those most likely to have a website, or to ensure access for all of their staff to the Internet. We cannot test this with our aggregated data, since we compare the productivity of high-using versus low-using firms for each question separately. This means that we cannot tell if a firm that is high-using on one metric, like having a fibre connection, is high-using on another measure, like ensuring access for its staff to the Internet. We do present the results by variable as well as by sector.

**Firm-level interviews**

315. The second major part of our method is interviews with firms and organisations in our sectors of interest. We want to generate some useful information on business use of Internet services that might explain how the high-level impacts that we see come about.
316. We aimed to interview 10-15 firms in each of the sectors, but ended up with a somewhat larger total of 76 broken down as shown in the following table.

Table 4: Interview sample

<table>
<thead>
<tr>
<th>Sector</th>
<th>Interview count</th>
<th>Types of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism</td>
<td>19</td>
<td>• Operators (7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Service providers (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Industry associations and regional tourism organisations (7)</td>
</tr>
<tr>
<td>Dairy/Agriculture</td>
<td>22</td>
<td>• Farmers and milk companies (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Industry bodies (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Service providers (9)</td>
</tr>
<tr>
<td>Retail trade</td>
<td>19</td>
<td>• Small to medium retailers (13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Large retailers (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Service providers (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Industry bodies and other (2)</td>
</tr>
<tr>
<td>Business services</td>
<td>16</td>
<td>• Legal services (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Other (10)</td>
</tr>
<tr>
<td>Sum</td>
<td>76</td>
<td></td>
</tr>
</tbody>
</table>

Source: Sapere analysis

317. The interviews were semi-structured, the questions are available on request. The questions were modified from the design of Varian, Litan, Elder and Shutter (2002), a study of the impacts of the Internet in Europe and the United States, an approach that has also found favour with the McKinsey Global Institute in their 2011 study of the impact of the Internet.

318. The questions:

• Confirm our existing understanding of areas in which businesses are using Internet services derived from the answers to BOS questions
• Ask about the current state of Internet services (e.g., how far along they are on the adoption curve) and planned and potential areas for adoption of Internet services
• Query the level of Internet-related expenditure in various areas, and estimates of impacts and outcomes of Internet business uses (e.g. increased revenues, or decreased costs of sales).
• Try to identify in more detail the types of revenue and cost impacts that emerge,
• Ask about the extent to which businesses track their return on investment from Internet business solutions and why they made investments, and
• Query whether there are any barriers to the adoption of Internet business solutions.

319. We typically found firms to interview by starting with industry bodies or representative organisations, and then asking them for contacts at firms. We also found it helpful to talk to service providers who were selling their wares to firms in the sector. We also
asked each interviewee at the end of the interview for other contacts. In all, we contacted about 150 individuals. We think that the process we followed makes it likely that our interviewees were often more advanced users of Internet services than others in the industry.

320. Our sample data also appears to be overweight with more advanced users. The table below compare the firms answering yes on each question with the same figure from the general Business Operations Survey results for 2012.

**Table 5: Comparison of sample with Business Operations Survey**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Our sample</th>
<th>All Business Operations Survey 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% of more of staff have Internet access</td>
<td>42%</td>
<td>44%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>81%</td>
<td>69%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>81%</td>
<td>77%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>27%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ

321. The point of these interviews was not to provide a representative sample of firms in the industry in question. Instead our goal was to build a richer picture of what some firms were doing with Internet services in the industry in question. The results of the interviews help to explain why the productivity impacts that we see from the overall numbers might be coming about. They also enable us to test whether our own numbers are a reliable reflection of what is happening in the sector in terms of use of Internet services.

322. We selected four firms in the course of interviews for a more extensive interview that is presented as a case study. The case studies are intended to explain and showcase impacts of Internet services, how they come about, and to provide some thoughts on prospects and lessons for firms that we thought were both interesting and demonstrative of trends in the sector.

323. In order to keep interview responses confidential, other than the four case study firms, we do not provide a list of the firms that we spoke to. We are grateful for their generous and helpful comments, but the way that we have reported the results of interviews means that in several cases firms would be able to be identified from their comments if a list of interviewees were provided.
Results

Overall results

324. Table 6 shows our overall results. The top row is our preferred estimate: that across all sectors there is a difference of six per cent in productivity between firms that make substantial use of Internet services and the average firm in the same industry.

