



NEW ZEALAND INSTITUTE FOR THE STUDY  
OF COMPETITION AND REGULATION INC.

## The Rural-Urban “Digital Divide” in New Zealand: Fact or Fable?

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## Background

Much attention in recent months has been focused upon both the existence and the extent of a “digital divide” between urban New Zealanders and their rural counterparts. A commonly held perception is that rural New Zealanders, hobbled by the relative disadvantages of an inadequate telecommunications infrastructure, are much less able to share in the benefits offered by the Internet and electronic commerce than city dwellers<sup>1</sup>. This perceived “telecommunications digital divide” is popularly held to be prejudicing the ability of rural and provincial firms and individuals to access the Internet, and is thus contributing to a growing “electronic commerce digital divide”. Indeed, many of the recommendations contained in the recently released Ministerial Inquiry into Telecommunications<sup>2</sup> are justified by the assumption that price regulation in the Telecommunications industry, and enshrining into standard a basic level of service available to all customers at a universal price throughout New Zealand, will go a long way towards “closing the rural-urban digital divide”.

Despite the debate and the rhetoric, however, few definitive studies that either verify the existence, or measure the extent, of this perceived divide have been undertaken. Rather, speculation surrounding the extent of the “divide” has been supported predominantly by surveys of respondents’ perceptions of disadvantage<sup>3</sup> rather than analyses of actual uptake and usage. Nonetheless, some empirical studies have been undertaken to establish the extent of any “divide”. Principal among these are:

- the Ministry of Economic Development’s (MED) annual analysis of the Information Technology sector in New Zealand<sup>4</sup>;
- a study of rural telephony commissioned by the Ministry of Agriculture and Fisheries (MAF)<sup>5</sup>; and
- the BRC and MED’s analysis of business uses of the Internet<sup>6</sup>.

In addition, the Institute for the Study of Competition and Regulation (ISCR) has prepared a report on the state of electronic commerce in New Zealand, which examines the relative

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<sup>1</sup> For instance, David Anderson’s article *No Closing of the Gap in Rural Telecommunications* in *Rural News*, September 4 2000.

<sup>2</sup> Ministerial Inquiry into Telecommunications. 2000. *Final Report*. Wellington: <http://www.teleinquiry.govt.nz>.

<sup>3</sup> For instance, the Ministry of Economic Development’s (1999) policy paper *The Social Impact of Information Technology: a briefing paper to the Minister for Information Technology* states that, while information about access is limited, “what information we do have suggests that a digital divide is likely in .....parts of rural New Zealand” (para 16). This is reinforced in ITAG’s (1999) *The Knowledge Economy*. Yet no substantiating data is provided. Indeed, it is noted that the MAF study, as well as collecting data regarding Internet usage, also collects significant quantities of perception data.

<sup>4</sup> Ministry of Economic Development. 2000. *Statistics on Information Technology in New Zealand 2000*. Wellington: MED. <http://med.govt.nz/pbt/infotech/currentstats>.

<sup>5</sup> Atkins, Trevor. 2000. *Telecommunications: Use, Constraints and Potential in Rural Areas*. Wellington: Ministry of Agriculture and Fisheries Policy

states of the infrastructure – electronic banking, telephony, and the internet – that underpins electronic commerce<sup>7</sup>. While the ISCR study does not undertake any new data collection, instead relying upon previously assembled publicly available data, it combines the available empirical evidence with an analysis of the specific characteristics of the New Zealand business, economic and social environment in order to draw its conclusions about the extent of availability and uptake in both urban and rural regions of New Zealand.

The results of these studies paint a far more equivocal picture of the extent of the rural-urban digital divide than popular debate has led us to believe is the case. While the MED/BRC analysis shows a lower uptake of computer and Internet use by businesses in provincial and rural areas than main centres<sup>8</sup>, the MAF study, despite reporting significant levels of user dissatisfaction with the standard and quality of rural telephony services<sup>9</sup>, when juxtaposed with figures from the MED statistics on information technology in New Zealand and other sources collated for the ISCR report, fails to support the contention that individual rural users are any slower in the uptake of new technologies than the average New Zealander<sup>10</sup>. Indeed, the MAF figures provide some substantiation for the ISCR conclusion that geographic isolation may provide a greater incentive for rural users to become connected to the Internet<sup>11</sup>, while inadequate telephony infrastructure may be encouraging even earlier substitution by new technologies which bypass the telephony system, than is evident in the usage patterns of urban New Zealanders<sup>12</sup>. Furthermore, the ISCR study shows that rural New Zealand does not appear to be disadvantaged relative to urban New Zealand with respect to access to other key elements of electronic commerce infrastructure

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<sup>6</sup> Ministry of Economic Development. 2000. *Electronic Commerce in New Zealand: a Survey of Businesses and their Uses of the Internet*. Prepared from research commissioned from BRC.

<sup>7</sup> Boles de Boer, David; Lewis Evans and Bronwyn Howell. 2000. *The State of e-New Zealand*. New Zealand Institute for the Study of Competition and Regulation Research Paper. <http://www.iscr.org.nz/navigation/research/>.

<sup>8</sup> Only 5% of Main Centre (Auckland, Wellington, Christchurch and Dunedin) businesses do not use computers compared to 9% of provincial and rural businesses (the balance of New Zealand). Similarly, 17% of Main Centre businesses do not use the Internet, compared to 25% of provincial and rural.

<sup>9</sup> It is interesting to note that despite the large number of respondents to The MAF' survey reporting problems associated with telephony services, when the problems associated with slow Internet access speed were removed from the data, reported problems fell only 4% (from 58% to 54% of respondents). This would tend to imply that potentially slower Internet access speed is neither a significant problem for rural users, nor an impediment to the uptake of Internet services – ISCR p 49.

<sup>10</sup> Despite facing infrastructure disadvantages such as extensive use of low capacity copper cable, low maintenance levels and physical distance from cellphone towers, rural users' telephone and mobile phone penetration rates (99% and 70% respectively – MAF and MED) exceed the national averages (96% and 40% - ISCR). Furthermore, MAF' reported computer usage in rural areas (61%) at least matches if not exceeds the national penetration (42.8% at 1998, approximately 50% in 2000 by current MED projections) with 76% of those computers being used for business purposes and 81% connected to the Internet (projected nationally at around 60% - MED). MAF' figures are slightly lower than the corresponding BRC/MED provincial and rural computer penetration – it is posited that this is because the BRC/MED figures include businesses in provincial towns which were not part of the MAF study.

<sup>11</sup> If the costs of communication in rural areas are higher than in urban areas, then the point at which the marginal benefits of adopting a new or substitute technology exceed the marginal costs will occur sooner for a rural user than an urban one. Therefore, in a demand-driven situation, we would expect to see, all other things being equal, rural users adopting the new technology earlier than urban ones.

<sup>12</sup> 17% of the respondents to MAF's' survey have a satellite dish for digital data downloading (both television signals and other data), and he reports significant interest in early adoption of wireless applications. MED's

such as Automatic Teller Machines (ATMs) and Electronic Funds Transfer at Point of Sale (EFTPOS) terminals<sup>13</sup>. In addition, the growing availability of mobile EFTPOS terminals<sup>14</sup> eliminates one more potential disadvantage for rural New Zealanders – if the infrastructure is not tied to a specific location, then location – either rural or urban - ceases to be a significant differentiator of accessibility.

So is there really a rural-urban “digital divide” in New Zealand? Gaining some sort of consistent and comparative impression from the above studies is problematical, given that each uses a different definition of what constitutes “urban” and “rural”<sup>15</sup>. Furthermore, the definition of the entities being surveyed differs between individuals (e.g MAF), businesses (e.g. MED/BRC), or mixed business/family/individual units (e.g. MAF). This bears materially upon the inferences to be drawn when extrapolating from infrastructure accessibility measures into electronic commerce usage patterns, as the requirements for specific forms of infrastructure to support electronic commerce depend critically on the predominant uses to which digital media are put.

For example, the usual Internet data transfer requirements for individuals, families and many small businesses tend to be more consumption-related, requiring much greater downloading capacity than uploading capacity. The requirements for other small, and medium to large businesses tend to be more symmetric (combining both production and consumption patterns equally, including electronic selling and purchasing), or even skewed towards production, and hence greater uploading (e.g large amounts of advertising, or transmission of digital products to customers). What may appear to be a “digital divide” due to unequal distribution of some forms of infrastructure on a geographical basis may thus not necessarily constitute an effective “usage divide” if the usage patterns of the various physical locations differ significantly. And if government policies and business strategies used to address a perceived “producer divide” are used to also address what may or may not be an actual “consumer divide”, then not only is the wrong “divide” being addressed, but usage and uptake patterns may also be distorted by inappropriate infrastructure and application investment, potentially worsening the divide that actually exists.

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figures show a national pay television penetration of any form – both digital and UHF - of only around 25 to 30%.

<sup>13</sup> Anecdotal evidence reports the existence of four EFTPOS terminals in Haast and three in Te Araroa. Furthermore, an anecdotal comment from a banking sector executive supports the ease with which rural users have adopted electronic commerce in banking. “You’d think, with all the fuss made about closing bank branches in rural towns, when we are the only bank left standing in the town we would pick up all the dissatisfied clients of other banks. But that just isn’t happening – most keep their relationship with their original bank and use Internet banking, ATMs and EFTPOS instead.”

<sup>14</sup> Vodafone, from the week beginning 4/9/00.

<sup>15</sup> For instance, the MED/BRC study defines “urban” as Auckland, Wellington, Christchurch and Dunedin, while “provincial” is the balance of New Zealand. MAF’s sample was drawn from New Zealand Post’s rural

For instance, investment in high capacity two-way telecommunications infrastructure throughout the country on the basis that all users in all areas, both rural and urban, should be entitled to the same standard of access to the Internet may not be the most efficient investment decision if both the needs and user profiles of areas differ<sup>16</sup>. Furthermore, making such infrastructure available at prices which do not reflect the real cost may encourage users to customise development of applications based upon the available technology, rather than searching for alternatives which may offer a more cost-effective, and hence efficient, solution. Similarly, it would be equally unwise to provide incentives, either implicit or explicit, to encourage specific means of trading (for instance, encouraging web-based trading for all entities) without first giving consideration to the extent to which the business cases of the individual entities involved support such an investment. Ironically, both of these measures would “close” some perceived “divides”, but at the expense of the wise use of the economy’s scarce resources.

Thus, any determination or measurement of a potential “rural-urban divide” based upon geographical criteria will require a detailed analysis not only the availability of infrastructure but also the extent of uptake, the types and sizes of entities which are using the infrastructure, and the uses to which the uptake is being put. To this end, it can be said that the existing studies provide insight into some aspects of this analysis. However, the picture provided by these data is still patchy, with significant components conspicuously absent.

## The Study

The purpose of our study is to provide some additional data to increase understanding of any potential New Zealand geographical differences in business use of the Internet. Consistent with the definition of electronic commerce used in both the MED/BRC and ISCR studies, we define “business use of the internet” to be any business use to which the Internet is put, thus including both transactions of information (email, advertising, web-based searches), and buying and selling (business to business and business to consumer) exchanges. To distinguish between the bases of urban and rural used in other studies, we define “metropolitan” to be the four main cities in New Zealand: Auckland, Wellington, Christchurch and Dunedin. “Provincial” centres are defined to be the principal towns in each of the 14 districts defined in the Telecom Yellow Pages data excluding the “metropolitan” centres, while “rural” is defined as the rural hinterland surrounding each provincial centre in each of the regions<sup>17</sup>. Where “urban” is used, this encompasses both metropolitan and provincial centre classifications.

