1. Introduction

The rise of the information economy and the challenges of the global market have secured a strategic place in all firms for electronic commerce (hereafter referred to as EC). More than just an Internet façade, EC has the potential to streamline central organisational policies and procedures. In fact, to remain competitive in global markets, EC has become imperative (Maguire et al., 2001, p.1) and encompasses activities such as electronic data interchange, having a Web site that is linked with key business processes, and capabilities to buy online (European Commission, 1998; Watson et al., 2000; Reedy et al., 2000; Turban et al., 2000; and Fillis et al., 2004). It has been argued that competing in the new millennium without Internet-enabled capabilities will be similar to “trying to compete today without a sales force or a telephone” (Frank, 1997, p. 31). In this paper, EC is defined as “any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact” (European Commission, 1998). It includes business-to-consumer and business-to-business activities conducted using electronic data transmission via the Internet and/or WWW.

There are many studies documenting the advantages associated with adopting Internet-enabled technologies for business purposes (e.g. Quelch and Klein, 1996; Hamill and Gregory, 1997; Burgess and Cooper, 1998; Keogh et al., 1998 Zampetakis, 2000). Despite these much-publicised advantages, recent research has shown that a large number of small to medium sized enterprises (SMEs) have been slow to capitalise on this new mode of carrying out business (see for example Clark et al., 2001, 2002; Smyth and Ibbotson, 2001).

EC uptake in New Zealand has been particularly slow compared with some of its major trading partners, including the United States, United Kingdom, and Australia (Gray et al., 1999; Clark et al., 2003; Reed, 2003; McCole and Ramsey, 2004). This suggests that the New Zealand Government’s vision to “…be world class in embracing EC for competitive advantage” may not be going according to plan. It also suggests that the goals outlined in the New Zealand Government EC Strategy document are not being met.

The aim of this paper is to understand why some New Zealand firms in the professional services industry have been slow to embrace EC activities? This question is
explored in three parts. First of all the extent of EC adoption in the professional service sector is explored. Second, professional service firms that have/have not adopted the Internet for business purposes are compared on internal/external factors that are reported to underpin adoption. Third, a logistic regression is performed in order to discriminate between factors that predict adoption/non-adoption.

2. Literature Review

Many studies have examined the use of new technologies in SMEs (see for example Chong, 2001; Cragg and King, 1993; Dos Santos and Peffers, 1998; Fillis, 2004; Ramsey et al., 2003, 2004). With particular reference to EC, Chong (2001) notes that ‘although there is growing body of literature dedicated to the analysis of the technical and operational aspects of EC, there is little empirical research on topics relating to the factors that lead to the successful adoption of this emerging technological innovation and business practice’ (p. 3). Our research seeks to find out which factors have the greatest influence on the adoption and use of EC for business purposes in a sample of SMEs in New Zealand. Similar to Chong (2001) who recognises that ‘in the absence of empirical studies to assist in the selection of the most significant variables for EC adoption, all relevant factors have been identified and grouped into broad categories of internal and external environment factors’ (p. 4).

2.1 Internal Environment Factors

Simpson and Docherty (2004, citing Bodorick et al., 2002; Jeffcoate et al., 2002; Cragg et al., 2002; Darach and Lucas, 2002; Sadowski et al., 2002; Kalakota and Robinson, 2001; Lawson et al., 2003; Timmers, 2000) provides a detailed discussion of the reasons for and barriers to EC adoption in SMEs. From their summary, we refer to those that are internal to the firm. These include: management resistance; technology concerns; resource issues; lack of awareness; and lack of information (see Simpson and Docherty, 2004, p. 320 for a fuller discussion). We add to this work by considering whether market orientation influences EC adoption.

