MOBILE DATA TECHNOLOGY FOR SMALL BUSINESS: NEEDS, USES AND ADOPTION

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ABSTRACT

The technological environment in which contemporary small- and medium-sized enterprises (SMEs) operate can only be described as dynamic. The exponential rate of technological change, characterised by perceived increases in the benefits associated with various technologies, shortening product life cycles and changing standards, provides for the SME a complex and challenging operational context. The primary aim of this research was to identify the needs of SMEs in regional areas for mobile data technologies (MDT).
In this study a distinction was drawn between those respondents who were full-adopters of technology, those who were partial-adopters, and those who were non-adopters and these three segments articulated different needs and requirements for MDT. Overall, the needs of regional SMEs for MDT can be conceptualised into three areas where the technology will assist business practices; communication, ecommerce and security.

Keywords: Mobile data technologies, ecommerce, SME, adoption, Internet

INTRODUCTION

The technological environment in which present Australian SMEs operate can best be described as dynamic and vital, however businesses have made an important psychological jump in viewing the Internet as a *marketing* tool rather than a *technological* issue (Dearne 2001). The explosive rate of technological change, characterised by perceived increases in the benefits associated with various technologies, shortening product life cycles and changing standards, provides for the SME a complex and challenging operational context.
The development of infrastructures capable of supporting the Wireless Application Protocol (WAP) and associated technologies represents the latest generation of technological innovation with potential appeal to SMEs and end-users alike. For all stakeholders, the primary appeal of these mobile data technologies, apart from mobility, is that associated 'services' are delivered on *existing devices* with which users are familiar – mobile phones, palm-tops, or other personal digital assistants (PDAs). However, whilst much attention has focused on high volume end-user 'lifestyle' applications for mobile data services (Mobile Data Conference, 1999), less emphasis has been placed on applications and services that would meet the needs of SMEs.
There are two objectives for this article. First, to discuss the literature in the area of adoption of mobile data innovation and, second, to report on the findings of an empirical study with SMEs in a regional setting. The primary aim of this research is to identify the needs of SMEs in regional areas for mobile data technologies MDT. The research question addressed being, 'what are the needs of regional SMEs in relation to MDT, and do these needs differ depending on the level of IT adoption already in place?'

LITERATURE REVIEW

Adoption of Information Technology

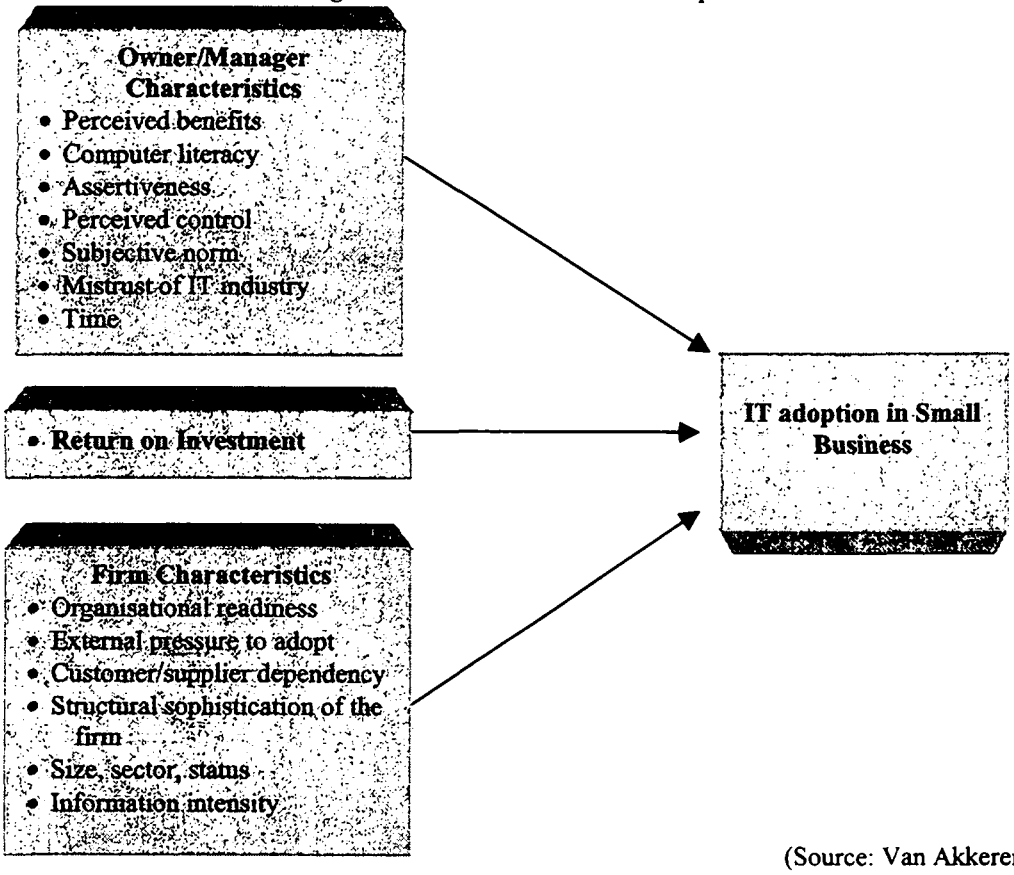
Early studies addressing the adoption of Information Technology (IT) provide insight into reasons why decision-makers adopt or do not adopt innovations. The Diffusion of Innovation theory (Rogers 1995) suggests that characteristics of innovations help to persuade potential adopters to embrace or reject an innovation. Other researchers have since completed work resulting in modifications to Rogers' original theory that provide numerous models addressing IT adoption and usage within an organisation.
The Technology Acceptance Model suggested by Davis (1989) addresses IT adoption, implementation and diffusion in terms of perceived ease of use and perceived usefulness based on behavioural intentions. Belief about the system, perceived usefulness and perceived ease of use are seen as directly affecting attitude to use (Gefen and Straub 1997; Agarwal and Prasad 1997). Further studies suggest that behaviour is a direct function of behavioural intention and perceived behavioural control that will impact on decision–makers choosing whether to adopt an innovation (Ajzen 1991, Taylor and Todd 1995). Therefore, in the adoption of mobile data technologies, will the same behavioural/psychological factors impact on the decision by owner/managers to adopt MDT?
Constructs used in the above models are generally based around perceptions, beliefs, attitudes and intentions of the decision-maker. More recent studies have identified other factors in addition to these that will impact on an owner/manager's decision to adopt new innovations such as mobile phones and Internet technologies. These