325. We also present in Table 7 the alternative weighting approach, where the contribution of each industry to the total is weighted by the industry size. This gives an estimated impact of nine per cent, again across all industries and between firms that make substantial use of Internet services and the average firm in the same industry.

326. The other rows in the tables show the impacts of different estimations, including removing industry outliers (the Health, Mining, and Electricity, Gas, Water and Waste Services sectors), and comparing the productivity of high Internet-using firms with that of low-using firms rather than with the industry average.

327. The third column in each case shows the difference in dollars per employee per year between firms that make high use of Internet services, and the average firm in the same industry. Our preferred estimate is that firms that make higher use of Internet services are more productive to the tune of $16k per employee per year, but these numbers move around in ways that are not intuitive because adding or subtracting industries from the set or changing the basis of comparison changes the underlying productivity figure from which the number is derived.

328. The averaging approach in Table 6 draws on proportional differences in value-add per employee, our measure of productivity. These have greater variation than the average change in the absolute value-add figures themselves. This means that we see larger estimates of impact and greater variations between industries using the averaging method.

329. In our view, the average impact number is helpful if one wants to get a sense of how much use of Internet services can move a particular industry or help a particular firm: the average productivity bonus for a firm that is a high user of Internet services is six percent. The weighted average impact is more helpful if one wants to think about the overall impact of Internet services, since it adjusts for the size of the affected industries, so that a small impact in a big industry counts for more than a small impact in a small industry.

62 The utilities and mining sectors were very large positive contributors, while the health sector was a very large negative contributor to value-added differences. Further discussion by Statistics New Zealand revealed that this negative impact in the Health sector was generated by some very large, highly-connected but low productivity firms, with the top 20 firms accounting for 49% of employment, but only 29% of the value-add.

63 The very outlying results (comparing productivity in high using firms versus low using firms) are heavily influenced by the Finance and Insurance sector, where the percentage differences for some of the variables that make up our indicators are enormous. There are also other observations with high percentage change values and low absolute dollar impacts and vice versa in this data.
### Table 6: Estimates of impacts overall (averaging approach)

<table>
<thead>
<tr>
<th>Productivity comparison (averaging approach)</th>
<th>Impact (%)</th>
<th>Impact ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High usage versus industry average, all industries</td>
<td>6%</td>
<td>$15,973</td>
</tr>
<tr>
<td>High usage versus industry average, excluding outliers</td>
<td>11%</td>
<td>$5,738</td>
</tr>
<tr>
<td>High usage versus low usage, excluding outliers</td>
<td>73%</td>
<td>$21,513</td>
</tr>
<tr>
<td>High usage versus low usage, all industries</td>
<td>83%</td>
<td>$61,880</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

### Table 7: Estimates of impacts overall (weighting approach)

<table>
<thead>
<tr>
<th>Productivity comparison (weighting approach)</th>
<th>Impact (%)</th>
<th>Impact ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High usage versus industry average, all industries</td>
<td>9%</td>
<td>$10,278</td>
</tr>
<tr>
<td>High usage versus industry average, excluding outliers</td>
<td>7%</td>
<td>$7,485</td>
</tr>
<tr>
<td>High usage versus low usage, excluding outliers</td>
<td>29%</td>
<td>$24,341</td>
</tr>
<tr>
<td>High usage versus low usage, all industries</td>
<td>35%</td>
<td>$30,742</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

### Results by sector

330. Table 8 shows estimates for the industries of interest, comparing high usage firms with the average for that industry. We see positive impacts in Tourism and Retail Trade, with large productivity differences in the former. There is no specific dairy sector in the statistics, and so we use a combination of the Agriculture sector to cover the on-farm side of the story, and Food Product Manufacturing on the processing side. We see a positive impact in Food Product Manufacturing balanced against a negative impact in Agriculture. We do not understand this Agriculture result and we suspect data troubles, which we explore further in the industry level analysis in the body of the report.

331. The fourth sector of interest is professional services. We could not generate meaningful results from the data for that sector, perhaps because use of Internet services is already highly advanced, meaning that our method of comparing low-use with high-use firms does not show the true impact of the Internet. We note that firms told us in interviews that Internet services were fundamental to their business and that they could not operate without them. Again, we look at this point in more detail in the chapter on industry-level findings.
Table 8: Estimates of impacts by industry, excluding outliers

<table>
<thead>
<tr>
<th>Industry</th>
<th>Impact (%)</th>
<th>Impact ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism</td>
<td>12%</td>
<td>$16,597</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>7%</td>
<td>$3,176</td>
</tr>
<tr>
<td>Dairy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>-36%</td>
<td>-$29,720</td>
</tr>
<tr>
<td>Food Product Manufacturing</td>
<td>27%</td>
<td>$31,616</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Results by variable

332. Table 9 shows estimates of impacts by question across all industries, excluding outliers, and using both the averaging approach (the top half of the table) and the weighting approach (the bottom half).