We analyse these data in conjunction with the previous studies to gain further insight into the relative patterns of email and website usage by businesses in metropolitan, provincial and rural New Zealand, and test our findings against three commonly held perceptual hypotheses of the “rural- urban digital divide” in New Zealand:

- that there is a “rural-urban digital divide” because metropolitan businesses use websites more than provincial and rural ones;
- that there is a “rural-urban digital divide” because provincial and rural New Zealand businesses are slower to adopt new technologies; and
- that there is a “rural-urban digital divide” in favour of the North Island, and particularly Auckland, businesses due to the greater population base and closeness to equipment and infrastructure suppliers.

Our analysis finds that there is little evidence to support any of these hypotheses. Rather, we find although a possible divide exists between some provincial centres and their rural hinterland with respect to use of websites and email, this is not necessarily a function of geography, as some rural regions outperform some metropolitan centres in the uptake of both websites and email. Furthermore, there is evidence to suggest that, for email at least, the South Island exhibits greater uptake than the North Island.

Next, we draw out some explanations for the patterns of behaviour we have determined from our analyses of all available sets of data. Principal among these are:

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- that higher rural communication costs are a significant factor in encouraging earlier and higher levels of provincial and rural email adoption;
- that what we are witnessing in provincial and rural email adoption may be paralleling the demand-driven adoption of EFTPOS in New Zealand;
- that the optimal conditions for determining timing of website adoption are not necessarily the same as those for email adoption;
- that while access to broadband is acknowledged as a significant component in the growth of electronic commerce, uniform, two-way broadband infrastructure available universally is not necessarily essential in order to develop efficient information exchange transactions, as regional and product differences indicate different infrastructure needs; and
- that we are beginning to see some evidence of substitution effects of websites for email as business communication tools.

We conclude our analysis with a brief summary identifying those remaining “rural-urban business digital divides” which our analysis does indicate may be real, and recommendations of where the models for closing these gaps may be found.

### ***The Yellow Pages Data Resource***

The decision to use Yellow Pages data for this analysis was based upon the fact that the Yellow Pages stands as the predominant register of businesses in New Zealand engaged in both business-to-business and business-to-consumer trading. It thus allows us to focus upon business, as distinct from individual, uses of Internet-based technologies. Furthermore, the use of a secondary data source allows us to conduct a positive analysis rather than the mixed positive and normative analyses which have been employed in the survey-based MAF and MED/BRC studies. We recognise that this approach is novel, as we can find no record of similar analyses in the international literature. Thus, we have no basis for international comparison for either our methodology or our results. However, we believe that this approach offers an opportunity to gain new insights on comparative regional behaviour of business Internet use in New Zealand.

The parameters of the data collection part of this study have been framed by the availability of New Zealand-wide business data in the Yellow Pages business telephone numbers listings. In its electronic form, the Yellow Pages directory also includes provision for businesses to list both an email and a website address. Furthermore, links can be made directly from the electronic Yellow Pages to the listed business’s website. Consequently, the

data enable calculation of the proportion of all firms listing telephone numbers in a given geographical area that also list an email and/or a website address.

The Yellow Pages data provide some advantages in both scope and content. Firstly, they enable a measure to be taken on a population basis (businesses listing in the Yellow Pages) rather than using the sample-based methodologies adopted by the other studies. This removes the margin of sampling error present, and overcomes the problem of insufficient numbers from specific small areas (such as Wairarapa and the West Coast) being represented, which occur in sample-based surveys. New Zealand has approximately 192,000 companies registered at the companies office<sup>18</sup>, while the Yellow Pages directory has listings for approximately 190,000 businesses. Thus, even allowing for the fact that not all businesses are registered companies, not all registered companies are active, and that there may not necessarily be a one-to-one correspondence between companies and telephone listings, the Yellow Pages still appears to provide a fairly comprehensive and representative directory of New Zealand businesses. Additionally, despite the variety of contact methods available to businesses, telephone is still the predominant means by which the majority of New Zealand businesses communicate<sup>19</sup>. Thus, listing a telephone number in a directory such as the Yellow Pages would be expected to be the predominant method of communicating this vital contact information, so we assume that the Yellow Pages, the only national directory of its kind, will provide a comprehensive representation of New Zealand businesses.

Secondly, the data allow the ability to match the location of businesses advertising email and website addresses to quite tightly defined geographical areas (even to the level of a telephone exchange, in some instances). The combination of population analysis plus fine distinction in location enables a relatively sophisticated level of comparison to be undertaken which has not been possible in either the MAF or MED/BRC analyses. Thirdly, the Yellow Pages data also allow us to investigate comparative usage of electronic addresses by businesses physically located in and thus predominantly serving their own geographic area, and businesses with a national organisation facilitated by 0800 and mobile telephone numbers. And fourthly, while it is not the focus of this analysis, the data can also be further classified using the business categories used to group businesses in the original directory (e.g. Automotive, Personal Services, etc.).

It is noted, however, that there may also be some limitations in this data. The principal limitation is that, while the data allow a population count, they will necessarily present a significant under-representation of the numbers of businesses operating email and websites,

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<sup>18</sup> <http://www.companies.govt.nz/> (visited 10/01/2006). The number of companies registered in New Zealand is 192,000.



as not all businesses with websites and email addresses choose to list these details in the Yellow Pages directory. While we acknowledge that the proportion of businesses registering websites and email addresses is significantly lower than those obtained from the survey-based methodologies of the MAF and MED/BRC studies, we are confident that, as the relative proportions between email and websites closely resemble the MAF/BRC proportions, then although the absolute percentages are not a true reflection, the comparative proportions are integrative. Furthermore, we can find no evidence to suggest that there are any significant differences in the listing practices of different regions<sup>20</sup>. Thus, we are confident that, while absolute percentages may be low, inter-regional comparisons are valid on the basis of the percentages we have derived. We further note that the fact that the fee charged<sup>21</sup> for Yellow Pages listing helps to ensure that those businesses which have chosen to list are indeed active electronic commerce participants, as there would be no incentive to pay and list an email or website address if the activities associated with the operation of that address were not a core part of regular trading practices. Thus, while we accept that we have an under-representation in terms of numbers, we believe that we have a reliable comparative representation of active users between regions and between website and email uptake.

As the firms listing in the Yellow Pages use these listings as a form of advertising, we assume that they are all engaging in “producer” activities. However, the act of listing cannot tell us as much about their “consuming” activities. Thus, the interpretations from our results must necessarily be limited to aspects of “producing” behaviour. Additionally, the Yellow Pages data does not enable comparisons on the basis of organisational size – a large organisation will be treated equally with a small organisation in our analysis<sup>22</sup>.

Despite the limitations posed by the data, we have reasonable confidence that the comparative proportions between email and website listings which we report on in this analysis will reflect actual differences in the use of each medium in practice.

## **The Data**

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<sup>20</sup> We note that inter-regional comparisons might be compromised if there were regional differences in the way in which listings were solicited. One way that such a difference might be detected would be if one area displayed a significantly greater number of multiple listings for businesses (for instance, as a result of a vigorous listing campaign by Yellow Pages salespeople). However, no such significant regional variation presents itself. Therefore we have no reason to assume that any one region has been more vigorous in soliciting email and website listings either.

<sup>21</sup> \$25 per month for a website listing and link, \$5 per month for an email listing (GST-exclusive) – Telecom Yellow Pages website as at 24/10/00 <http://www.yellowpages.co.nz/cgi-bin/order>.

<sup>22</sup> We note that the MED/BRC data were weighted for business size. Our comments are thus restricted to the proportion of businesses transacting electronically rather than the transaction volume that they generate.

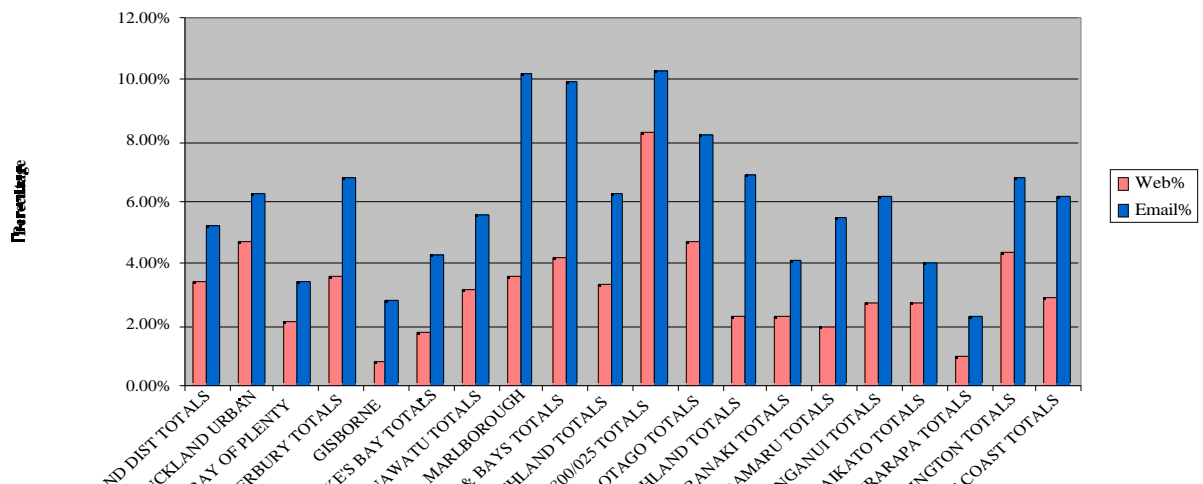
Over the period from mid September to early October 2000, the Telecom Yellow Pages electronic directory listings for each of the 18 geographical regions (identified in Appendix 1) and the national 0800 and mobile numbers were scanned to determine:

- the total number of businesses listed in each area by sub-regional exchanges
- the total number businesses listed under each category classification (allowing for the fact that some businesses list across multiple categories)
- the number of businesses listing an email address by each category and sub-region
- the number of businesses listing a website address by each category and sub-region.

A table summarising the data at a regional level is contained in Appendix 2. This table shows that 190338 businesses are represented in this study, in 290070 individual listings. That is, each business is listed on average in 1.5 categories. There does not seem to be any distinct regional pattern with respect to multiple listings, with the range being between 1.4 in the West Coast to 1.8 in Northland. Most regions show multiple listings of the order of 1.5 to 1.6. Therefore, we conclude that the listing behaviour of businesses does not appear to differ substantially between regions.

Of the 18 identified regions, the percentage of listings with website addresses ranged between 0.8% (Gisborne) and 4.76% (Auckland Urban). The percentage of regional listings with email addresses ranges from 2.29% (Wairarapa) to 10.25% (Marlborough). A nineteenth classification, 0800 and 021/025 numbers which cannot be linked to one specific geographical location, makes up the balance of the data. This 0800 number “region” exhibited by far the largest proportion of both website listings, with 8.29%, and email, with 10.26%. As this classification cannot be split up on a geographical basis, we will omit it from our discussion of regional variations. However, we will analyse the results of this classification, including reasons why the 0800 number is a clear leader in websites, but only marginally ahead of the nearest geographical region in email, in a subsequent section.