Another internal factor that is likely to influence technology adoption is market orientation. Market orientation (or market-oriented behaviour) can be viewed as the implementation of a particular corporate philosophy, the marketing concept (Gray et al., 1998a, 1998b, 2000). Market orientation goes beyond simply responding to customer needs: it also includes countering competitor actions. Since the initial empirical research by Kohli and Jaworski (1990) and Narver and Slater (1990), a growing number of studies have supported the links between market-oriented behaviour and company performance, including recent studies in the services sector (Chang and Chen, 1998; Han et al., 1998; Van Egeren and O’Connor, 1998 as cited in Gray et al., 2000, p.149).

A market orientation essentially involves doing something new or different in response to market conditions, and may be viewed as a form of innovative behaviour (Gray et al., 1998a). The opportunities for growth as well as the need to keep up with competition are often regarded as the driving forces behind EC adoption (Drew, 2003, p.84). This implies that a market-oriented firm will adopt Internet based technologies and develop a Web presence to facilitate and practice e-marketing – thus allowing that firm to compete on (and in) the same grounds as their bigger counterparts. More market-oriented firms therefore will show greater responsiveness to Internet-enabled technology.

2.2 External Environment Factors

Chong (2001, citing Fink and Kazakoff, 1997; Hart and Saunders, 1994; Iacovou et al., 1995; Kettinger, 1994; Pennings and Harianto, 1992; Robertson and Gatignon, 1986; Tan, 1998; Takac and Singh, 1992) provides an excellent discussion of some of the external environment factors likely to influence the successful adoption of EC. These include: environmental uncertainty; pressure from other trading partners as well as other industry-specific competitive pressures; government influences; critical mass; issues related to infrastructure; and technological standards (see Chong, 2001, p. 5 for a fuller discussion). We add to this discussion by including issues relating to general technological innovation.

To study adoption of general technological innovation, Tornatsky and Fleischer (1990) developed the technology-organisation-environment framework, which identified three aspects of a firm’s context that influence the process by which it adopts and implements technological innovation. A firm’s environment is one of these contexts and consists of: competitors; access to resources supplied by others; and dealings with government (Tornatsky and Fleischer, 1990, p. 152-4 as cited in Zhu et al., 2002, p. 338).

Experience tells us that technology adoption is primarily market-driven, either by competition or by the availability of new technologies and the search for new industrial applications (Rogers, 1995; Porter, 2001). In
those markets where competition is intense, demand elasticises are expected to be higher because of the existence of close substitutes and this has the potential to drive innovative behaviours within the firm (Majumdar and Venkataraman, 1993).

Technologies do not easily diffuse in industries. In general, the use of new technologies is expected to increase by time due to different reasons (Rogers, 1995). One model of technology diffusion is the epidemic model, indicating that the lack of information available about the new technology can limit the diffusion of technology. Another model, the probit model, suggests that different firms adopt new technology at different times due to their differences in goals and abilities. An alternative model is related to density dependence that considers diffusion as the result of legitimation and competition (Cetindamar, 2001, p.186-7).

Of particular relevance to this research is the epidemic model of technology diffusion. The epidemic model of technology diffusion stresses information spillovers from users to non-users (see Canepa and Stoneman, 2004). Thus a firm’s propensity to adopt a technology at a certain point is positively influenced by the present level of adoption and diffusion in the economy as a whole, or by the proportion of adopters in the industry or sector to which the specific firm is affiliated. Empirical studies confirm that epidemic effects are powerful drivers of technology adoption (Canepa and Stoneman, 2004; Bertschek and Fryges, 2002).

3. Research Questions

Our research seeks to find out which factors have the greatest influence on the adoption and use of EC for business purposes in a sample of SMEs in New Zealand. We have developed three research questions to help us accomplish this:

RQ1 What is the current state of EC adoption in SME professional service firms in New Zealand?

RQ2 Are there any differences between adopters and non-adopters in terms of internal and external environmental influences?

RQ3 What internal and/or external factors actually predict EC adoption?