333. It is clear that whether a firm has a website or not and whether it purchases goods or services online are not associated with major productivity differences between firms on our numbers. This could be because practically all firms in our sample are have websites and are purchasing online, so the comparison with firms that do not have websites and do not purchase online is not instructive.

334. On the other hand, firms with substantial online sales do seem to be substantially more productive than the average firm in their industry, and using a fibre connection, or having a very high proportion of staff online is associated with higher productivity firms on average, although not when the figures are weighted for industry size.
Table 9: Estimates of impacts by question, excluding outliers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>All industries (averaging)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>16%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>0%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>0%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>25%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>12%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>All industries (weighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>3%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>2%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>4%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>20%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Detailed results by sector

335. We present here the responses for each variable in each sector, as well as the productivity estimates.

Tourism

336. Table 10 shows the firm-level responses to each of the five variables we use to measure Internet use.
Table 10: Responses to key questions by firm (Tourism)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(%)</th>
<th>No,#(%)</th>
<th>Average yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>96 (41%)</td>
<td>141 (59%)</td>
<td>42%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>210 (88%)</td>
<td>30 (12%)</td>
<td>81%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>210 (88%)</td>
<td>27 (12%)</td>
<td>81%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>66 (29%)</td>
<td>168 (71%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>57 (25%)</td>
<td>180 (75%)</td>
<td>27%</td>
</tr>
</tbody>
</table>

**Source:** Statistics NZ data, Sapere analysis

Table 11 expresses the same responses in terms of employees. With the exception of staff access to the Internet, firm size appears to matter in respect of Internet usage, i.e., larger firms are higher users of Internet services. We can also see that firms overwhelmingly have websites and purchase online, and that nearly half of large firms do more than 25% of their sales via the Internet.

Table 11: Responses to key questions by employee count (Tourism)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(%)</th>
<th>No,#(%)</th>
<th>Yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>8,000 (30%)</td>
<td>18,400 (70%)</td>
<td>43%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>25,100 (95%)</td>
<td>1,400 (5%)</td>
<td>94%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>25,300 (95%)</td>
<td>1,200 (5%)</td>
<td>95%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>14,500 (45%)</td>
<td>12,000 (55%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>16,800 (64%)</td>
<td>9,700 (36%)</td>
<td>55%</td>
</tr>
</tbody>
</table>

**Source:** Statistics NZ data, Sapere analysis

Table 12 compares productivity in higher usage firms with the estimated industry average from our sample. Note the very low differences on the website and online purchase variables, which could be connected with the fact that almost all firms already have a website and are purchasing online.
Table 12: Value-added per employee versus industry average (Tourism)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>Industry average</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or more of staff have Internet access</td>
<td>$132,264</td>
<td>$141,285</td>
<td>-$ 9,021 (-6%)</td>
</tr>
<tr>
<td>Whether firm has a website or not</td>
<td>$146,061</td>
<td>$141,285</td>
<td>$4,776 (3%)</td>
</tr>
<tr>
<td>Purchase goods via the Internet</td>
<td>$145,292</td>
<td>$141,285</td>
<td>$4,007 (3%)</td>
</tr>
<tr>
<td>More than 25% of sales via Internet</td>
<td>$181,263</td>
<td>$141,285</td>
<td>$39,978 (28%)</td>
</tr>
<tr>
<td>Used a fibre connection</td>
<td>$184,531</td>
<td>$141,285</td>
<td>$43,246 (31%)</td>
</tr>
<tr>
<td><strong>Sector (average) total</strong></td>
<td><strong>$157,882</strong></td>
<td><strong>$141,285</strong></td>
<td><strong>$16,597 (12%)</strong></td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Retail trade

339. Table 13 shows the firm-level responses to each of the five variables.

Table 13: Responses to key questions by firm (Retail Trade)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(% )</th>
<th>No,#(% )</th>
<th>Average yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>93 (34%)</td>
<td>186 (66%)</td>
<td>42%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>213 (76%)</td>
<td>69 (24%)</td>
<td>81%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>228 (82%)</td>
<td>51 (18%)</td>
<td>81%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>9 (3%)</td>
<td>273 (97%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>51 (18%)</td>
<td>231 (82%)</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