include economic factors such as return on investment and characteristics of the firm such as the size, sector and status, and the structural sophistication of the firm.

Adoption of IT/Ecommerce by SMEs

Empirical studies have identified a variety of factors thought to affect e-commerce/Internet technology adoption in small business (Brooksbank, Kirby, Kane 1992, Kirby and Turner 1993, Julien and Raymond 1994, Iacovou, Benbasat, Dexter 1995, Thong and Yap 1995, Harrison, Mykytyn, and Rienenschneider 1997). From the adoption factors identified in earlier studies, Van Akkeren and Cavaye (1999) developed a model (figure 1) based on a study on the adoption of e-commerce technologies thought to facilitate or inhibit technology adoption by SME owner/managers.

Figure 1: Framework of SME Adoption of Innovations



(Source: Van Akkeren and Cavaye 1999)

The **first** component of this model can be described as owner/manager characteristics and these are based on behavioural and attitudinal factors, being:

- *Perceived benefits* affect technology adoption in terms of the perceived ease of use and/or usefulness of the technology. If the owner/manager does not perceive the technology in a positive way, they will be reluctant to adopt (Iacovau et al. 1995, Kirby and Turner 1993, Thong and Yap 1995).
- The *computer literacy* of the business owner can also influence technology adoption. If the owners are unaware or do not understand the technologies available, they are unlikely to adopt them into their own business (Kirby and Turner 1993, Thong and Yap 1995).
- The *level of assertiveness, rationality and interaction of business decision processes* can also impact on IT adoption. If owners of the firm are assertive in business decision processes, understand the benefits and uses of the technology to their organisation, and are able to rationalise that information, they will be more likely to adopt IT (Julien and Raymond 1994, Harrison et al. 1997).
- *Perceived control* relates to the amount of requisite opportunities and resources (time, money, skills, co-operation of others) someone possesses to be able to carry out the course of action (technology adoption). For example, a small business owner may decide that connection to the Internet is an important competitive use of IT. Yet if there is a possible budget shortfall, or lack of time or understanding of the technologies, their decision to adopt will be influenced (Harrison et al. 1997).