4. Methodology

4.1 Research Context

The research is confined to the professional services sector in New Zealand. Professional service firms are information intensive and are therefore more likely to adopt Internet-enabled technology for business purposes (Miles et al., 1994; Peterson et al., 1997; Lovelock et al., 1999; Porter, 2001; Preissl, 2003). The research is also confined to small-to-medium sized enterprises (SMEs). A SME is defined as an enterprise employing fewer than 250 persons (EU, 2003). SMEs constitute the majority of all enterprises in New Zealand – and the majority of SMEs in New Zealand are in the professional services sector (Ministry of Economic Development, 2003).

4.2 Data Collection Method

A questionnaire was developed that included measures of both internal and external environmental factors. These included perceived barriers to EC (Cragg et al. 2001; Darch and Lucas, 2002; Sadowski et al., 2002; Ramsey et al., 2003, 2004; Simpson and Docherty, 2004); the nature of the service offered (Gray et al., 1999); degree of market-orientation (Kohli and Jaworski, 1990; Gray et al., 1999); competitive factors (Gray et al., 1999; Hart and Saunders, 1994; Iacovou et al. 1995; Ramsey et al., 2003, 2004) and technology awareness (Gray et al. 1999; McCole and Ramsey, 2004). Being taken from published research these constructs are considered to be reliable and have construct validity. The constructs were measured using a Likert-type format ranging from strongly disagree to strongly agree. The questionnaire also included other demographic / firm characteristic items which were measured using nominal-type scales.

4.3 Sampling Frame

A commercial data provider was asked to select a sample of 500 professional service firms based on the definition provided by Miles et al. (1994). Businesses were selected according to NZSIC codes, number of staff employed (less than 250 FTE), and selected NZ cities. The cities included Auckland, Wellington, Christchurch, Palmerston-North and Dunedin - which is where the majority of New Zealand SMEs are situated (Ministry of Economic Development, 2003).

A stratified random sample was used to ensure a proportional representation of the different small-to-medium professional service firms across New Zealand. Questionnaires were posted in October 2003. The final total (useable) response rate was 31.6 percent (158 questionnaires).
4.4 Definition of Adopters and Non-adopters

In line with definitions of EC (see for example the European Commission, 1998; Watson et al., 2000; Reedy et al., 2000; Turban et al., 2000; Aldin et al., 2004; and Fillis et al., 2004) businesses that had a Web site that could “facilitate any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact” were termed adopters; and those that did not conform to this definition were termed non-adopters. The sample comprised 96 adopters and 62 non-adopters.

4.5 Early versus Late Responses

To check for non-response bias, the procedure suggested by Armstrong and Overton (1977) was applied. Questionnaires were assembled in date order of receipt, having been date stamped as they arrived. Approximately equal numbers of questionnaires from the first few days after the mailing date and last few days on which there were responses were selected for testing. The t-test to check for significant differences between early and late responses were performed on a number of variables. No significant differences in means were found between the early and late groups at p < 0.05 on any of the variables tested. On the basis of the method of Armstrong and Overton (1977), this indicates that non-response bias did not appear to be an issue (see also Baxter, 2005).

5. Results and Discussion

5.1 Current State of EC Adoption (RQ1)

Table 1 (n = 158) presents an overall profile of responses in terms of business sector and the percentage (and number) that had Web-based communication (email) together with the percentage (and number) that had a Web site. The majority of firms in the sample were involved in the legal profession, financial consulting services, management/business consulting, architectural/building services and publishing and printing. Table 1 also illustrates that whereas the majority of the firms surveyed had at least one computer and modem to facilitate Web-based communication (email), the percentage that had their own Web site was much lower. For example, whereas all management/business consulting firms surveyed had Web-based communication, only 42.9 percent had a Web site/presence. The same was found for legal firms: whereas 91.9 percent had Web-based communication, only 50 percent had a Web site/presence. The highest penetration of Web site/presence was found in firms involved in research and development (100 percent), publishing and printing (93.8 percent), computer services/software development (90 percent), ‘other’ professional services (87.5 percent), recruitment/employment services (80 percent), and marketing and advertising (75 percent). Interestingly, all firms involved in telecommunications, and engineer design/consulting all reported that they did not have a Web site/presence even though they did have Web-based communication. Overall 96.2 percent of firms had at least one computer and modem to facilitate Web-based communication, but only 61.4 percent had a Web site/presence.