340. Table 14 expresses the same responses in terms of employees. Bigger firms are higher users of Internet services, except interestingly for sales online.
Table 14: Responses to key questions by employee count (Retail Trade)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(#%)</th>
<th>No, #(#%)</th>
<th>Yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>16,000 (40%)</td>
<td>24,200 (60%)</td>
<td>43%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>36,800 (92%)</td>
<td>3,300 (8%)</td>
<td>94%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>33,000 (82%)</td>
<td>7,100 (18%)</td>
<td>95%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>400 (1%)</td>
<td>39,700 (99%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>18,500 (46%)</td>
<td>21,600 (54%)</td>
<td>55%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

341. Table 15 shows the productivity difference between firms indicating high Internet usage and the industry average for Retail Trade.

Table 15: Value-added per employee versus industry average (Retail Trade)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>Industry average</th>
<th>Difference</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or more of staff have Internet access</td>
<td>$48,023</td>
<td>$46,742</td>
<td>$1,281</td>
<td>3%</td>
</tr>
<tr>
<td>Whether firm has a website or not</td>
<td>$46,771</td>
<td>$46,742</td>
<td>$29</td>
<td>0%</td>
</tr>
<tr>
<td>Purchase goods via the Internet</td>
<td>$46,365</td>
<td>$46,742</td>
<td>-$377</td>
<td>-1%</td>
</tr>
<tr>
<td>More than 25% of sales via Internet</td>
<td>$59,505</td>
<td>$46,742</td>
<td>$12,763</td>
<td>27%</td>
</tr>
<tr>
<td>Used a fibre connection</td>
<td>$48,925</td>
<td>$46,742</td>
<td>$2,183</td>
<td>5%</td>
</tr>
<tr>
<td>Sector (average) total</td>
<td>$49,918</td>
<td>$46,742</td>
<td>$3,176</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Dairy/Agriculture

342. There is no single dairy sector in the industry statistics. We look at two separate parts of the picture: the Agriculture sub-sector, which includes the production side of the dairy industry, and the Food Product Manufacturing sub-sector (in turn part of the Low Technology Manufacturing sub-sector), which includes the processing and marketing of dairy products.

343. Table 16 shows the firm-level responses on each of the five variables for the Agriculture sector, and Table 17 shows the same data for Food Product Manufacturing.
Table 16: Responses to key questions by firm (Agriculture)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(#%)</th>
<th>No,#(#%)</th>
<th>Average yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>21 (11%)</td>
<td>165 (89%)</td>
<td>42%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>72 (40%)</td>
<td>111 (60%)</td>
<td>81%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>138 (74%)</td>
<td>48 (26%)</td>
<td>81%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>21 (9%)</td>
<td>174 (91%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>15 (8%)</td>
<td>171 (92%)</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Table 17: Responses to key questions by firm (Food Product Manufacturing)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(#%)</th>
<th>No,#(#%)</th>
<th>Average yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>36 (20%)</td>
<td>153 (80%)</td>
<td>42%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>150 (78%)</td>
<td>42 (22%)</td>
<td>81%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>141 (73%)</td>
<td>51 (27%)</td>
<td>81%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>9 (5%)</td>
<td>177 (95%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>45 (23%)</td>
<td>147 (77%)</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

344. Table 18 expresses the same responses in terms of Agriculture sector employees, and Table 19 shows the same data for the Food Product Manufacturing sub-sector.