- *Subjective norm* affects technology adoption in terms of the strength of the person's normative beliefs that 'groups' think the behaviour of interest (technology adoption) should or should not be performed, multiplied by a person's motivation to comply with the group (Harrison et al. 1997).
- *Mistrust of the IT industry* relates to the attitudes of owner/managers that IT professionals are untrustworthy, difficult to understand and overcharge (Van Akkeren and Cavaye 1999).
- *Lack of Time* refers to the owner/managers' attitude that they do not have sufficient time to invest in gaining knowledge and purchasing and implementing new technologies (Van Akkeren and Cavaye 1999).

The **second** factor in this model is based on economic considerations, or Return on Investment (ROI). The need by small business owners for an immediate *return on investment* is due to the necessity of being concerned with medium-term survival rather than the long-term attainment of market share. When making a substantial outlay of capital resources the SME owner needs to see an immediate short-term ROI (Fichman and Kemerer 1993).
The **final** category of factors is based on firm characteristics:

- *Organisational readiness* refers to the level of technology currently incorporated into business processes. If there is little technology incorporated, or outdated/inefficient technology being utilised, a firm is less prepared to incorporate the technologies and therefore less likely to adopt (Iacovou et al. 1995).
- A small business owner/manager will be reluctant to adopt innovative IT unless there is a specific request for it by their trading partners and/or customers. If this *external pressure to adopt* IT is not present in the industry sector, then the business owner may perceive the technology as a waste of resources (Thong and Yap 1995, Iacovau et al 1995).
- The *dependency of the small business customer on the supplier* is linked to the previous factor. Not only would the supplier need to have adopted the technology to make it viable, the small business owner would need to recognise and understand the benefits to his or her firm in adopting the technology. In addition, an organisation may perceive that their clientele was of a certain socio-economic level that would not readily benefit from the introduction of new technologies (Kirby and Turner 1993).
- The *structural sophistication of the firm* in terms of centralisation and complexity will also influence technology adoption in its ability to incorporate new technologies into its work practices. A particularly complex structure could either inhibit or facilitate technology adoption and would be dependent on whether the owner believed that IT could be easily incorporated and enhance operations, or excessively disrupt operations (Julien and Raymond 1994, Harrison et al. 1997).
- The *size, sector and status* of the organisation have been shown to influence technology adoption, particularly in relation to the sector and status. If competitors and trading partners within the sector have adopted IT, an owner may be more inclined to adopt as well. The size of the business can also influence technology adoption, as a very small business with only two or three employees may not have the time or expertise to devote to implementing and using new technologies (Thong and Yap 1995, Julien and Raymond 1994, Harrison et al. 1997).
- Finally, the *level of information intensity* within the organisation may influence the owner to adopt or not adopt a technology. For example, if large amounts of data and information are part of the business processes, an owner may be more likely to adopt technologies that could streamline operations and lead to improved information process within the organisation (Thong and Yap 1995).

Recent studies about why SME owner/managers adopt or do not adopt IT and e-commerce technologies have highlighted both inhibitors and facilitators to adoption and are similar in content to the factors described above. Thong (1999) discusses SME adoption as being determined by decision-maker characteristics, information system (IS) characteristics, organisational characteristics and environmental characteristics. Further, the need for IS to offer better alternatives to existing practices are critical to adoption by SMEs (Thong 1999). Therefore, could the use of mobile data technologies provide the 'better service' that SME owner/managers seek?
Owner/manager characteristics, planning orientation, and the existence of alliances/networks influence technology adoption by SMEs (McGregor and Gomes 1999). Specifically in terms of alliances/networks, previous literature also suggests that the decision to adopt or not adopt IT will be influenced by the network within which the small business operates, particularly if time, cost and operational efficiencies can be realised (Piovesana and Raush 1998, Lawrence 1998, Sillence, MacDonald, Lefang, Frost 1998). In contrast, Bridge and Peel (1999) in their study of SMEs in the UK, suggested that adoption of IT would be improved through education of the benefits of the technologies and by fostering a planning orientation to IS design and implementation.
In an Australian study on IT adoption by SMEs, Fink (1998) identified adoption decisions as having three distinct phases: assessing IT benefits, organisational culture and firm-suited IT; assessing internal resources and procedures; and evaluating external environment, support and services. In terms of mobile data technologies,

one could argue that owner/mangers would need to assess what, if any, benefits can be derived by adopting the technologies and whether their firm was suited to adoption. Part of that evaluation would necessarily need to include both the internal and external environment in which the firm operates.
Previous studies on SME adoption of IT/e-commerce highlight a range of factors thought to influence an owner/managers' decision to adopt new technologies. The marketing of mobile data technologies to SME owner/managers will be competitive and intense.