**Figure 1: Yellow Pages Email and Website Addresses % of Listing**





## The Fables

### ***Fable 1: There is a “digital divide” because urban businesses “on the net” have proportionally more websites than provincial and rural ones***

These numbers tell an interesting story. As borne out in the MED/BRC study, in all instances, the number of firms using email exceeds the number using websites for commercial activity. However, while the MED/BRC study shows around 80% of all firms using email also having websites (Main centres<sup>23</sup> 85%, Provincial and Rural firms 74%), our analysis shows a significant regional variation, ranging from 35% in Marlborough to 81% for 0800 numbers. Not surprisingly, given the MED/BRC findings, the highest ratios of websites to email occur in the metropolitan areas (in descending order Auckland Urban, Waikato, Wellington, Auckland Districts, and Otago) while the lowest occur in rural areas (in ascending order Gisborne, Southland, Marlborough, Timaru-Oamaru, Hawkes Bay, Nelson and Bays and Wairarapa). This appears to reinforce the “digital divide” perception that “urban businesses are ahead in e-commerce because they use websites proportionally more than their rural counterparts”.

However, a more detailed analysis shows that the reason why urban businesses have proportionately more websites is not necessarily because they are more “enabled” but because businesses in a number of provincial and rural regions are significantly greater users of email! While Appendix 2 shows the spread of website and email listings, Figure 2 shows that provincial and rural regions have significantly higher proportions of email addresses listed than their metropolitan counterparts. Indeed, excepting Otago (which combines Dunedin with its rural hinterland), the highest ranking provincial region, Marlborough, with 10.25% of its businesses listing email addresses in the Yellow Pages, has an email listing rate 50% higher than its closest metropolitan rival, Wellington, which, with 6.84% of its businesses listing email addresses, ranks only 5<sup>th</sup> highest.

Furthermore, even the figures for website listings do not show a clear advantage for main centres over provincial and rural ones. As Figure 3 shows, although Auckland has the highest regional website listing percentage, with Wellington third, Otago (of which Dunedin represents only 2/3rds of the figure) is second, Nelson and Bays fourth and Marlborough sixth.

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<sup>23</sup> See Appendix 2 for a detailed breakdown of the data.

Figure 2: Yellow Pages Email as a Percentage of Listings

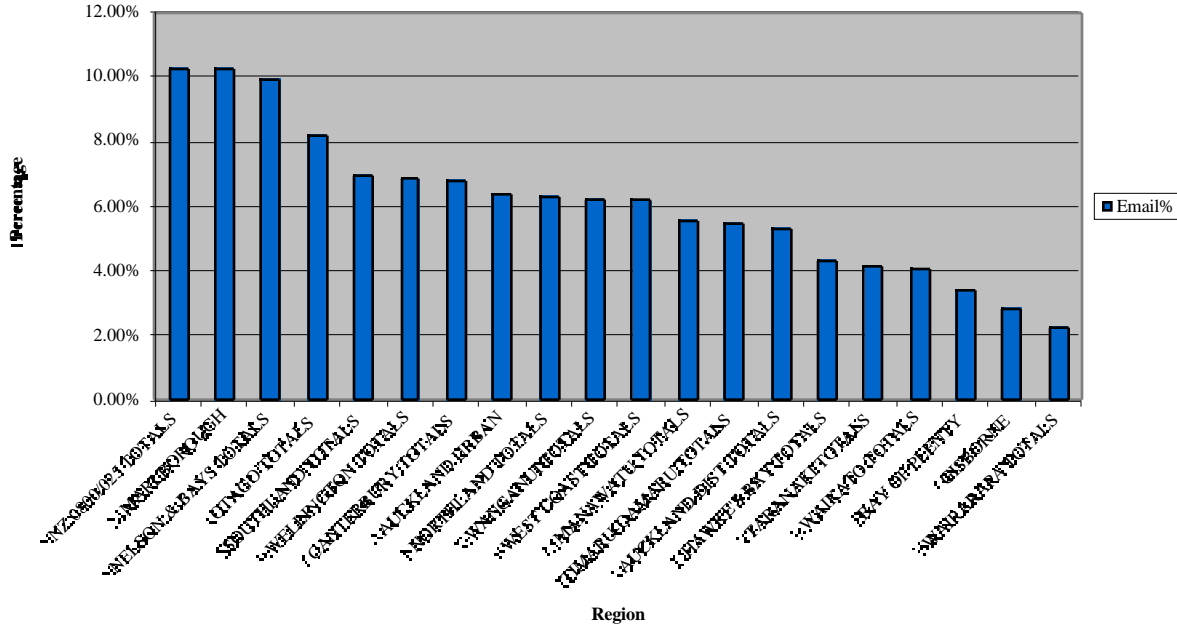
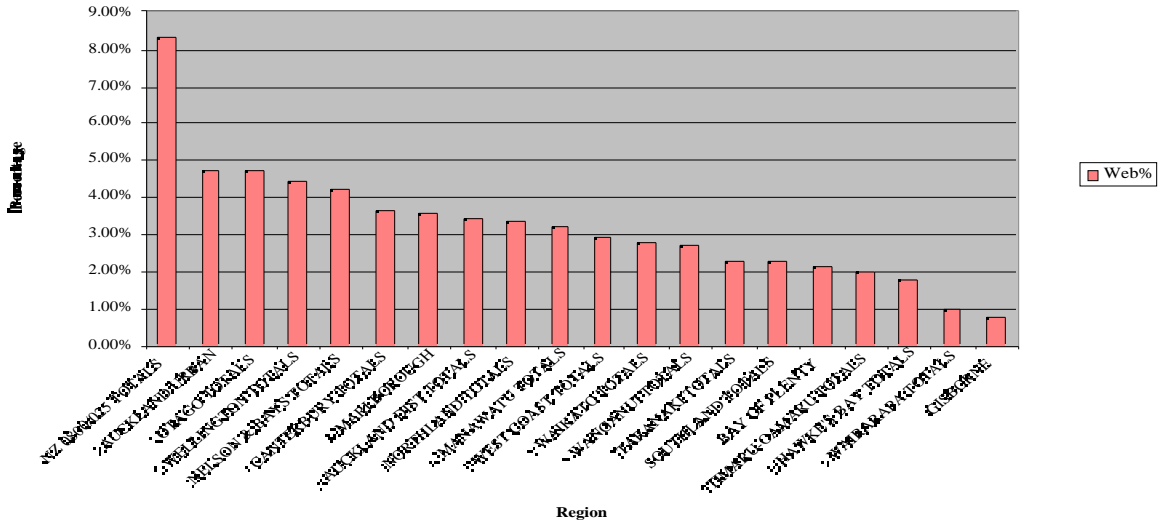


Figure 3: Yellow pages Websites as a Percentage of Listings



While the MED/BRC and MAF studies polled businesses and individuals about the *existence* of websites and email tools, we believe that these Yellow Pages figures display a much more accurate picture about how these tools are *actually being used* in day to day transactions<sup>24</sup>. For there would be little point in a business paying to list their electronic contact details unless these methods were actively being used for business purposes. This analysis of uptake thus sheds more light on the reality of urban and provincial/rural differences. These figures tend to indicate that email is being used much more extensively as a business tool in rural

areas than urban ones, and that usage of websites in some rural areas (namely Nelson and Bays, Marlborough and Otago excluding Dunedin) is also significantly higher than some urban areas, for example, Christchurch and Auckland Districts (which was included in Urban for the MED/BRC study).

Indeed, the Yellow Pages data suggest that there may well be a divide “going the other way” – that provincial and rural business users of email in some areas are proportionately more “enabled” than their metropolitan counterparts by a significant margin. This is partially supported by the MAF survey, which shows that over half of the respondents to the question on the future role of telecommunications believed that, despite living in rural areas or especially because they lived in rural areas, new telecommunications-based technologies had much to offer, and that they would be in a position to take advantage of them<sup>25</sup>.

### ***Table 2: Provincial New Zealand is dragging the e-commerce chain***

Superficially, the Yellow Pages data suggesting higher rural uptake of email appears to contradict the MED/BRC finding (quoted above) that provincial New Zealand businesses have a lower uptake of email than their metropolitan counterparts. We acknowledge that our data, broken down by the 18 Telecom calling regions, defines “rural” differently to the MED/BRC sample. Furthermore, we note that the regions which show significant proportionate leadership represent smaller populations than the metropolitan regions. To test the validity of our findings, we aggregated our data into the classifications used in the MED/BRC study. The results of this aggregation are contained in Appendix 3. In this aggregation, Main Centres represent the sum of Auckland Urban, Auckland Districts, Wellington, Christchurch and Dunedin. All others are aggregated into Provincial Areas.

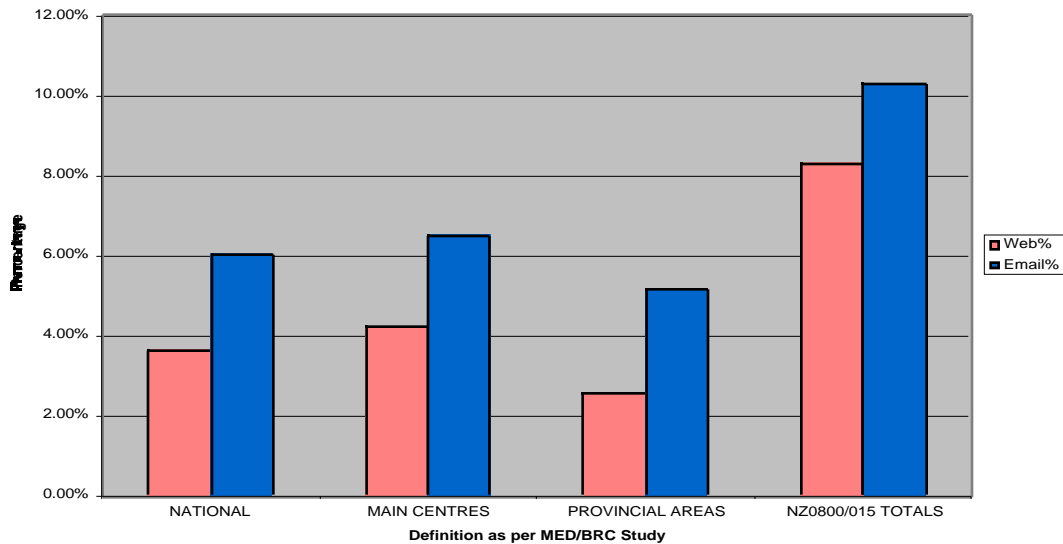
Using this aggregation, our data do indeed mirror the MED/BRC results. Main Centres<sup>26</sup> show higher proportions of both website and email listings, and the (Provincial at 65% and 86% of Main Centres respectively compared with 74% and 85% in the MED/BRC study). These data are illustrated in Figure 4.

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<sup>24</sup> Anecdotal evidence supports this observation. Fencepost rural development manager Paul Grave references “the Internet momentum that’s now very evident in rural New Zealand” in *Straight Furrow* 17/10/00 p 12.

<sup>25</sup> ...