The results suggest that although firms may be connected to a modem to facilitate Web-based communication, they don’t seem to be taking advantage of Internet-enabled commerce for business purposes.

5.1.1 Reason for having a Web Site

The top five reasons were: to advertise and promote our firm’s name and intent (57.2 percent); to communicate specific product/service information (51.6 percent); to enhance customer service (39.0 percent); to communicate with customers and/or suppliers (37.7 percent); and because competitors have one (25.8 percent). Only 5.7 percent of the sample cited to receive payments online as a main reason for having a Web site/presence. The results imply that even though there has been a rise in Web site ownership since 2000 (see Clark et al., 2001), it is not matched by a growth in online activities (i.e. more ‘advanced’ levels of sophistication).

5.1.2 Internal Integration

The vast majority of firms had no integration between their key internal systems and Internet applications. Of the businesses that did have partial or complete integration, service/product database (34.2 percent); customer database (27.1 percent); and accounting systems (20 percent) were more likely to be integrated with Web site applications. Overall, the level of EC sophistication in the majority of the firms surveyed tended to be “primitive” (Chaffey et al., 2000).

5.1.3 EC Benefits

The main benefits realised from having a Web site/presence included (measured on a 5 point scale where 1 = strongly disagree to 5 = strongly agree): effective advertising and brand building (mean = 3.2); increased customer base (mean = 2.6); increased sales
(mean = 2.6); cost savings (mean = 2.4); increased profits (mean = 2.3); finding new suppliers (mean = 1.7); and better purchasing terms (mean = 1.5). Closer inspection of these results suggest that the firms surveyed are not realising any benefits from having a Web presence, other than it provides effective advertising and brand building. These findings would again suggest that the level of EC sophistication within the firms surveyed is, at best, “primitive” (Chaffey et al., 2000).

5.2 Establishing Internal and External Factors
In order to answer research question 2, principal component analysis (PCA) using orthogonal rotation (VARIMAX) was first performed to assess the underlying structure of the data. The PCA method is particularly suited to research issues that are concerned about prediction and determining the minimum number of factors to account for the maximum amount of variance in the data (Hair et al., 1998). Orthogonal extraction, using varimax rotation suited our research goals and the need to reduce a large number of variables to a small set of uncorrelated variables (Hair et al., 1998). Varimax rotation also attempts to minimise the number of variables that have high loadings on a factor hence enhancing the interpretability of the factors. The rationale for this approach was to assess whether or not there were clear internal and external dimensions which could be (1) used to compare non-adopters and adopters; and (2) used as covariates in logistic regression to assess the extent to which they actually predict (or not) EC adoption.

The appropriateness of the data for factor analysis was confirmed by using the Bartlett's test of sphericity. The Bartlett's test result for sphericity is large at 1208.552 and the associated significance level was p < .001. The result of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the data is 0.803 which is meritorious (Hair...
### Table 2: Rotated Component Matrix