The marketing of innovations

The marketing of innovations to SMEs has undergone considerable analysis and debate, particularly in relation to new technologies. Mahajan and Muller (1998) propose that with 'high-tech' products, the targeting of innovations does not necessarily lead to market success. Further, they suggest that traditional 'laggards' are dropped from marketing strategies and 'innovators' and 'early adopters' be grouped together and targeted. In this way, the early and late majority can be grouped as the mainstream market and strategies developed separately for this group.
Major innovations may have to 'prove themselves' in new markets before they can displace other technologies (Friar and Balachandra 1999). It is the early adopters or innovators who will initially experiment with these technologies and hence marketing of new technologies to this group is a useful first step. In addition, the usefulness and ease-of-use will impact on owner/manager acceptance of the technologies (Agarwal and Prasad 1997). Thus, focusing on these attributes may improve overall acceptance by SME owner/managers, a view supported by Nambisan and Wang (1999) who posit that the acceptance of web-based technologies is influenced by ease of use and perceived usefulness in terms of current IS sophistication, complexity of the new technologies, and perceived costs and benefits. They add that strategies needed to market web-based technologies should address the needs of the user and identify for them the context to which the technology can be used for business purposes.
Previous studies suggest that the marketing of technological innovations to SME owner/managers is a minefield of emotion, attitudes, behavioural intention and perceptions, coupled with other factors considered important to owner/managers such as cost and technical complexity. Further, issues such as computer literacy of the owner/manager, and the size, sector and status of the firm are also considered important. It would appear, therefore, that marketers of MDT have many barriers to overcome.

Mobile data technologies and SMEs

In Australia, the adoption of Internet/e-commerce technologies varies in different states, and further, between regional and city-based firms. However, the adoption of mobile phones is consistently high across states and regions within Australia. MDT, which marries mobile phones and e-commerce technologies, is seen as eliminating time and distance as barriers for regional businesses in their adoption of these technologies. A search of the literature has provided limited results on MDT adoption and/or marketing strategies, however, this is not surprising given the 'newness' of the technologies.
The mass market for mobile data technologies is so far largely untapped (Axby 1998, Harrison 1999). Estimates put usage of mobile devices as one billion worldwide by 2003 (Greengard 2000), or US$1.3 trillion in relation to annual turnovers by 2003 in the US alone (Thurston 2000). With such potential markets available to the vendors of mobile data services and devices, it is useful to understand reasons why the majority of potential end-users are so far resisting these new technologies.
Lack of speed is a barrier to adoption as MDT is slow and hence inefficient (Taylor 1999, Saunders, Heywood, Dornon, Bruno, and Allen 1999). Another barrier is the lack of standardised IT environment for developing mobile data applications and this impedes the growth of the mobile data market (Harrison 1999, Axby 1998). Limited bandwidth, higher usage costs, increased latency, and a susceptibility to transmission noise and call dropouts are also possible barriers to adoption (Duffy 1999). In addition, problems with mobile data devices such as limited memory and CPU size; small, monochrome screens; low bandwidth; and erratic connections are further adoption barriers (Johnson 1999). It is possible therefore that adopters are 'sitting back' and waiting for at least some of these problems to be corrected before entering the mobile data market. Another area of concern for end-users is that the Wireless Application Protocol (WAP), the emerging technology used to send data to and from handheld devices, has no in-built security mechanisms and this is of concern not only to the business user, but to the customers of the business as well (Riggs and Bachelor 1999, Chan 2000).
The marketing of mobile devices to potential customers will provide many challenges to the various players in the mobile data industry. Luring potential users away from their desktop PCs will require innovative marketing strategies and the literature provides many different approaches to capture potential customers. Wexler (1999) suggests three factors for the successful proliferation of mobile data services: coverage, ease of use and cost. In terms of segmentation, Axby (1999) suggests that there are two distinct market segments for these products:

white collar groups and blue collar groups, distinguishing these groups via their application needs. For example, access to e-mail, database and file transfer applications will vary between the two segments, therefore packaging the appropriate applications to the particular segment would be a useful strategy.
It may also be argued that products would need to be developed for both business and the mass consumer markets. Capturing users requires 'transparency', that is, users want information or communication access whenever and wherever they need it, using whatever device is most convenient at that moment (Osowski 1999). Consumers do not buy technology; they buy benefits (Duffy 1999) and MDT benefits include easy communication through e-mail, ready access to information, entertainment, and improved lifestyle through e-commerce and home banking.
A 'customer-centric' focus that personalises the device, providing simplicity, intimacy, transparency and immediacy, provides a complete e-business solution (Hom 2000). Clearly, the literature on marketing mobile data devices to date underlines the importance of highlighting the benefits of using the technologies, and the ease of use to potential customers.
Most literature on the adoption and marketing of MDT is not empirically based and is limited to discussing the technologies in terms of their application to business, rather than adoption barriers or marketing strategies. Findings from this research provide a deeper understanding of the facilitators and barriers to the adoption of MDT by SME owner/managers and focuses on the needs of the businesses.