Table 18: Responses to key questions by employee count (Agriculture)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(#%)</th>
<th>No,#(#%)</th>
<th>Yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>430 (5%)</td>
<td>8,900 (95%)</td>
<td>43%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>7,000 (75%)</td>
<td>2,200 (25%)</td>
<td>94%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>8,400 (89%)</td>
<td>7,100 (11%)</td>
<td>95%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>1,500 (16%)</td>
<td>7,800 (84%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>2,600 (28%)</td>
<td>6,700 (72%)</td>
<td>55%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis
Table 19: Responses to key questions by employee count (Food Product Manufacturing)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(%      )</th>
<th>No,#(%  )</th>
<th>Yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>15,600 (30%)</td>
<td>36,400 (70%)</td>
<td>43%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>50,000 (96%)</td>
<td>2,000 (4%)</td>
<td>94%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>45,700 (88%)</td>
<td>6,400 (12%)</td>
<td>95%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>4,900 (9%)</td>
<td>47,100 (91%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>34,900 (67%)</td>
<td>17,200 (33%)</td>
<td>55%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Table 20: Value-added per employee versus industry average (Agriculture)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>Industry average</th>
<th>Difference</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or more of staff have Internet access</td>
<td>$66,639</td>
<td>$82,445</td>
<td>-$15,806</td>
<td>-19%</td>
</tr>
<tr>
<td>Whether firm has a website or not</td>
<td>$78,326</td>
<td>$82,445</td>
<td>-$4,118</td>
<td>-5%</td>
</tr>
<tr>
<td>Purchase goods via the Internet</td>
<td>$81,315</td>
<td>$82,445</td>
<td>-$1,130</td>
<td>-1%</td>
</tr>
<tr>
<td>More than 25% of sales via Internet</td>
<td>$15,609</td>
<td>$82,445</td>
<td>-$66,835</td>
<td>-81%</td>
</tr>
<tr>
<td>Used a fibre connection</td>
<td>$21,734</td>
<td>$82,445</td>
<td>-$60,711</td>
<td>-74%</td>
</tr>
<tr>
<td>Sector (average) total</td>
<td>$52,725</td>
<td>$82,445</td>
<td>-$29,720</td>
<td>-36%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

345. Table 20 and Table 21 compare productivity in higher usage firms with the estimated industry average from our sample. In Agriculture we see an unexpected result: the impact on productivity from higher Internet usage is negative across all variables, and particularly in respect of sales and fibre connectivity. This indicates that use of Internet services reduces on-farm productivity, a result that we doubt as discussed in body of the report. Given the positive productivity impact in Food Product Manufacturing, we treat the effect in the combined sectors as neutral in the data that we have.
Table 21: Value-added per employee versus industry average (Food Product Manufacturing)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>Industry average</th>
<th>Difference</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or more of staff have Internet access</td>
<td>$207,743</td>
<td>$115,170</td>
<td>$92,572</td>
<td>80%</td>
</tr>
<tr>
<td>Whether firm has a website or not</td>
<td>$116,451</td>
<td>$115,170</td>
<td>$1,280</td>
<td>1%</td>
</tr>
<tr>
<td>Purchase goods via the Internet</td>
<td>$121,537</td>
<td>$115,170</td>
<td>$6,367</td>
<td>6%</td>
</tr>
<tr>
<td>More than 25% of sales via Internet</td>
<td>$156,869</td>
<td>$115,170</td>
<td>$41,699</td>
<td>36%</td>
</tr>
<tr>
<td>Used a fibre connection</td>
<td>$131,334</td>
<td>$115,170</td>
<td>$16,164</td>
<td>14%</td>
</tr>
<tr>
<td>Sector (average) total</td>
<td>$153,099</td>
<td>$115,170</td>
<td>$37,929</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Business services

346. Table 22 shows the firm-level responses to each of the key question areas.

Table 22: Responses to key questions by firm (Business Services)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(% )</th>
<th>No, #(% )</th>
<th>Average yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>273 (90%)</td>
<td>30 (10%)</td>
<td>42%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>273 (90%)</td>
<td>30 (10%)</td>
<td>81%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>285 (94%)</td>
<td>18 (6%)</td>
<td>81%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>9 (3%)</td>
<td>294 (97%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>141 (47%)</td>
<td>162 (53%)</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

347. Table 23 expresses the responses in terms of employees. There do not appear to be systematic differences between firms of different sizes in Business Services.
Table 23: Responses to key questions by employee count (Business Services)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Yes, #(%   )</th>
<th>No, #(% )</th>
<th>Yes all sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>80% or more of staff have Internet access</td>
<td>29,300 (90%)</td>
<td>3,200 (10%)</td>
<td>43%</td>
</tr>
<tr>
<td>Website</td>
<td>Whether firm has a website or not</td>
<td>31,400 (96%)</td>
<td>1,100 (4%)</td>
<td>94%</td>
</tr>
<tr>
<td>Procurement</td>
<td>Purchase goods via the Internet</td>
<td>29,100 (89%)</td>
<td>3,500 (11%)</td>
<td>95%</td>
</tr>
<tr>
<td>Sales</td>
<td>More than 25% of sales via Internet</td>
<td>610 (2%)</td>
<td>32,000 (98%)</td>
<td>7%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Used a fibre connection</td>
<td>24,600 (76%)</td>
<td>8,000 (24%)</td>
<td>55%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

348. Table 24 shows productivity differences between higher Internet usage firms and the estimated industry average value-add. As noted in the report, there is no obvious pattern to the figures: the major factor in the estimated negative difference in value-added for higher Internet users is the sales variable, with firms making substantial use of online sales being less productive. Given what firms told us in interviews, we think this result reflects data or methodology troubles.