<table>
<thead>
<tr>
<th>Item</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological changes provide big opportunities in our service sector</td>
<td>.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A large number of new service ideas have been made possible through technological breakthroughs</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The technology in our service sector is changing rapidly</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We actively seek intelligence in technological changes in the environment that may affect our business</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We do not trust the technology/security associated with the Internet</td>
<td></td>
<td>.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet enabled business is highly risky for us and our customers</td>
<td></td>
<td>.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are not prepared to change our business processes to accommodate e-commerce</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are unaware of the benefits of the Internet for our business</td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have other more pressing concerns</td>
<td></td>
<td></td>
<td>.87</td>
<td></td>
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</tr>
<tr>
<td>There is a good fit between staff capabilities and e-commerce</td>
<td></td>
<td></td>
<td>.80</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>There is a good fit between financial resources and e-commerce</td>
<td></td>
<td></td>
<td></td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is a good fit between our service/product offering and e-commerce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>This business lags behind the industry in responding to new technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.83</td>
</tr>
<tr>
<td>We are slow to respond to new technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>We are slow to detect changes in technologies that might affect our business</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.85</td>
</tr>
<tr>
<td>We measure customer satisfaction on a regular basis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.71</td>
</tr>
<tr>
<td>We encourage customer comments and complaints because they help us to do a better job</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.58</td>
</tr>
<tr>
<td>Compared to others in our industry, our firm is first to recognise and develop new markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Our customers tend to look for new services all the time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.84</td>
</tr>
<tr>
<td>Competition in our service sector is “cut throat”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>In our kind of business, customers’ preference for services change quite a bit over time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Eigenvalue</th>
<th>% of Variance explained</th>
<th>Factor mean</th>
<th>Standard deviation of factor</th>
<th>Cronbach’s Alpha for factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.8</td>
<td>27.5</td>
<td>3.3</td>
<td>.91</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>2.8</td>
<td>13.3</td>
<td>2.0</td>
<td>.76</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>7.7</td>
<td>2.4</td>
<td>.86</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>6.7</td>
<td>2.4</td>
<td>.87</td>
<td>.87</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>6.4</td>
<td>3.2</td>
<td>.84</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>5.5</td>
<td>2.9</td>
<td>.78</td>
<td>.78</td>
</tr>
</tbody>
</table>

1. No cross loadings exist. Values below .35 were suppressed.
2. Factor labels: F1 = response to technological environment - opportunities afforded by technology; F2 = negative attitudes / perceived barriers to EC; F3 = EC capability; F4 = slow to detect change / respond to new technologies; F5 = customer orientation; and F6 = sensitivity to changes in customer / competitor environments.
et al., 1998). Both tests indicate the appropriateness of factor analytic techniques in this study.

Principal component analysis (PCA) using orthogonal rotation (VARIMAX) was then applied. All factors with an eigenvalue (latent root criterion) greater than one were considered significant (Hair et al., 1998). In addition, values less than .35 were suppressed and items that cross-loaded were deleted (21/35 items retained). The final factor solution contained 6 interpretable factors accounting for over 67 per cent of the common and unique variance. The communalities ranged from 0.385 to 0.831; therefore, a degree of confidence in the factor solution was permissible. The factor solution with the factor loadings is presented in Table 2. The internal reliability of the analysis was further measured by calculating the Cronbach's alpha for the 6 Factors (Table 2). The alpha values ranged from 0.60 to 0.86. These alpha values were all within the acceptable level. The 6 factors proved to be relatively easy to interpret, owing to the strong variable loadings. The factors can be viewed from two distinct categories: internal and external factors. These are discussed next.

5.2.1 Internal Factors

Four factors were deemed to represent internal characteristics in that they could be controlled by the management of the firms in the sample. Factor 2, titled negative attitudes/perceived barriers to EC, includes measures of trust, risk, and willingness to change. This factor accounts for 13.3 per cent of the variance. Factor 3, titled EC capability, is concerned with fit and overall ability to adopt EC. This factor accounts for 7.7 per cent of the variance. Factor 4, titled slow to detect change/respond to new technologies is concerned with the speed at which businesses respond to new technologies and/or detect changes in the technological environment. This factor accounts for 6.7 of the variance. Factor 5, titled customer-orientation, refers to the extent to which the firm is concerned with providing customer satisfaction and value relative to competitors. This factor accounts for 6.4 per cent of the variance.