Figure 4: Yellow Pages Website and Email Percentages of Listings



Yet the same data yield the significant provincial and rural email advantage evidenced in “Fable 1” above. This apparent inconsistency can be explained by the relative sizes of the samples in each of the two analyses. The Main Centre and Provincial and Rural analysis merges the well-performing provincial and rural areas of Otago, Marlborough, Nelson and Bays and Southland, which have small numbers anyway, with the poorly performing provincial areas of Wairarapa, Gisborne, Waikato, Bay of Plenty, Taranaki and Hawkes Bay. The significantly greater number of business listings in the latter group crowds out the smaller number of listings in the former group (64,788 compared to 30,091), biasing the national comparison downwards. While both the MED/BRC findings and our analysis show an average national picture whereby provincial and rural New Zealand trails main centres, this averaging conceals the significantly better performance of a number of provincial areas. To assume a national perception of a “rural divide” whereby all provincial and rural regions lag all main centres is thus both false and misleading. At least four provincial and rural centres outrank *all* main centres in business email usage on the basis of our data.

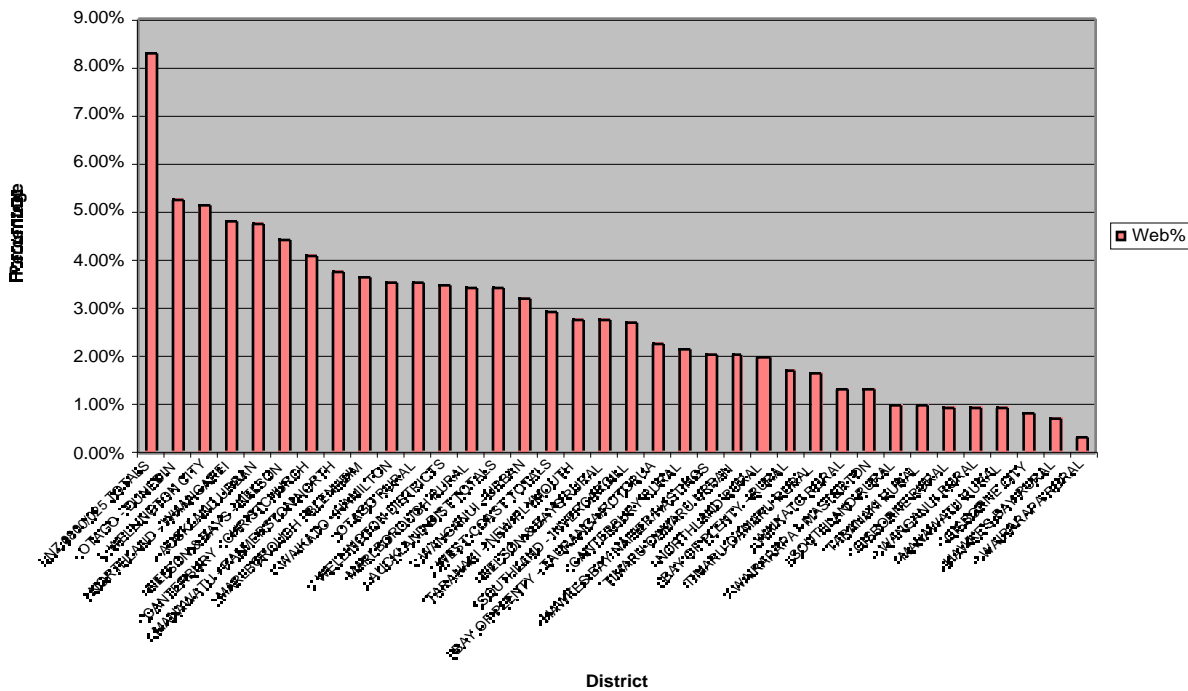
Thus we cannot support the grossly oversimplified hypothesis that rural New Zealand *per se* is dragging the e-commerce chain in its entirety. Rather, we draw attention to the fact that some large provincial and rural areas, namely Wairarapa, Gisborne, Waikato, Bay of Plenty, Taranaki and Hawkes Bay, fit this “rural-urban digital divide” scenario, while others quite clearly do not.

This finding, however, leads us to question whether the rural-urban divide hypothesis may have some validity if we redefine what is meant by “urban” and “rural”. The scope of the Yellow Pages data enables us to refocus our analysis on a Provincial Centre and Rural

Hinterland segregation. For this analysis, we separate the data pertaining to the main provincial centre(s) from the rest of the region's data. For instance, we separate Whangarei from the rest of Northland, and Napier and Hastings from the rest of Hawkes Bay. We leave Auckland separated out into Auckland Urban and Auckland Districts, but subdivide Wellington into Wellington (Wellington City, Porirua and Hutt Valley) from Wellington Districts (Kapiti Coast). The separated data are contained in Appendix 4.

In light of the earlier analyses, it is not therefore surprising to find that the rankings for both website and email listings reflect to some extent the regional rankings. In the website rankings, there is a clear dominance of urban centres over rural. The leading centres for website listing are (in decreasing order of usage) Dunedin, Wellington, Whangarei, Auckland Urban, Nelson, Christchurch, Palmerston North and Hamilton. The lowest reported website listing is in rural hinterlands (in ascending order) Wairarapa, Hawkes Bay, Manawatu, Wanganui, Gisborne, Taranaki and Southland. All provincial centres except Gisborne City<sup>27</sup> rank higher than their corresponding hinterlands<sup>28</sup>. This clearly appears to support the existence of a divide between urban centres and provincial towns, and their rural hinterlands<sup>29</sup>.

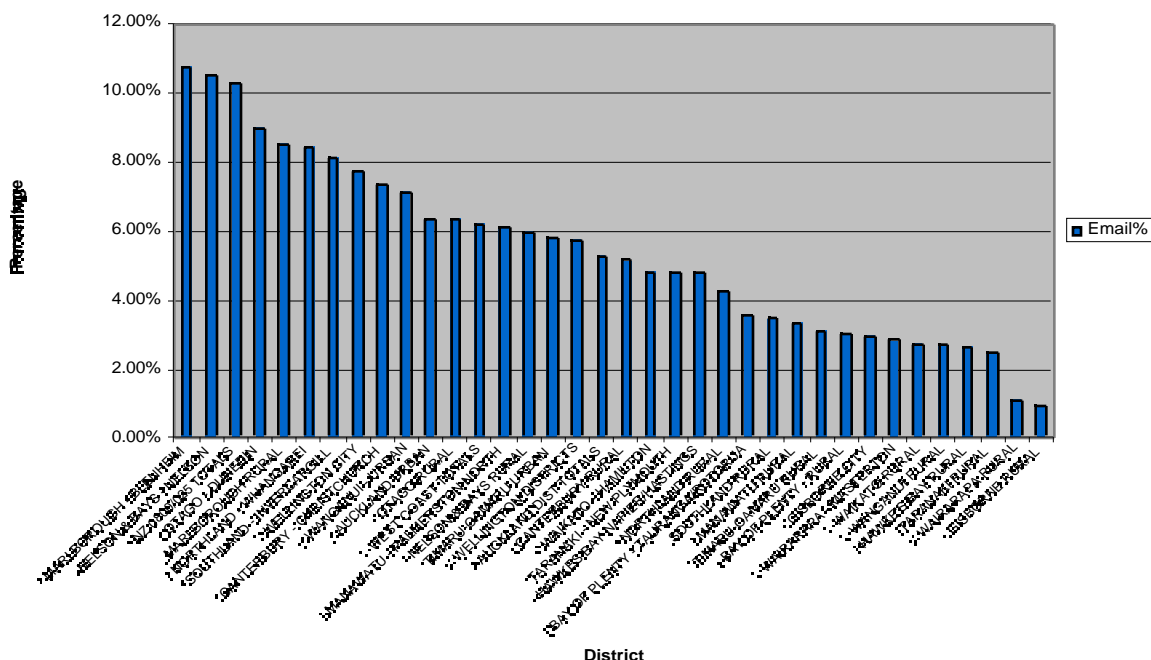
Figure 5: Yellow Pages Website Percentage of Listings: Rural-Urban Split



<sup>27</sup> Gisborne Rural's higher ranking is a function of the small number of websites listed in a small population.  
<sup>28</sup> Note for this analysis, we did not separate West Coast into provincial centre and rural, as all data was collated on the basis of Westport, Greymouth and Hokitika. No distinguishable hinterland could be determined from the raw data. However, as the numbers involved are small, such a separation could not have been analysed confidently.  
<sup>29</sup> However, we do offer a caution here – due to the small numbers of listings in most of the low-end rural



Figure 6: Yellow Pages Email Percentage of Listings: Rural-Urban Split



Significantly, though, while the metropolitan centres appear high in the rankings for websites, they are not overwhelmingly dominant. Dunedin and Wellington are clear leaders, but Whangarei ranks above Auckland, and Nelson ranks above Christchurch. This indicates that website usage in some provincial centres is as high as that in metropolitan areas. Furthermore, Otago Rural ranks 11<sup>th</sup>, ahead of both Wellington Districts and Auckland Districts. It is significant to note that both Auckland Districts and Wellington Districts (including some towns such as Kapiti equally as big as the provincial centres such as Masterton) rank substantially below some provincial centres. If these were amalgamated into the Auckland and Wellington City totals, then the city totals would fall even further in ranking behind the leading provincial centres. The results for email listings are even more decisive in favour of provincial centres than the website figures. Blenheim and Nelson are clear leaders, with Dunedin the highest ranking metropolitan at 4<sup>th</sup>. Wellington and Christchurch sit at 8<sup>th</sup> and 9<sup>th</sup>, behind Whangarei (6<sup>th</sup>) and Invercargill (7<sup>th</sup>). The same rural districts as in the website analysis comprise the least listed users of email. Interestingly, the highest ranking rural area in email listing is Marlborough (5<sup>th</sup>), consistent with both Blenheim’s high provincial centre ranking, and Marlborough’s total district email ranking (see Fable 1 above).

Further analysis shows that, while hinterlands represent 16% of all business listings, they comprise only 8% of the website listings and 10.6% of the email listings. However, the rural hinterlands showing lowest uptake represent only 7% of the total listings, and of these

region-specific, and that, furthermore, the regions that exhibit significantly low actual and proportional performance can be readily identified.

In summary, the Yellow Pages analysis apparently refutes the hypothesis that there is a “digital divide” between New Zealand metropolitan and provincial centres. Indeed, some provincial centres appear to be proportionately more engaged in using electronic methods, especially email, than their metropolitan counterparts. Further research into the reasons why provincial centres such as Nelson, Blenheim, and Whangarei rank above Auckland, Wellington and Christchurch is required for deeper explanations.

However, the analysis does reinforce the hypothesis in respect of all hinterlands in relation to their urban centres. It also identifies that some rural hinterlands – namely Gisborne, Wairarapa, Hawkes Bay, Manawatu, Wanganui, Taranaki and Waikato – are performing particularly badly. This indicates that further research is required into why these rural hinterlands are performing particularly poorly in relation to others – such as Otago, Nelson and Bays and Marlborough – which are outperforming some provincial centres. Such analysis is required to identify the real causes of the “divide” – which does not, on the face of this analysis, appear to be driven by population density or geographic location alone.