RESEARCH DESIGN

Data collection

Potential respondents were drawn from the Yellow Pages online with different business types grouped into their industry sector according to the Australian and New Zealand Standard Industry Classification (ANZSIC) system. The database comprised approximately 5500 potential respondents in total and a sample of 500 respondents were interviewed.
Interviewers worked through their respective database in a random manner to contact potential respondents and a policy of three callbacks before disregarding the potential respondent was employed.

Response rates

Following completion of the 500 telephone interviews, and in conjunction with the data entry process, questionnaires were screened to gauge their usability. Of the 500 survey response sheets submitted by interviewers as 'completed', 18 were deemed 'not usable' due to substantial insufficient collection of data on certain variables[2], or due to the respondent falling outside certain sampling parameters[3]. The final sample size was thus 482, derived from 1251 telephone calls, indicating an overall response rate of 39% which is above the accepted norm. Data was coded and entered into an SPSS Data File.

Data analysis

Setting the p level at 0.05, as was done in this study, succeeded in filtering out weak correlations, thus we can be 95% confident that the results are actually true. Unless otherwise stated the p-level here is significant at 0.05 or less, indicating that there is a 5% probability that the relation between the variables found in the results is a chance occurrence.
This research was concerned with understanding the needs of SMEs for MDT. However, the literature suggests that it is foolish to treat all SMEs the same in respect of IT and, thus, a measure of IT adoption was used to ascertain whether a full-adopter of technology, for example, had the same needs for MDT as did a partial- or non-adopter. Thus, the rate of IT adoption is crucial to business longevity in the 21st Century; indeed, 62% of SMEs are in the process of becoming online businesses, with a further 29% recognising the need to do so (Dearne 2001). Further, more than nine in ten (95%) medium sized businesses are now connected to the Internet (Dearne 2001). With this in mind, Analysis of Variance (ANOVA) was conducted to identify differences

[2] Insufficient collection of data on certain variables resulted from impromptu termination of the interview by the respondent. 'Substantial' insufficient data was defined as a situation whereby the respondent completed less than 50% of the Questionnaire, not including demographic data (if the demographic data was in fact completed).
[3] 'Falling outside sampling parameters' refers to responses that were obtained (unknowingly on the interviewer's behalf) from outside the geographical sampling area, or from businesses with more than 200 employees (i.e. not an SME).

between more than two groups (for example, adoption levels). The ANOVA tests were run with a 'Tukey's post hoc evaluation'[4] to determine significant differences between groups at the 5% significance level.

Adoption status

Table 1 displays adoption status characteristics of the sample. In brief, **non-adopters** were defined as those respondents who *did not* use computers for business purposes (i.e. in the day-to-day running of a commercial enterprise). **Partial-adopters** were those respondents who used computers for business purposes, however *did not* use an Internet connection for business purposes. **Full-adopters** were defined as those respondents who used a computer *and* an Internet connection for business purposes.

Table 1: Adoption Status – Sample Characteristics

Adoption Status	No.	% of Total Sample
Non-Adopters	70	15%
Partial-Adopters	137	28%
Full-Adopters	275	57%
Total	482	100%

FINDINGS

1. Technology Adoption by Adopter Level

Few studies concerned with the adoption of technology by SMEs have focused on past or current behaviour as an indicator of future intent. This study specifically categorised SME owner/managers based on current usage of IT and then focused on the needs of these three categories in relation to the newest technology, MDT. Given the obvious link between the Internet and mobile phones, in terms of MDT, these two areas were specifically addressed in the survey.

The Internet

More than half of the sample (57%) had an Internet connection used for business purposes. These **'full-adopters'** were asked their main reason for being connected to the Internet as well as their secondary or other reasons (if any) (see Table 2). The question used to elicit this information for all respondents was open-ended and responses were analysed and subsequently coded.