5.2.2 External Factors

Two factors were deemed to represent external characteristics in that they are beyond the control of the service firm. Factor 1, titled response to technological environment/opportunities afforded by technology, includes measures pertaining to new service ideas offered by new technology and general speed of technological change taking place in the environment. This factor explains the greatest variance with 27.5 per cent. Factor 6, titled sensitivity to changes in customer/competitive environments, refers to the “fluid” and harsh nature of customer/competitive markets. This factor explains 5.5 per cent of the variance.

5.3 Differences Between Adopters and Non-adopters (RQ2)

The Independent-samples t-test was used to assess whether there were any differences between adopters (n = 96) and non-adopters (n = 62) in terms of internal/external influences on EC adoption. In line with definitions of EC (see for example the European Commission, 1998; Watson et al., 2000; Reedy et al., 2000; Turban et al., 2000; Aldin et al., 2004; and Fillis et al., 2004) businesses that had a Web site that could “facilitate any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact” were termed adopters; and those that did not conform to this definition were termed non-adopters. This technique is appropriate when groups are of unequal size and is robust against moderate violations of normality and homogeneity of variance (Corston and Colman, 2000). The non-parametric equivalent of the t-test (the Mann-Whitney U test) was also carried out. Both tests returned the same results (in terms of significance), but only the t-test is reported.

The results of the t-tests show that the mean values of the internal/external factors differ somewhat between adopters and non-adopters of EC for business purposes. Adopters and non-adopters were significantly different on five out of the six factors identified in Table 2. Adopters are more aware of opportunities afforded by technology (p < .01); are more customer-oriented (p < .01); and are more sensitive to changes in their customer/competitive environment (p < .001). On the other hand, non-adopters returned higher scores relating to barriers/impediments (p < .001) and tended to be slower to detect changes in technologies that might affect their business (p < .01). There were no differences between adopters and non-adopters in term of ability to adopt (p > .05), indicating that adopters and non-adopters cannot be differentiated in terms of staff capabilities, financial resources, and service/product fit.

5.4 Predicting Adoption (RQ3)

In order to answer research question three, logistic regression was used to identify (predict) attributes
affecting adoption. Logistic regression is a special form of regression in which the dependent variable is a non-metric, dichotomous (binary) variable. In this research, the dependent variable is adoption (0 = non-adoption, 1 = adoption) and the 6 factors from PCA VARIMAX (Table 2) acted as covariates. The forward stepwise (likelihood ratio) computation method was used to analyse the data. This regression technique builds a model one variable at a time and indicates those variables that are statistically significant to the model.

As illustrated in Table 4, the final model Chi-square together with the goodness-of-fit index and other model statistics suggest a very good fit to the data. For example evidence of good fit is given by the model’s classification rate or hit ratio of 71.3 per cent (67.2 per cent for non-adopters and 74.6 per cent for adopters). This percentage is a strong indication of the discriminating power of the predictor variables. In fact these percentages can be compared favourably with the proportional chance criterion (51%) as the most useful reference point in instances of unequal cell sizes (Morrison, 1969 as cited in Patterson, 2004).

Table 4 shows the regression coefficients (B), the standard error (S.E), Wald statistic, degrees of freedom (df), significance level (Sig) and the odds multiplier (Exp(B)). Using forward stepwise (LR) logistic regression only 2/6 factors (1 internal and 1 external) were found to significantly predict EC adoption. The two variables are: barriers/impediments to EC (internal) and sensitivity to change in customer/competitors environments (external). These findings were also consistent with the results returned by the full model (using the enter computation method). The odds multiplier gives the average impact of the predictor variable on adoption. Perceived barriers/impediments have, by far, the greatest impact on adoption behaviour. Business managers of professional SME firms in New Zealand reported that the perceived barriers/impediments associated with EC reduce the odds of adoption by 10/1. This finding is consistent with findings from other countries. For example Darch and Lucas (2002, as cited by Simpson and Docherty, 2004, p. 320) found several perceived barriers to the adoption of EC in Australian SMEs including costs, lack of EC skills, lack of knowledge, lack of help, lack of time and trust/security issues associated with technology. On the other hand, those firms that are (more) aware that customers look for new services, recognise that competition (in their service sector) is “cut throat”, and/or understand that customer preferences for services continually change - increases on average - the odds of adoption by 2.2 to 1. Although largely intuitive, this finding reinforces the notion that more proactive firms are more likely to adopt EC practices in an effort to accommodate more demanding customer needs, which in turn may make them more attractive than competitors who have not adopted the technology.