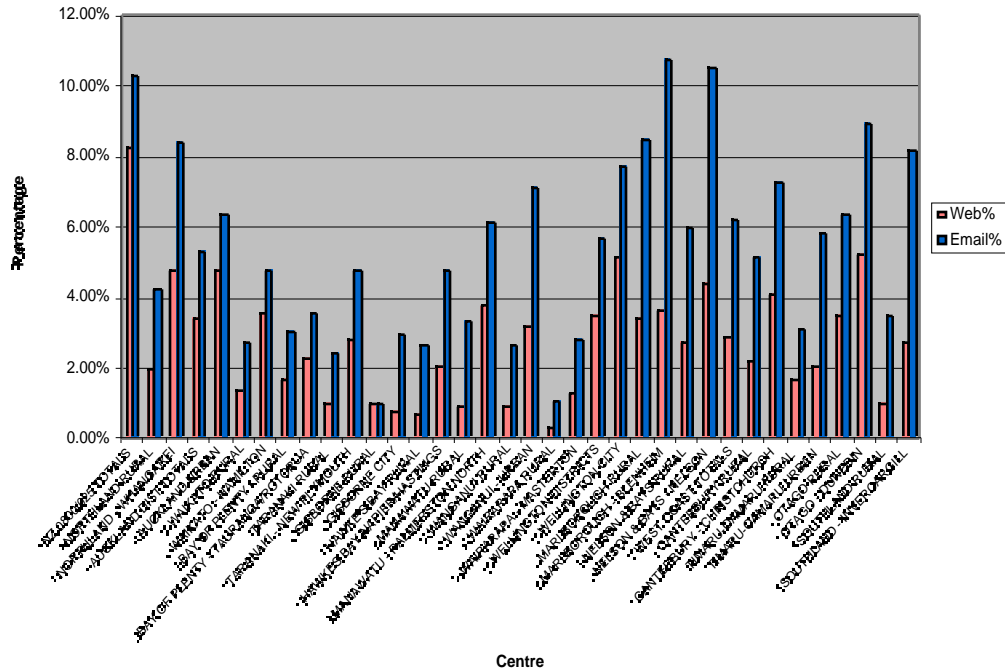
### ***Fable 3: New Zealand e-commerce activity begins and ends in Auckland***

An apparently surprising outcome of the above analysis is that New Zealand’s largest city, Auckland, does not appear to be the leader in electronic commerce. The greater population of businesses, and closeness to both suppliers and markets has traditionally given Auckland businesses a commercial advantage over others, and has been a significant factor in Auckland businesses being among the leaders in the uptake of other business processes and technologies (for example, just-in-time inventory management). However, this pattern of uptake does not appear to be replicated in website and email listing behaviour. Indeed, Auckland ranks only 5<sup>th</sup> in website listing and 11<sup>th</sup> in email.

Somewhat surprisingly, it is New Zealand’s smallest metropolitan centre – Dunedin – which by this analysis is the metropolitan leader. Furthermore, Dunedin’s rural Otago hinterland also features highly, among those that have been identified as rural leaders. Particularly, Otago’s rural hinterland, including such rural towns as Balclutha, Cromwell and Alexandra, outperforms Auckland District, which contains suburban areas such as Manukau, Papakura and North Shore. This implies that there are some very different dynamics driving the uptake of electronic commerce communications compared with those driving the uptake of

In order to see whether there are any geographical patterns linked to this uptake pattern, we arranged the data into a north – south geographical alignment. Figures, 7, 8 and 9 illustrate this arrangement.

Figure 7: Yellow Pages Website and Email Listing Percentages: Geography



The significant trend revealed by this analysis is that there are “concentrations” of like website and email listing behaviour in specific adjacent geographic areas. For instance, Wellington/Marlborough/Nelson and Bays represents a cluster of high listing, along with Otago and Invercargill (although not translating as highly into Southland rural). A cluster of related low listing occur in Bay of Plenty/Waikato/Taranaki/Gisborne/Hawkes Bay/Wairarapa. While these patterns are evident in urban geography (Figure 8), they are even more obvious in rural geography (Figure 9).

Figure 8: Yellow Pages Website and Email Listing Percentages: Urban Geography

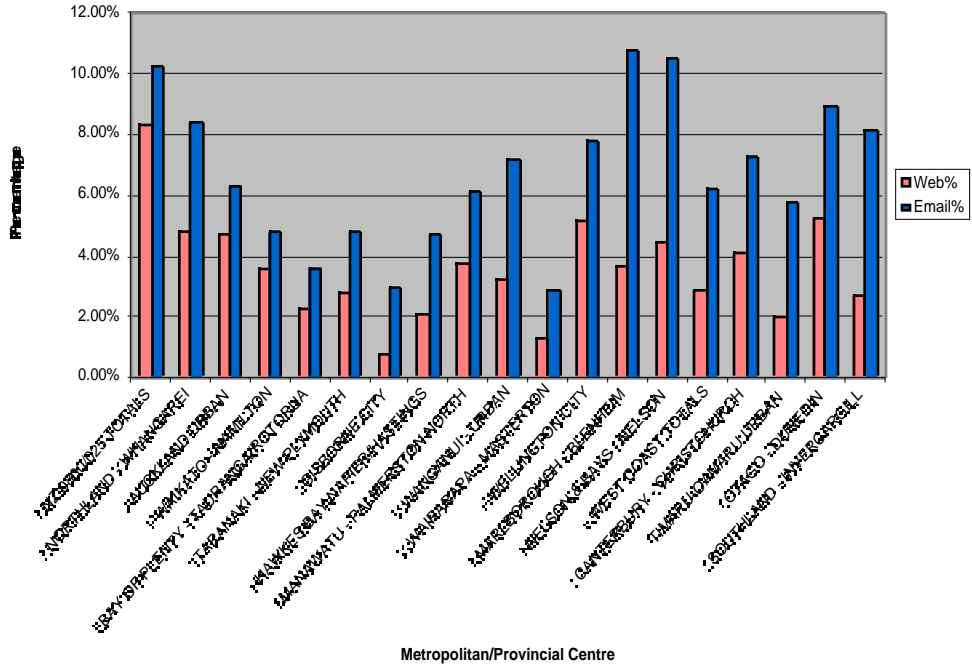
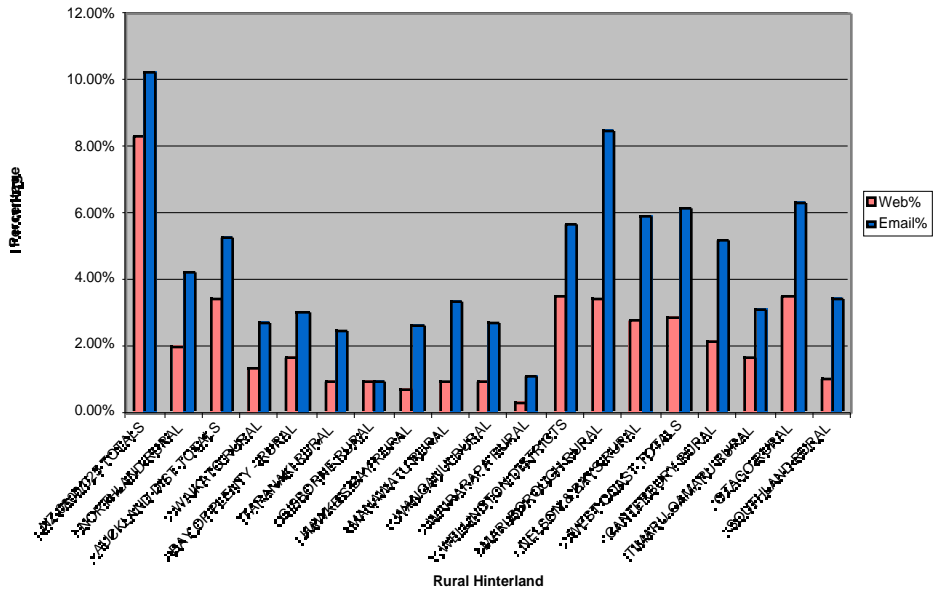


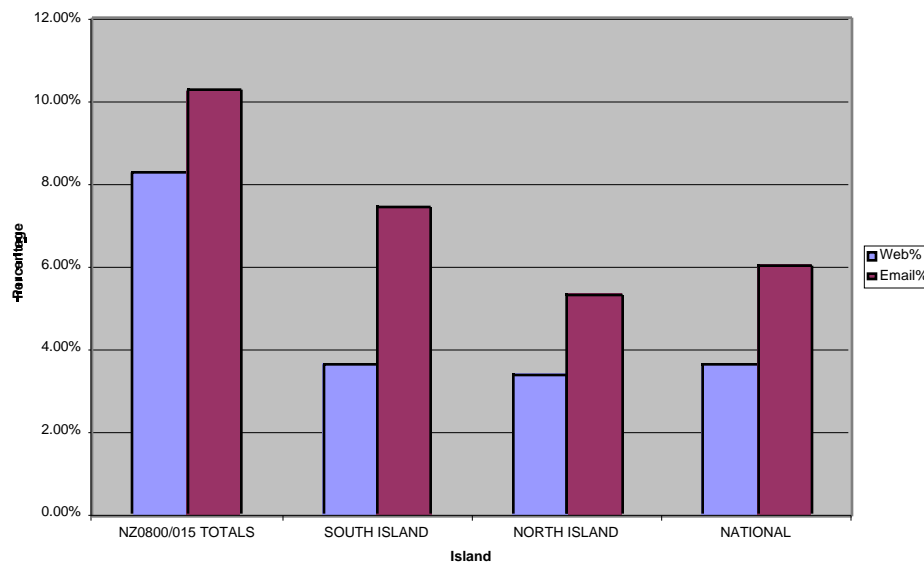
Figure 9: Yellow Pages Website and Email Listing Percentages: Rural by Geography



The rural geography graph, however, reveals another interesting trend – the South Island appears to have consistently higher listing percentages than the North Island, despite the population of listings in the North Island being much greater (71% of listings are North Island, 29% South Island). This is even more clearly evident in Figure 10. This graph shows that, while there does not appear to be a very great north/south difference in website listing behaviour, there is a significant South Island advantage in the listing, and hence use, of email as a business tool.

Indeed, this appears to suggest that there may in fact be an *inverse* relationship occurring in the propensity of businesses to list, and hence use, email. Rather than supporting the hypothesis that Auckland, as the predominant business and population centre would be the likely leader in this aspect of business uptake of electronic commerce, our analysis offers some evidence to suggest that the opposite is true. That is, areas most distant from the main commercial centre – those in the South Island – have the proportionately greater email uptake.

Figure 10: Yellow Pages Website and Email Listing Percentages: North Island v South Island



Thus, not only can we refute the hypothesis that Auckland assumes electronic commerce uptake leadership as a function of its traditional business concentration and leadership, we can also suggest that a combination of both distance from Auckland, and lack of business concentration, appears to be a significant factor in the significantly greater propensity for South Island businesses to adopt email as an electronic commerce business tool.

## **What we may be able to interpret from the data**

While on an initial analysis, the findings from our data appear contradictory and confusing, we believe there are logical and justifiable explanations for the results we have obtained. These justifications lie in an analysis of the economics underpinning business uptake of new processes and technologies. Investigation of such factors as the marginal costs and marginal benefits to businesses, the uses to which businesses appear to be putting the new technologies, the products that they are producing, and from this, analysis of when the optimal time to invest is likely to occur, provide some plausible explanations for all of the phenomena observed in our data analysis.