Table 24: Value-added per employee versus industry average (Business Services)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>Industry average</th>
<th>Difference</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or more of staff have Internet access</td>
<td>$102,626</td>
<td>$97,992</td>
<td>$4,634</td>
<td>5%</td>
</tr>
<tr>
<td>Whether firm has a website or not</td>
<td>$97,719</td>
<td>$97,992</td>
<td>$273</td>
<td>0%</td>
</tr>
<tr>
<td>Purchase goods via the Internet</td>
<td>$96,244</td>
<td>$97,992</td>
<td>-$1,749</td>
<td>-2%</td>
</tr>
<tr>
<td>More than 25% of sales via Internet</td>
<td>$74,107</td>
<td>$97,992</td>
<td>-$23,885</td>
<td>-24%</td>
</tr>
<tr>
<td>Used a fibre connection</td>
<td>$101,982</td>
<td>$97,992</td>
<td>$3,990</td>
<td>4%</td>
</tr>
<tr>
<td>Sector (average) total</td>
<td>$94,536</td>
<td>$97,992</td>
<td>-$3,456</td>
<td>-4%</td>
</tr>
</tbody>
</table>

Source: Statistics NZ data, Sapere analysis

Future scenarios

349. In our report we assess possible future scenarios and try to answer the question of what value Internet services might come to have to New Zealand if particular scenarios came about, e.g., ongoing growth in more sophisticated use of Internet services, or greater firm use of more productivity-boosting technologies.
350. Economically-speaking, this is an assessment of the extent to which existing adoption and usage of Internet services lies beneath the production possibilities frontier and the value attached to shifting to the frontier in the future.

351. This is naturally a very subjective exercise, but to get a ballpark estimate of the sorts of impacts we might be talking about, we start by defining a frontier from existing usage, i.e., we estimate the productivity impact of moving firms reporting lower usage of Internet services to the same level as firms reporting higher usage in each industry. That is, we assume that the current maximum impacts are achievable by all firms, and sum the results across industries to obtain a future scenario of optimum usage for each variable across all industries. We also do a similar calculation but in a slightly different way, applying the value-add difference for each industry but based only on the variable that gives the highest boost to productivity in that industry, rather than summing across variables.

352. These methods work for sectors where high use of Internet services is calculated as having positive impacts overall: in essence, we treat the low-users as high-users and see what difference that makes to the overall numbers. We also do some analysis of how this hypothetical impact might come about, in particular which industries have the biggest opportunities, and to what extent the impact is a productivity effect (i.e., a lift in average productivity per employee) versus a volume effect (i.e., a lift in the number of employees working at a different level of productivity).

353. Note that the estimated future impacts are subject to a high degree of uncertainty. Given these uncertainties, the future scenarios are best treated as a ballpark estimate that is instructive on the scale of potential impacts, rather than a forecast or a prediction of the future impacts of the business use of Internet services.

354. One evident objection is that we are only counting the productivity gain from “winners”, i.e., we are assuming that all firms will boost their performance from using Internet services, and not counting firms that do not get a productivity boost or that go out of business because they can no longer compete with their more productive neighbours.

355. That said, while it is possible that some firms win and grow more productive and the rest go out of business, and the net impact on output is small or zero, there is nothing to suggest that this is the natural or most obvious result. The low-using firms do currently exist, and were they to become high-usage then it is conceivable that either the productivity gain stems from lower costs, i.e., the same level of sales at lower cost, or an increase in the size of the market, i.e., better matching of products and services with customers that means an increase in sales overall that does not come at the expense of competitors, with this second effect being less likely. The key message is that that lower costs, the most commonly cited and intuitive explanation for economic impacts of the internet, do not necessarily mean that there are losers. Lower costs are almost by definition how the economy gets a movement to or a shift of the frontier. i.e., a better use of available resources and capabilities.
Caveats

356. There are some caveats worth presenting on our work to demonstrate that we have considered the issues. We treat our results as being indicative of the sort of impacts that are being generated by the Internet, and providing some useful paint on the map of understanding, rather than a definitive answer on all points. We note that we are trying to study something that is relatively new and developing very quickly.