Table 2: Internet Usage by Full-Adopters – Reasons SME Connected to Net

Reason Connected/Use	No. times named as 'Main Reason'	% of 'Main Reasons'	No. times named as 'Secondary Reason'	% of 'Secondary Reasons'
Research or Information Search	90	33%	47	25%
Communicate/email	83	30%	52	28%
Advertise Products and Services	31	11%	15	8%
Download Info. or Software	18	7%	25	13%
Order Products & Services	16	6%	12	6%
Take Orders (Sales)	11	4%	8	4%
Network with Other Businesses	8	3%	6	3%
Monitor Competition	6	2%	10	5%
Use Directories like Yellow Pages	5	2%	4	2%
Banking/Pay Bills	4	2%	7	4%
Pay for Products & Services	1	-	1	-
Other	1	-	1	-
Don't Know/Can't Say	1	-	-	-
Total	**275**	**100%**	**188***	**100%**

**Not all 'full-adopters' named a secondary reason for connecting to the net.*

[4] These tests and post hoc evaluation methods were administered as recommended by Coakes & Steed (1999) and Sekaran (1992).

The most significant reasons for SMEs being connected to the Internet were to research, or information searching and communicating/email. These reasons rated highest as both the main and secondary reasons for connecting. Far fewer SMEs reported conducting transactions such as 'ordering products and services', 'paying for products and services' and 'banking/paying bills'. While this does not mean that such activities were not undertaken, the data merely suggests that these are not (currently) the main reasons SMEs adopt Internet technologies.

Table 3 outlines the reasons given to the same question by partial- and non-adopters of technology. It should be noted that no distinction was made between the reasons for not using a computer (nons) and the reasons for not connecting to the net (partials). Rather, the reasons listed refer to general reasons for 'not connecting'.

Table 3: Reasons NOT Connected (Nons and Partials)

Reason NOT Connected	No. times named as 'Main Reason'	% of 'Main Reasons'	No. times named as 'Other Reason'	% of 'Other Reasons'
No Benefit to Business	67	32%	16	29%
Will Connect/Looking into it	52	25%	4	7%
Not Interested	28	14%	8	14%
Don't Know Enough	24	12%	15	27%
Can't Afford it	12	6%	7	13%
Wrong Equipment	10	5%	1	2%
No Time	7	3%	4	7%
Don't Know/Can't Say	4	2%	-	-
Security Worries	3	1%	1	2%
Total	**207**	**100%**	**56***	**100%**

**Not all non- or partial-adopters named an 'other' reason for NOT connecting.*

Of the 207 respondents classed as either non- or partial-adopters, approximately one third (32%) saw no reason to connect, either to a computer or the Internet, for business purposes, as they could see no benefit to their business. However, 25% of non- or partial-adopters conceded that they will connect in future or are 'looking into it'. 'Not knowing enough' also ranked as an important primary and secondary reason for not connecting.

Mobile Phones

The majority of respondents (82%) used a mobile phone for business purposes. However, of those who did not use a mobile phone for business purposes, only a small proportion were 'non-adopters'. In other words, some SMEs used computers and the Internet but did not use mobile phones. Only 17 respondents, or 4% of the total sample, used neither a mobile phone nor a computer for business purposes. Nearly half (47%) of the 86 respondents who did not use a mobile phone for business purposes were full-adopters and thus had an Internet connection.

When asked why a mobile phone was **not** used, the majority (81%) indicated they did not see a need. In terms of mobile phone use, most SMEs indicated that the majority of calls made or received on mobile phones were local. One hundred respondents (25% of those that use a mobile phone) indicated that 90-100% of the calls that they made or received were local. Most respondents also indicated that the phone was used less than five times per day although over 50 SMEs (nearly 14% of those that use mobile phones) indicated usage levels exceeding 20 calls per day.

2. Reaction to MDT by IT Adopter Level

The key issue in this research was to test how the different adopter levels compared to each other in their attitudes, needs and approach to technology as it is suggested that the more IT-literate people are, the more aware they will be of their current and future new technology needs. Table 4 displays the results of the ANOVA analysis, showing the key differences between the three adopter groups in terms of MDT needs.