Table 3: Difference Between Adopters and Non-Adopters

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean Adopters</th>
<th>Mean Non-Adopters</th>
<th>t-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Response to technological environment / opportunities afforded by technology</td>
<td>3.5</td>
<td>3.0</td>
<td>-3.4</td>
<td>.001</td>
</tr>
<tr>
<td>2. Perceived barriers / impediments to EC</td>
<td>1.8</td>
<td>2.3</td>
<td>4.1</td>
<td>.000</td>
</tr>
<tr>
<td>3. EC capability</td>
<td>2.5</td>
<td>2.3</td>
<td>-1.6</td>
<td>.103</td>
</tr>
<tr>
<td>4. Slow to detect change / respond to new technologies</td>
<td>2.2</td>
<td>2.7</td>
<td>3.3</td>
<td>.001</td>
</tr>
<tr>
<td>5. Customer-orientation</td>
<td>3.4</td>
<td>2.9</td>
<td>-3.3</td>
<td>.001</td>
</tr>
<tr>
<td>6. Sensitivity to change in customer / competitive environments</td>
<td>3.1</td>
<td>2.6</td>
<td>-4.1</td>
<td>.000</td>
</tr>
</tbody>
</table>
6. Conclusions

This research has reported the extent of EC within smaller professional service firms in New Zealand, examined the differences between adopters and non-adopters and developed a logistic model to find out which items drive EC adoption.

Overall, the results provide evidence of a “primitive” (Chaffey et al., 2000) and “localised exploitation” (Venkatraman, 1994) of EC technology. The research found significant differences between firms that adopt and those that do not adopt EC technologies. Adopters tend to be more proactive and even more “creative” in that they are more aware of opportunities afforded by new technology (in terms of offering new service ideas). They also tend to be more customer-oriented and are more sensitive to the changes taking place in customer/competitive environments. Non-adopters harbour negative attitudes towards EC and believe that there are still many barriers hindering them from selling their goods and services online. Non-adopters are also slower in detecting changes in technologies that might affect their business. No differences were found between adopters and non-adopters in term of ability to adopt (i.e. staff capabilities, financial resources and service/product fit).

Negative mindsets regarding EC (such as: not trusting the technology; a belief that EC is highly risky; not being willing to change; not being aware of the benefits; and believing that there are more important things to be done) remains the biggest factor impeding adoption. This finding concurs with other studies. For example Kalakota and Robinson (2001, as cited in Simpson and Docherty, 2004, p. 320) reported that the main barrier to EC is the unwillingness of managers to be responsible for technological change. Timmers (2000, as cited in Simpson and Docherty, 2004, p. 320) suggested that ignorance surrounding technology fuels concerns about security, costs, legislation and interoperability. Further, Chappell and Feindt (2002, as cited in Sadowski et al., 2002, p. 78) reported that the valuable resources of time and effort to incorporate such telecommunications were principal barriers to the adoption of IT.

On the other hand firms that are more sensitive to changes in customer/competitor environments are more likely to adopt EC than those that are not. Again, this concurs with findings from other countries. For example, according to Fink and Kazakoff (1997, as cited in Chong, 2001, p.5), SMEs are usually characterised by a high level of environmental uncertainty such as fluctuation in interest rates, reliability of supply, competition, etc., and related to this is the point that the use of IT and EC is often imposed on SMEs by major customers or suppliers. Such pressure from trading partners has been found to play a critical role in IT and EC adoption by small firms (Hart and Saunders, 1994; Iacovou et al., 1995 as cited in Chong, 2001, p.5).