### ***Proposition 1: Earlier and higher provincial and rural email adoption is consistent with higher rural communication costs and benefits***

The Yellow Pages data show, in particular, a greater level of email uptake in some provincial areas, and a distinct advantage for smaller metropolitan areas over larger ones. While further research to more fully verify the reasons for this pattern is indicated, we believe that part of the explanation lies in the relative costs and benefits of communication in less densely populated and more remote areas.

The principal use of email in a business is for communication. Email can be used as a substitute for traditional postage, telephone, fax and face-to-face communication. In particular, it is a very close substitute for fax and postage services, which both enable the transfer of a document that can be printed and stored in “hard copy” format<sup>30</sup>. Typically, businesses in more remote or less densely populated areas by necessity face higher costs of communication. This is particularly true of face-to-face communication, where travel costs are greater, but also for fax and telephone communication due to the need to make a long distance call charged on a distance-based scale upon the basis of minutes of communication time. If the message to be conveyed is long and complex, then the communication time will be longer, or face to face communication required, and is hence more costly.

In the New Zealand context, although the Kiwi Share imposed upon Telecom maintains a constant level of telephone rental costs across New Zealand, and preserves unmetered calling within local call zones for domestic telephone consumers, businesses are still required to pay a per minute call charge for local calls. Furthermore, the local call zones of rural and provincial New Zealand comprise significantly fewer telephone subscribers than metropolitan local call zones. Hence, with a smaller network of local (i.e. low call charge)

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<sup>30</sup> . . . . .

telephone subscribers, one would expect that a rural or provincial business would need to make proportionately more higher charged calls than a comparable business in a metropolitan area, where the majority of trading partners might be expected to reside within the less costly local call zone<sup>31</sup>. Physical distance from suppliers and customers also increases the cost of communication initiated by these trading partners. It is inevitable that, to some extent, the costs of communication borne by these trading partners will also impact upon the business in question. Suppliers would be expected to include higher costs of communication in the price of goods sold to the firm, and the firm may also be required to accept a lower margin when selling to “out of town” customers in order to offer the same value (including the costs of communication) that a firm close to the customer can offer.

Collectively, all of these costs – transport, telephony, raw materials and the implicit costs involved in the extra time required to conduct communications via these methods – would be expected to be higher for a rural or provincial firm than a metropolitan one. If these costs are higher, then the “break-even point” at which the benefits of a new technology such as email begin to offer real cost savings to a firm, will occur at a relatively earlier stage than for a firm whose costs are lower. As the marginal benefits begin accruing at a higher cost of email technology, it is quite consistent that we observe proportionately higher levels of email uptake in rural and provincial New Zealand than in metropolitan New Zealand. As the costs are higher, the benefits begin accruing at a higher cost of the technology, and businesses will be prepared to take up new technologies at a higher price than those facing lower costs. Thus we would expect businesses facing higher communication costs to be among the earliest adopters of substitute communications technologies. As we would not appear to have yet reached saturation point for email in businesses (the highest proportion of email adoption recorded in any of the surveys looked at for this analysis is 72% - MED/BRC), then we would expect to see a higher penetration in the areas where communication costs are higher. This is precisely the pattern of provincial and rural uptake revealed by the Yellow Pages analysis.

The distribution of the higher email uptake that we observe in the South Island is also quite consistent with our hypothesis. The higher concentration of businesses in the North Island (where 71% of the businesses listed in the Yellow Pages are located) combined with the much larger geographical area of the South Island means that it is significantly more likely that the trading partners of South Island businesses will be located at a greater distance than (for instance) rural and provincial North Island businesses. Thus, the higher penetration of email in the more geographically distant and remote areas of the South Island – Marlborough, Nelson and Bays and rural Otago – is entirely consistent with the much lower

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<sup>31</sup> In this respect it is noted that, while in the introduction we noted that the results of our analysis should be

penetration in rural Waikato (comparatively close to Auckland) and rural Wairarapa (comparatively close to Wellington), where the costs of communication, though still higher than urban areas, would be proportionately lower than in rural Marlborough or rural Otago.

Logically, though, if this argument is carried through to its extremities, we would expect to see even higher proportionate levels of uptake in the rural areas than in the provincial centres. This clearly is not the case in the Yellow Pages data, as all rural hinterlands<sup>32</sup> show lower email uptake than their provincial centres. We contend that there are at least two plausible explanations for this observation – the costs and quality of telephony infrastructure in rural areas, and the types of businesses which are typically located in rural areas which play a role in determining the most efficient communications technology to adopt.

There has been much debate in recent months about the quality of rural telephony infrastructure in New Zealand. However, not all the impediments to rural electronic commerce uptake are restricted to the capacity of the telecommunications infrastructure. These impediments arise from the interaction of a complex set of factors, of which the state of rural telecommunications, while significant, is not the sole driver. Nonetheless, we find that there is some evidence to suggest that the costs of rural telephony, both out-of-pocket and time and quality loss, are higher for rural businesses, and that this may be part of the explanation of lower and later uptake of both email and websites in rural areas.

It is acknowledged that the capacity of the local loop in some rural areas is insufficient to satisfy the requirements of reliable fax and email transmission. Yet, the MAF report cites Telecom's claim that 95% of the rural population has access to 14kbps services necessary for fax and email services, meaning that access to email is impeded by telecommunications infrastructure for only a very small proportion (5%) of the rural population<sup>33</sup>. However, for this 5%, the barrier to adopting email is significant, as it prevents participation entirely.

Furthermore, not all telephony impediments to rural email and other Internet uptake are attributable solely to line capacity. Standards of line maintenance, both that owned by Telecom and that which is the responsibility of rural consumers is also a factor, with low maintenance leading to poorer quality connectivity, and high costs of private line

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and consumer business behaviour.

<sup>32</sup> Except Gisborne rural, for which the small number of businesses with email and websites distorts the analysis.

<sup>33</sup> While we recognise that 33kbps is recognised as the desirable minimum capacity standard for reliable Internet (i.e. operating a website and accessing the websites of other businesses) we can find no publicly-available figure regarding the percentage of the rural population with access to this capacity. However, based upon estimates in the Telecom submission to the Telecommunications Inquiry that it would cost \$230 million to provide all rural customers with 14.4kbps access and \$550 million for 33kbps, then assuming that 33kbps



maintenance borne by rural subscribers raising the costs relative to provincial and metropolitan subscribers. Line noise, exchange overloading and electric fence interference were also cited as significant factors contributing to poor quality telephone service (24%, 18% and 22% respectively) for respondents to the MAF survey, all of which would result in additional time and inconvenience costs to rural subscribers. Despite these higher costs, however, the MAF report indicates that the benefits of Internet connectivity are sufficiently large for some subscribers to invest in bypass technologies such as wireless and satellite. But the threshold for investment in these technologies is high, meaning that few businesses may have a valid justification for uptake.

Businesses in rural areas thus clearly face higher costs on average in substituting email for other forms of communication than businesses in provincial centres, where these additional costs do not have to be borne. This pushes the costs of adoption much higher, requiring more benefits to justify adoption, effectively delaying the point of uptake.

Furthermore, misleading perceptions of the relative costs of existing telephony infrastructures are also potentially distorting the pattern of bypass technology investment and uptake in rural areas. The universal price of the Kiwi Share means that rural customers are paying substantially less than the average cost of providing their telephone service<sup>34</sup>. End consumer decisions to invest in bypass technology will be made on the basis of the additional benefits relative to the difference between the prices for the new and existing technologies. If the price to the customer for the existing technology is artificially low, then a higher level of benefit will be required to justify uptake of the new technology than if the customer faced the real costs. If such high benefits are not achievable, then the customer will not buy the new technology and no market will exist. From the supply side perspective, investment will be prevented as there would be no return on the investment at the artificially low prices, even in the event of there being demand for the technology.

Nonetheless, we contend that, despite the higher costs of rural communication in some rural areas, the benefits gained from email may exceed the additional costs. This is evidenced in the higher uptake in some of the more remote areas. However, the higher uptake in these areas may also be influenced not just by the costs of technologies, but also by the ability to accrue additional benefits. It is perhaps not surprising to find that the rural areas where email uptake is high are also those whose local economies are comparatively more buoyant (e.g. Marlborough, rural Otago) than others (e.g. the Gisborne). Furthermore, the types of industries which underpin these more buoyant economies (e.g. tourism in rural Otago, wine in Marlborough) require businesses to communicate regularly with trading partners who are

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<sup>34</sup> See for instance, Bruce Lewis, Telephone's "Kiwi Share" Is Government Willing to ... (ICOP Commission and

located at a distance. The business case for adopting new technologies becomes justified at a much earlier stage, as both the costs of communication are larger, so the benefits of reduced costs and increased business are larger. Furthermore, if the products in which the business trades are digital, or can be supplemented by digital co-products, the business case for the adoption of both email and websites is viable much earlier<sup>35</sup>.

Thus, we believe, the patterns of rural and provincial email adoption and the bias in favour of higher uptake in the South Island that we have witnessed in the Yellow Pages data are entirely consistent with an adoption pattern driven by the distribution of the costs and benefits facing business users.

***Proposition 2: The patterns of email adoption we are seeing in provincial and rural New Zealand appear to indicate demand-driven adoption similar to the EFTPOS rollout***

We also believe it is pertinent at this point to highlight similarities between the national rollout and uptake of EFTPOS and the uptake of email, particularly in rural and provincial areas. The national rollout of EFTPOS has resulted in a new technology offering benefits to both retailers and consumers becoming practically ubiquitous in New Zealand<sup>36</sup>. The ease with which both consumers and retailers have adopted this new technology is due principally to the fact that the benefits accrue to both parties, and thus we have seen demand for the service from both groups result in a very early, and world-leading adoption.

Similarly, the benefits from email accrue to both parties in the transaction – both the sender and the transmitter – in reduced time and cost of communicating, and increased timeliness of message exchange. If benefits accrue to both parties, then there are incentives for trading partners to both adopt the new technology simultaneously in order to benefit as soon as possible. Hence we would expect to see “clusters” of uptake among businesses which are frequent exchangers of communications. This demand-driven pattern of uptake may help to explain “clusters” of higher email uptake in some provincial towns, with double incentives of earlier accrual of benefits and a greater proportion of trading partners also adopting the technology driving higher levels of uptake (that is, localised network effects). Similar patterns of early EFTPOS uptake were evidenced in areas where advantages accrued earlier to both retailers and customers when banks closed local branches.

Another similarity between EFTPOS and email lies in the way in which the demand-led uptake results in a seamless “re-engineering” of the business practices of those adopting the

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<sup>35</sup> See, for example, the discussion in *Journal of Business*, 68 (1995), 50-61.

technology when this adoption is driven by a justifiable cost-benefit tradeoff. The incentives provided by reduced costs or increased benefits encourage both adoption of the technology, and adaptation to the requirements of its use. Just as the net benefits of EFTPOS have encouraged a relatively seamless transfer for retailers and consumers to a “cashless society” and familiarity with keypads, passwords and visual display units, the net benefits of email promise another relatively smooth transfer to, and adoption of, Internet-based methods of not just exchanging communications, but also exchanging other forms of business transaction as well. We posit that the growing ubiquity of email as a method of communication, facilitated by the net benefits available to both parties to the communication, may be an important precursor to greater ease, comfort and familiarity of the use of the Internet for other forms of transacting. We posit that the high proportions of both email and website listings in Otago (both Dunedin and Rural) and Nelson Bays, in particular, are evidence of this. Further research is required to explore how the effects of this “mass human re-engineering” as a result of mutual benefit-based, demand-driven rollouts play a role in the growing ubiquity of new technologies.