Table 4 – ANOVA Differences Between Adopter Levels

Statement	Full-Adopter	Partial-Adopter	Non-Adopter
Wait before investing (n=474)	2.09	1.74	*
Being able to email (n=460)	2.3	2.66	2.9
Owner/Manager feels excited (n=471)	2.54	2.87	3.04
Trade with customers (n=456)	2.61	3.02	*
Being able to navigate (n=437)	2.73	3.11	3.13
Being able to monitor or operate equipment (n=447)	2.83	*	3.42
Live 2-way video (n=445)	2.92	3.23	*
Staff would feel threatened (n=452)	3.79	3.54	3.05
Overall interest in acquiring (n=474)	**2.49**	*	**2.93**

** only statistically significant results are shown.*

The ANOVA results showed that there were clear differences in the attitudes and needs of respondents, depending on their different level of adoption of technology. Full-adopters were more excited about the prospect of this technology compared to the partials and nons. This state of mind is carried through the data as, in terms of waiting before investing in the technology, the full-adopters indicated that they would not wait as long as the partial-adopters. Similarly, in the business environment, there are key differences between the three groups. The non-adopters, for example, are significantly different to the other two groups in relation to staff reaction. It would appear that the less familiar the owner/manager is with current technology, the higher their perception is that their staff would likewise be uncomfortable with new technology.

Clearly, the acceptance of technology will influence attitudes and approaches to it; it will also influence perceived needs of different market segments. A key bank of questions in the questionnaire focused respondents on the use of MDT in a business setting and asked them to state to what extent they agreed or disagreed[5] with a set of statements. To complement this bank of questions, an important, overarching question was also posed but placed later in the survey to alleviate any bias. This later question gauged the level of interest[6] in acquiring the MDT, if it was available and affordable tomorrow. Thus, by focusing on those respondents who answered either 'strongly agree' or 'agree' with each statement in the 'key benefits' bank, it can be shown which features of MDT are important to each adopter level.

Full-Adopters

Full-adopters were most comfortable with technology compared to the rest of the sample. Table 5 displays the rankings of key benefits for the full-adopter group, together with the 'overall interest in acquiring' response.

Table 5 – Full-Adopters who 'Strongly Agree' or 'Agree' with Statements

Rank	Statement	Full-Adopter % (n=275)
1	Wait before investing	86
2	Being able to email	79
3	Owner/Manager feels excited	64
4	Trade with customers	62
5	Banking and other admin.	59
6	Trade with suppliers	59
7	Monitoring business premises	59
8	Being able to navigate	56
9	Being able to access the net	53
10	Being able to monitor or operate equipment	53
11	Competitive pressure to adopt	52
12	Live 2-way video	49
13	No need for this technology	35
14	Being able to shop	31
15	Staff would feel threatened	15
	Overall interest in acquiring	**60**

[5] Using a Likert-type scale where 1=strongly agree to 5=strongly disagree.

[6] Using a Likert-type scale where 1=very interested to 5=very uninterested.

Whilst full-adopters agree that they will wait a while before investing in the mobile data technology (86%), the owner/manager was excited by the prospect of it (64%). In terms of addressing the needs of the full-adopter SME owner/manager, the most important benefits were found to be using MDT for mobile email (79%), e-commerce via trading with customers (62%) and suppliers (59%), and to bank at their own convenience (59%) or monitor their premises (59%).

Six in ten (60%) full-adopters were very interested or interested in acquiring this technology.

Partial-Adopters

Table 6 displays the rankings of key benefits for the partial-adopter group.

Table 6 – Partial-Adopters who 'Strongly Agree' or 'Agree' with Statements

Rank	Statement	Partial-Adopter % (n=137)
1	Wait before investing	93
2	Being able to email	64
3	Banking and other admin.	60
4	Monitoring business premises	56
5	Trade with suppliers	53
6	Owner/Manager feels excited	48
7	Trade with customers	46
8	Competitive pressure to adopt	46
9	No need for this technology	46
10	Being able to monitor or operate equipment	44
11	Being able to navigate	42
12	Being able to shop	42
13	Being able to access the net	40
14	Live 2-way video	38
15	Staff would feel threatened	26
	Overall interest in acquiring	**59**

Nine out of ten (93%) partial-adopters agreed, or strongly agreed, that they would wait a while before investing in this technology. However, when focused on how the technology could help them in their business, partial-adopters mainly felt that being able to deal with email (64%), banking (60%), and monitoring their business premises (56%), all in a remote fashion, would be advantageous. Six in ten (59%) partial-adopters were interested or very interested in acquiring this technology.

Non-Adopters

Non-adopters have little knowledge of IT in general, and use it least compared to the other two groups. Table 7 displays the rankings of key benefits for the non-adopter group.