357. The data is:

- Unweighted – It represents only the responses of firms in the sample, as opposed to being scaled up to reflect overall industry weightings in the economy. For technical reasons to do with the fact that we were combining together two data sets, the data could not be weighted.
- A snapshot – The data is from the Business Operations Survey and Annual Enterprise Survey 2012. So, while up-to-date, the data is just at a single point in time and therefore precludes a time-series perspective or insights into firm dynamics or how industries are changing over time. Related to that, there is a survivor bias, i.e., it cannot show firms that went out of business because they were insufficiently productive to survive.
- Somewhat partial – Statistics New Zealand suppressed some data records for confidentiality reasons before providing it to us. This is not a major impact on our work.
- Relatively raw – The variance the study looks to exploit is at times large and curious, and the data is largely used in its “raw” form rather than transformed or smoothed. We sought to explain the variances by interviews with firms.
- Predicated on judgement – In common with other studies of use, the choice of variables from the BOS was based on our judgement as to what might constitute high or low Internet usage, and outliers were also determined by an evaluation of the data.

358. Furthermore, the results do not capture the behavioural aspects motivating firms to use the Internet in a productivity-enhancing way. That is, firms may focus on profit rather than concern themselves directly with employee productivity. We have not looked systematically at individual firm motivations.

359. We think that the method employed is

- Conservative – In particular we compare firms making high usage of Internet services with the industry average (rather than with low usage firms). We have chosen this path partly because we cannot be sure that the difference we are seeing in productivity is caused by use of Internet services. That said, we are not aware of any study that shows a negative productivity impact overall from Internet services, and the generally modest and positive differences that we see in our numbers are reassuring.
- Restrictive – We cannot isolate the specific effects of a particular variable or tell whether there are interactions between variables, e.g., to test whether firms that have fibre are more or less likely to purchase goods online or have a higher proportion of employees with access to the Internet.
- Novel – We needed a way to get from five variables measuring use with associated productivity differences, into one variable and with one productivity impact. Had we had the data in an appropriate form, we might have econometrically estimated the
impact of each variable independently on productivity and constructed an index based on those results. Without access to such sophistication, we simply average across the variables we have, using both simple and weighted averages.

**Thoughts for future analysts**

360. We have found that the measures of Internet use in the Business Operations Survey are not perfectly suited for all firms or all situations.

- The measures seem to work reasonably well for impacts on the customer or market side, e.g., for business models that involve online sales and marketing to customers. They work less well for measuring the impact of the Internet on operations, or for firms where the sales and marketing side is less relevant. For example, sophisticated on-farm collection and distribution of data, which could be important for taking advantage of Internet services to boost farm productivity, will not show up in our measures.

- The measures are picking up differences between firms. In situations where there is no difference, i.e., for purchasing online or having a website, two things that practically all firms do, the comparison with the few firms that do not is less meaningful.

- What this second point means is that as the use of Internet services becomes more widespread in New Zealand firms, the measures of use in the Business Operations Survey will become less meaningful. We think that this could explain the odd result we see in Business Services, where it appears from the numbers that use of Internet services reduces firm productivity when the firms themselves (and casual empiricism) told us that the Internet was central to their operations and they could not work without it.

361. We chose five variables to focus on as our measures of use. We did not benefit from any previous investigation of which variables would most meaningful. Looking more closely at the variables in the Business Operations Survey and the extent to which they are correlated with real world business metrics would be a very helpful step forward. Similarly, constructing datasets that showed same firm performance over time and linked that with the use of ICT could be most instructive.

362. As noted in the report, we were constrained by confidentiality when trying to look at firm responses to particular Business Operations Survey questions at Level 3 of the ANZSIC industry classification. This was not a major difficulty for us except in Agriculture, where our numbers have likely been influenced by large, low productivity firms that were not involved in the dairy production activity that we wanted to focus on. It may be that an econometric method would have advantages in being able to avoiding these types of difficulties in the future.
Appendix – Case studies

- Tourism – Martinborough Top 10 Holiday Park
- Retail – Crane Brothers
- Dairy – Livestock Improvement Corporation
- Professional Services – Cloud Accountants