***Proposition 3: The optimal time to invest in websites depends more on firm size and product than on infrastructure and geographic business location***

While the location-based explanations of proposition 1 and 2 above provide some cogent reasons for the pattern of email uptake witnessed in the Yellow Pages data, the patterns associated with website listing and uptake are less clear. While areas such as Marlborough have very high email listing percentages, their rates of website listing are not proportionately as high. However, Otago rates highly in both measures. This suggests that the relationship we posited above, between email uptake and comfort with other Internet based technologies, may not be as straightforward as a direct correlation. While the potential explanations we make in this section are speculative, we believe that they highlight areas where further research work could be directed.

If we assume that the business case for the adoption of email rests upon a trade-off between the costs and benefits of alternative communication technologies, then what costs and benefits should be traded off in the business case for developing and using a website? While our argument that user familiarity with Internet-based techniques will play a role in reducing, for instance, staff training costs for keyboard skills, these are, we believe only a small component in the business case for developing and using a business website. While connection to email is a relatively cheap and easily implementable practice (if the business already has a computer, then the only additional costs will be the price of purchasing and

associated with using the facility) which easily substitutes in the business structure for existing communication practices, website development is more costly and complicated. Indeed, 40% of respondents to the MED/BRC survey cited costs as a significant reason inhibiting uptake of electronic commerce. The investment required for development and operation of a website is thus significantly higher, both in capital cost, and the costs of redesigning existing processes (e.g. sales and invoicing, banking, advertising) to accommodate the website processes. Thus, greater benefits, in absolute terms, will be required to justify the business case.

Hence, we would expect that larger businesses, with greater trading volumes, would reach the point where the costs of developing and operating a website are exceeded by benefits sooner than smaller businesses. As larger businesses tend to be more concentrated in larger provincial towns and metropolitan centres, we would expect to see greater uptake of websites in these areas than in smaller provincial and rural centres. And indeed, this is the pattern that the Yellow Pages data generally reveals, with high rankings for metropolitons Dunedin (1<sup>st</sup>), Wellington City (2<sup>nd</sup>), Auckland City (4<sup>th</sup>), and Christchurch (6<sup>th</sup>). Correspondingly, the lowest 6 rankings are populated by rural hinterlands.

Interestingly, though, the 3<sup>rd</sup> and 5<sup>th</sup> website rankings in the Yellow Pages data are occupied by provincial centres – Whangarei and Nelson respectively. While further information relating website listing with average business size in each of these leading areas would identify whether business size is or is not a factor in high uptake in these areas, this does not at an initial analysis appear to be sufficient to explain why these comparatively small provincial towns should rank as highly as their metropolitan counterparts in website uptake and listing. The inadequacy of business size as the main reason is also underlined by the fact that the highest ranking website area is Dunedin, New Zealand's smallest metropolitan area, which presumably would have proportionately fewer large businesses than, say, Auckland.

We contend that, while business size has a significant role to play in the economic justification for website adoption, another factor which could be expected to lead to earlier website adoption is the nature of the product sold. While all firms potentially can benefit from the advantages of website advertising, and the cost-related efficiencies of digital information and commercial exchange, there will be an increased incentive for firms trading in information products, and related information-based co-products to adopt website trading. Not only are the costs of their ancillary marketing and selling processes potentially able to be reduced by using web-based processes, so can their distribution costs. This additional avenue of potential cost reduction further advances the business case for website adoption by such businesses ahead of businesses which trade in traditional products.

A good example of this is an online research institute, which sells an information product

research reports. Our business case for trading our products via a website is further enhanced by the fact that we can transmit our reports to customers directly via the website, reducing the costs of printing, binding, packaging and freighting our product to consumers. The large size of these costs compared to the costs of developing and operating our website meant that we moved to this method of trading much sooner than if we had been in the business (say) of crafting hand-made pottery. While both of these tasks - research and creative potting – require the application of creative intellectual endeavour over a long period of time, and presumably require roughly equivalent amounts of advertising and marketing, clearly the added advantages of an electronic product would lead to an earlier break-even point, and hence website adoption, for the research institute.

Unfortunately, public information is not available to test whether the higher rankings of Dunedin, Whangarei and Blenheim can to be explained by this theory. However, there is sufficient anecdotal evidence to suggest that the types of products produced by some Dunedin businesses (e.g. the digital imaging cluster, research institutes attached to the University of Otago, tourism) may well be a factor that is beginning to be evidenced in the higher website uptake in this city. While it is highly speculative, there may also be some foundation to the suggestion that patterns of business associated with niche products, such as Whangarei's luxury boat-building industry (e.g. engineering design, interior fitting design, and even digital pre-sales publicity) may be a factor in higher website uptake.

The nature of the product combined with the relative state of the region's economy may also help explain why some rural areas rate very highly in both email and website adoption while others rank lowly. For instance, rural Otago, with a mixed economy based upon traditional agricultural products as well as tourism would provide a more conducive base for electronic transacting than (say) Gisborne which is more heavily reliant on traditional agricultural products.

While higher costs of rural telecommunications may be a potential inhibitor in the uptake of rural email, we are more hesitant in using this as an absolute justification for lower rural website uptake. While email requires the computer managing the email interface to be physically at the location where the messages are sent and received, and hence the service may be vulnerable to the effects of variable telecommunications infrastructure quality, the same is not necessarily true for a business operating a website. Websites can be, and in many instances are, hosted on the computers of Internet Service Providers (ISP) and specialist web hosting services. The host computer can in fact be located in a completely different geographic area to the business<sup>37</sup>. A rural business may therefore have its website hosted on a computer in an urban area, effectively bypassing any problems posed by

telecommunications infrastructures. Indeed, Yellow Pages offers a website hosting service for clients who don't even have a computer<sup>38</sup>. Thus, rural telecommunications infrastructure is immaterial when the purpose of providing a website is to enable clients to access information about the business, place orders or even receiving digital products housed on the website. If the predominant pattern of website business usage is the transmission of reasonably static data to clients, with minimal communication from the website host computer to and from the business location, then website location can be wherever the best business case dictates. This may explain why the rate of website uptake is very little different for South Island and North Island businesses, despite the greater average costs of communications that would be expected in the more geographically remote South Island compared to the North.

Only if the amount of information required to be transmitted to and from the physical site of operation of the business is large does the capacity and quality of the telecommunications infrastructure become important. In these instances, even in provincial and metropolitan centres, the most effective method of data transmission is not the standard voice telephony system, but dedicated leased broadband and high speed access methods such as ADSL. Yet, while ADSL offers a cost-effective way of leveraging existing copper wire infrastructure to provide increased bandwidth to metropolitan and provincial centre locations, it is not an option rural businesses as high capacity throughput cannot be sustained over cables any longer than about 3 to 4 kilometres<sup>39</sup>. This leaves leased broadband the only technologically feasible way for rural businesses to maintain large data volume transmission. As the cost of such services is significant, then this does pose a barrier to rural website uptake, but only for businesses with large data transfer requirements.

However, we add a caveat to this analysis. While our postulations relate to the behaviour of businesses as producers and operators of websites we cannot necessarily use these arguments to rationalise the usage by businesses of other businesses' websites – that is, when businesses act as consumers of website products and services. Location and infrastructure quality may be a factor in the patterns of businesses accessing other businesses' websites. However, this will only be a barrier for the small percentage of rural businesses with less than 33kbps line capacity. Furthermore, business size does not necessarily imply any greater or lesser benefit to be gained from information discerned from website searching or reduction in costs from the availability of digital products and exchange processes. However, the patterns that are emerging from this are not able to be elicited from the Yellow Pages data. Further research will be required to refine knowledge about these aspects.

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<sup>38</sup> New Brighton Florist case study <http://www.yellowpages.co.nz/advertise/success-stories/florist.html>

<sup>39</sup> We note that these technological limitations with ADSL pose difficulties in developing the “special

Thus, we have shown that the parameters governing the business case for, and hence determining the optimal time to invest in, uptake of websites by businesses differs significantly from those governing the uptake of email, and that these factors can also explain both the lower uptake of websites overall, and the differences in uptake between websites and email within one specific area. Principally, website adoption appears to be governed more by the size of the business and the types of products and processes the business trades in than by physical location or the state of infrastructure. It would appear that the data from the Yellow Pages are consistent with the patterns of uptake one would expect based upon this rationale in the business case for website adoption.

***Proposition 4: Websites can substitute for email in some business communications***

This leaves, as the final piece of the puzzle, the patterns of uptake yielded by the non-geographically dependent 0800 and 021/025 Yellow Pages listings. Businesses listing under these numbers tend to be businesses located in one centre and servicing the entire country, or businesses maintaining a national chain of either proprietary or franchised operations. The predominant use of such numbers is therefore either one or both of facilitating the exchange of information, or accepting orders for merchandise. In this respect, the uses to which 0800 numbers are put closely replicate the uses to which email and websites are put. We would therefore expect there to be some supply side substitution effects between these technologies. Furthermore, as the same technologies also offer customers additional benefits, such as greater accessibility to information, and time savings by being able to bypass human intervention in accessing that information, then we would expect to see customers substituting electronic methods of interaction for telephone ones. The Yellow Pages data do indeed exhibit evidence of some of these effects. However, it appears as though, while websites may provide the ability to substitute for both email and telephone, email is a complementary technology.

The Yellow Pages data show that 0800 numbers have the highest proportion of website listings in the country, some 74% higher than the highest region, Auckland Urban. However, while email listing is also high, it is in fact proportionately only the same as the highest region, Marlborough. Hence, it would appear that businesses operating 0800 numbers are significantly more likely to be also operating websites than other businesses, but not necessarily more likely to be listing email addresses.

It does not appear surprising that 0800 businesses operating on a national level would be more likely to be operating websites. Their products would be suitable for, and their business practices already be established to accommodate, remote delivery. Presumably there would be little need to develop new distribution processes merely because of introducing a new way of advertising or processing orders. Thus, by our business case argument, an earlier accrual of net benefits could be anticipated. Furthermore, nationally-based firms would be expected to be larger, and hence more likely, by our earlier arguments, to be early adopters of websites. Additionally, it would also be easier to choose a location on the basis of cheaper or more reliable communication infrastructure, if there was no requirement to be close to the business's customer base.

However, given that one central location necessarily means distance from significant parts of the customer base, one would have expected that higher communication costs would also translate into a higher level of email adoption, as witnessed in rural and provincial areas. Earlier and higher email adoption would be expected to be even more likely, given that businesses with 0800 numbers bear the costs of consumers communicating via traditional telephony. The incentives to 0800 businesses to adopt email seem higher even than those in rural areas. Yet the Yellow Pages data do not support this. While email adoption is high, it is not significantly higher than that in many regions. Superficially, this appears to be an anomaly.

This leads us to question whether there is some form of substitution happening between websites and email with respect to communication, where higher levels of website adoption may lead to reduced need to communicate by email. Two possible scenarios emerge.