Table 4: Forward Stepwise (LR) Logistic Regression Results (Trimmed Model)

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Perceived Barriers/Impediments to EC</td>
<td>-2.3</td>
<td>.44</td>
<td>26.3</td>
<td>1</td>
<td>.000</td>
<td>.11</td>
</tr>
<tr>
<td>6. Sensitivity to Change in Customer/Competitive Environments</td>
<td>.78</td>
<td>.30</td>
<td>6.7</td>
<td>1</td>
<td>.009</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Log-likelihood value: 127.9 (initial -2LL = 177.5)
Model Chi-square: 49.6 (p < .001)
Goodness of fit: 7.6 (df = 8) (p > .05)
Nagelkerke R Square: .43
Pseudo R²: .28
Overall hit ratio: 71%
Proportion chance criterion: 51%
Iacovou et al. (1995) also stated that the competitive pressure that firms face within their particular industry from customer and competitor environment greatly influences the company’s decision to adopt IT. Adopting EC is also another way of maintaining a favourable competitive position (see Chong, 2001, p. 5 for a fuller discussion).

Although largely intuitive, these results provide both academics and marketing practitioners with suggestions as to how to tackle the problem of non-adopter in professional SMEs in New Zealand. In terms of the relevance to the academic community, the biggest challenge now is to find out how to change the perceived barriers/impediments (or negative beliefs/attitudes) towards EC. Examples of best practice and/or investigation into EC as a value adding resource may help alleviate this concern, and research profiling best practice is needed. In terms of the practitioner audience, the results offer insight into how one might tailor/target EC tools and software to firms who have not yet adopted it (e.g. segmenting the market in terms of various levels of concerns and/or proactive/reactive tendencies). Owner-managers must be convinced of the benefits that EC can offer and receive continued support for implementing e-business practices. New Zealand Trade and Enterprise seem to the ambassadors for this and it is imperative that they continue to promote the benefits of EC within (service) firms.

The New Zealand government has already made significant efforts to help the country realise the vision “...be world class in embracing EC for competitive advantage”. Nevertheless they must continue to: raise awareness and champion EC; be informed about New Zealand's e-capability; provide help and support to those that need it; deliver cheaper and faster services to customers through the introduction of on-line services; lead by example through e-government and e-procurement; and ensure the continuing supply of skilled resources. Of course the onus for e-progress not only rests with the government. Choices about new technology and the exploitation of opportunities must be led by the private sector (see MED, 2003 for a fuller discussion). The development of EC must be led by individuals and business innovators. Adopters must continue to develop their EC capabilities and levels of sophistication. The biggest challenge that lies ahead is how to change the mindset of non-adopters and make them realise the benefits (and cost savings) that EC can deliver.

References
A Profile of Adopters and Non-adopters of eCommerce

School of Information Systems, Curtin University of Technology, Perth, Western Australia.


Biographies

Patrick McCole received his PhD from the University of Ulster in 2001. After working in Dublin City University for one year he moved to New Zealand in 2003 to take up a position as Senior Lecturer at the University of Otago in Dunedin. His main research interests include wired and wireless commerce, complaint behaviour and e-services. His publications have appeared in national and international journals as well as various conference proceedings.

Elaine Ramsey is a lecturer in e-marketing at the University of Ulster. Her main research interests relate to internet-based business developments among knowledge-based SMEs.

Correspondence address

Dr Patrick McCole, Senior Lecturer, University of Otago, Department of Marketing, Dunedin, New Zealand. Telephone: +64 (0) 3 4798162 Facsimile: 00 64 (0) 3 4798172 Email: pmccole@business.otago.ac.nz