If the purpose of the 0800 number is merely for communicating – for instance, putting the customer in contact with the local franchise – then there are significant human time and transaction cost savings available to the business by putting that information on a website. If human exchange of information over the telephone or in replying to an email is automated into a web page, and if the web page substitutes for a telephone call, then costs of information exchange are reduced and the costs of communication are shifted from the 0800 business onto the consuming business or individual. Together, these reasons would provide an incentive to 0800 businesses to favour development of websites for communication in preference to developing either email or telephone interfaces.

Likewise, if the purpose of the 0800 number is to collect information for the processing of transactions, then once again a web page provides the opportunity to reduce human processing costs and to shift communication costs onto consumers. While the adoption of



more complicated and expensive (for example, using secure servers) web page design, if transaction volume is sufficient, then the business case may warrant development. If 0800 numbers enable the “pooling” of national demand, thus generating economies of scale, then the critical mass of web-based purchases required to justify website selling would be expected to be reached earlier than if, for example, each local franchise collected and forwarded orders individually.

However, the same advantages are not available from email. While websites allow structuring of the information exchange process, and thus streamlining of mass customer interaction, the “free form” of both email and telephone interaction means that human interaction is required on every interaction to interpret and act upon the information communicated. In this respect, email provides few if any advantages over a call centre. The only advantage that email would provide would be an ability to extract a hard copy of the information exchange, while there would be a potential disadvantage in loss of timeliness, as emails cannot replicate the interactive nature of a telephone conversation. Hence, while email may complement the activities of either a telephone or website service, it is unlikely to act as a substitute, as it lacks some of the key functionality of both the other services.

Together, these explanations suggest that websites do, in fact, provide a close substitute for some aspects of communication that might otherwise occur via email. If such substitution is, in fact, occurring, and the substitute product provides significant cost advantages for the 0800 selling business, then this would go some way to explaining the apparent anomaly of higher website uptake but only comparable email uptake in 0800 companies in the Yellow Pages data.

## Conclusions

The combination of our analysis of the Yellow Pages data, and the research done by others leads us to conclude that, while there is evidence of some “rural-urban digital divides” in New Zealand, it is by no means as simple as saying that all rural businesses are disadvantaged relative to all urban businesses.

Our analysis shows that it is necessary, when making an assessment of “digital divides” to separate out the different forms of Internet-based technologies, as different patterns of uptake, and hence relative advantage and disadvantage are evident across different technologies. It is also necessary to establish the different uses to which the technologies are put, and whether there are any significant usage patterns which might require a different level of assessment to be made of the needs of different geographical areas. Furthermore, the products traded may also form a part of this analysis, along with the role each of these technologies may play as partial or complete substitutes and complements for each other. Unless there is a clear understanding of the role all of these factors play, it is difficult to determine whether any geographical region may be more or less advantaged than any other in terms of access to, or usage of, specific technologies.

Using this approach, the following conclusions emerge:

1. There is no evidence in the Yellow Pages data to support the existence of a “digital divide” with respect to the uptake of email and website applications between metropolitan and provincial centres in New Zealand merely on the basis of geography.
2. The Yellow Pages evidence suggests that there is a “divide” which favours earlier adoption of email in particular by businesses that are more remote from their trading partners over those whose partners are closer. This translates into a higher email uptake in the South Island than in the North.
3. There is evidence to suggest lower levels of uptake of both email and websites applications in all rural areas compared to the level of uptake in their provincial centres. This may be explained to some extent by a combination of the small scale of businesses reducing the incentives to invest in, particularly, websites, and higher costs (both of maintaining a service and the costs of bypass) facing rural telephony subscribers, which may be delaying uptake of email. Furthermore, the artificial costs of telephony faced by businesses in rural areas may be distorting the decisionmaking

4. However, there is evidence to suggest that some rural and provincial areas - namely Gisborne, Wairarapa, Hawkes Bay, Manawatu, Wanganui, Taranaki and Waikato – which appear to be at a greater disadvantage than other rural and provincial areas - namely Otago, Marlborough and Nelson and Bays. This relative disadvantage may be due as much to economic and social conditions dictating a later uptake of new technologies, and the nature of the products and services these businesses create, as to the state of telephony infrastructure, population density and geographical location.
5. “Digital divides” favouring earlier uptake of websites by urban and 0800 businesses may be as much a factor of the size of the business, the type of products bought and sold, and the locus of communication cost bearing as physical location.
6. In all instances, greater insights into the patterns of uptake of any of the Internet-based technologies are gained by analysing the business cases for adoption of the technology than merely focusing on location. Using this approach shows a “divide” which, infrastructure disadvantages notwithstanding, favours rural and provincial businesses over metropolitan ones in the adoption of email.

While we acknowledge again the limitations of the Yellow Pages data, we suggest that as the findings of this analysis can be rationalised against recorded and reported business behaviours, this study represents the most comprehensive analysis available currently on regional uptake of Internet-based technologies in New Zealand. As we have no comparable data, either in New Zealand or internationally against which to measure our findings, further quantitative research is required. Nonetheless, these findings provide a useful foundation to informing the policy debate surrounding the development of New Zealand’s national Electronic Commerce Strategy.

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***Appendix 1. Telecom Yellow Pages Geographical Regions.***

## ***Appendix 2. Telecom Yellow Pages Data Summarised by Region***

<b>Exchange</b>	<b>Count</b>	<b>Web</b>	<b>Email</b>	<b>Web%</b>	<b>Email%</b>
AUCKLAND DIST TOTALS	43,073	1465	2280	3.40%	5.29%
AUCKLAND URBAN	41503	1977	2630	4.76%	6.34%
BAY OF PLENTY	20550	434	704	2.11%	3.43%
CANTERBURY TOTALS	37643	1370	2559	3.64%	6.80%
GISBORNE	2621	21	75	0.80%	2.86%
HAWKE'S BAY TOTALS	10132	179	437	1.77%	4.31%
MANAWATU TOTALS	10110	322	564	3.18%	5.58%
MARLBOROUGH	3434	123	352	3.58%	10.25%
NELSON & BAYS TOTALS	7502	316	747	4.21%	9.96%
NORTHLAND TOTALS	11754	397	741	3.38%	6.30%
NZ 0800/025 TOTALS	8926	740	916	8.29%	10.26%
OTAGO TOTALS	12684	604	1042	4.76%	8.22%
SOUTHLAND TOTALS	6471	147	449	2.27%	6.94%
TARANAKI TOTALS	7225	168	302	2.33%	4.18%
TIMARU-OAMARU TOTALS	4916	97	269	1.97%	5.47%
WANGANUI TOTALS	4059	111	252	2.73%	6.21%
WAIKATO TOTALS	21077	582	853	2.76%	4.05%
WAIRARAPA TOTALS	3183	32	73	1.01%	2.29%
WELLINGTON TOTALS	31104	1370	2126	4.40%	6.84%
WEST COAST TOTALS	2103	61	130	2.90%	6.18%

**Appendix 3. Telecom Yellow Pages Data Aggregated by Main Centre and Provincial Area Classification**

<b>Exchange</b>	<b>Web%</b>	<b>Email%</b>	<b>Total</b>	<b>Count</b>	<b>Web</b>	<b>Email</b>
NATIONAL	3.63%	6.03%	190338	290070	10516	17501
MAIN CENTRES	4.21%	6.48%	100939	153386	6464	9943
PROVINCIAL AREAS	2.59%	5.20%	84305	127758	3312	6642
NZ0800/015 TOTALS	8.29%	10.26%	5094	8926	740	916

#### **Appendix 4. Telecom Yellow Pages Data Separated by Provincial Centre and Rural Hinterland**

<b>Exchange</b>	<b>Count</b>	<b>Web</b>	<b>Email</b>	<b>Web%</b>	<b>Email%</b>
AUCKLAND DIST TOTALS	43,073	1465	2280	3.40%	5.29%
AUCKLAND URBAN	41503	1977	2630	4.76%	6.34%
BAY OF PLENTY – RURAL	5916	101	179	1.71%	3.03%
BAY OF PLENTY – TAURANGA/ROTORUA	14634	333	525	2.28%	3.59%
CANTERBURY RURAL	9 003	1 95	4 65	2.17%	5.16%
CANTERBURY – CHRISTCHURCH	28640	1175	2094	4.10%	7.31%
GISBORNE RURAL	104	1	1	0.96%	0.96%
GISBORNE CITY	2,517	20	74	0.79%	2.94%
HAWKE'S BAY RURAL	2126	15	56	0.71%	2.63%
HAWKES BAY NAPIER/HASTINGS	8006	164	381	2.05%	4.76%
MANAWATU RURAL	2059	19	69	0.92%	3.35%
MANAWATU – PALMERSTON NORTH	8051	303	495	3.76%	6.15%
MARLBOROUGH RURAL	764	26	65	3.40%	8.51%
MARLBOROUGH – BLENHEIM	2670	97	287	3.63%	10.75%
NELSON & BAYS RURAL	907	25	54	2.76%	5.95%
NELSON & BAYS – NELSON	6595	291	693	4.41%	10.51%
NORTHLAND RURAL	5968	119	254	1.99%	4.26%
NORTHLAND – WHANGAREI	5786	278	487	4.80%	8.42%
<b>NZ 0800/025 TOTALS</b>	<b>8926</b>	<b>740</b>	<b>916</b>	<b>8.29%</b>	<b>10.26%</b>
OTAGO RURAL	3618	127	229	3.51%	6.33%
OTAGO – DUNEDIN	9066	477	813	5.26%	8.97%
SOUTHLAND RURAL	1677	17	58	1.01%	3.46%
SOUTHLAND – INVERCARGILL	4794	130	391	2.71%	8.16%
TARANAKI RURAL	1835	18	45	0.98%	2.45%
TARANAKI - NEW PLYMOUTH	5390	150	257	2.78%	4.77%
TIMARU-OAMARU RURAL	608	10	19	1.64%	3.13%
TIMARU-OAMARU URBAN	4308	87	250	2.02%	5.80%
WANGANUI RURAL	853	8	23	0.94%	2.70%
WANGANUI – URBAN	3206	103	229	3.21%	7.14%
WAIKATO RURAL	7533	101	204	1.34%	2.71%
WAIKATO – HAMILTON	13544	481	649	3.55%	4.79%
WAIRARAPA RURAL	996	3	11	0.30%	1.10%
WAIRARAPA – MASTERTON	2187	29	62	1.33%	2.83%
WELLINGTON DISTRICTS	14,011	489	800	3.49%	5.71%
WELLINGTON CITY	17,093	881	1,326	5.15%	7.76%
<b>WEST COAST TOTALS</b>	<b>2103</b>	<b>61</b>	<b>130</b>	<b>2.90%</b>	<b>6.18%</b>



**Appendix 5. Telecom Yellow Pages Data Aggregated by North and South Islands**

<b>Exchange</b>	<b>Web%</b>	<b>Email%</b>	<b>Count</b>	<b>Web</b>	<b>Email</b>
NZ0800/015 TOTALS	8.29%	10.26%	8926	740	916
SOUTH ISLAND	3.64%	7.42%	74753	2718	5548
NORTH ISLAND	3.42%	5.35%	206391	7058	11037
NATIONAL	3.63%	6.03%	290070	10516	17501