Table 7 – Non-Adopters who 'Strongly Agree' or 'Agree' with Statements

Rank	Statement	Non-Adopter % (n=70)
1	Wait before investing	87
2	Trade with suppliers	62
3	Banking and other admin.	52
4	Trade with customers	51
5	Being able to email	51
6	Being able to access the net	47
7	Live 2-way video	45
8	Being able to navigate	45
9	No need for this technology	44
10	Monitoring business premises	44
11	Staff would feel threatened	43
12	Competitive pressure to adopt	43
13	Owner/Manager feels excited	42
14	Being able to monitor or operate equipment	30
15	Being able to shop	29
	Overall interest in acquiring	**44**

Whilst non-adopters indicated that they, like the other two groups, would wait a while before investing in MDT (87%), they did not feel as strongly on this as the partial-adopters of technology (93%). The features of MDT that the non-adopters valued most were e-commerce via trading with suppliers (62%) and customers (51%), remote banking (52%), and email (51%).
In a marked difference to both the full-(60%) and partial-adopters (59%) of technology, less than half (44%) of the non-adopters were 'very interested' or 'interested' in acquiring this technology.

3. Industry Differences by Adopter Levels

This research project was concerned with understanding the differences between different adopter status groups in relation to MDT needs; including the industry sector variable into this discussion at this point strengthens the analysis. By displaying a cross-tabulation of these two aspects of the data, greater insight is provided in terms of the profile of industry sector by adopter status (Table 8).

Table 8 – Industry Sector by Adopter Status (%)

Industry Sector	Full-Ad.	Partial-Ad.	Non-Ad.	Total Industry
Property and Business Services (n=71)	85	15	0	100
Health and Community Services (n=45)	73	25	2	100
Agriculture, Forestry and Fishing (n=15)	60	13	27	100
Manufacturing (n=35)	60	17	23	100
Transport and Storage (n=18)	56	33	11	100
Wholesale Trade (n=28)	55	28	17	100
Retail Trade (n=106)	52	27	21	100
Construction (n=79)	47	36	17	100
Accommodation, Cafes and Restaurants (n=35)	45	33	22	100
Personal and Other Services (n=38)	32	55	13	100
Communication Services (n=4)	25	50	25	100
Total (n=482)	**57**	**28**	**15**	**100**

The Property and Business Services (85%) sector has the highest proportion of full-adopters of technology, followed by the Health and Community Services (73%) sector. Industries with the lowest proportions of full-adopters include Communication Services (25%), Personal and Other Services (32%) and Accommodation, Cafes and Restaurants (45%).

SUMMARY

This article set two objectives. First, to discuss the literature in the area of adoption of mobile data innovation and, second, to report on the findings of an empirical study with SMEs in a regional setting. Both of these objectives have been achieved and the empirical findings have assisted the primary aim of the research, which was to identify the needs of SMEs in regional areas for MDT.

Many factors impact on the adoption of MDT by companies, and many different applications will specifically encourage SMEs in regional areas to adopt. However, much of the literature to date has been of a speculative nature, with little empirical research to identify the variables that play a role in the adoption and marketing of these technologies, or in identifying the most appropriate applications. In this study, two key variables related to the firms were considered for analysis; the current IT adoption level and industry sector. The needs of regional SMEs for MDT applications can, however, be classified into three areas; communication, e-commerce, and security.

Overall, SMEs on the Sunshine Coast would wait before investing in this technology. However this is not surprising, given that Australian SMEs have generally been slower to adopt e-commerce technologies, compared with other developed countries such as Japan, the US and Singapore (Forrester Research 1997, Lawrence et al 1998, Van Akkeren and Cavaye 1999). This study has shown that SMEs have an overriding need for **communication**, closely followed by a need for **e-commerce** capabilities and **security**; thus, specific applications that address these needs include:

- access to email,
- trading with customers,
- trading with suppliers,
- banking and other administrative tasks, and
- monitoring business premises.

The ANOVA analysis showed that there are in fact key differences between the adopter level groups and, in marketing and adoption terms, this should be taken into account. There is a distinct difference, for example, between full- and partial-adopters when considering how long to wait before investing in MDT; the fulls would adopt quicker than the partials. Equally, the more comfortable the owner/manager is with current technology, the more excited they feel about the MDT, and this is further supported when dealing with staff, as the more IT-literate the owner/manager, the less threatened they say their staff would feel. Table 9 summarises the top ranking features of MDT needed by adopter group.

Table 9: Top Ranking Features of Mobile Data Technology by Adopter Groups

Statement	Full-Adopter (n=275)	Partial-Adopter (n=137)	Non-Adopter (n=70)
Being able to email	1st	1st	3rd
Trade with customers	2nd	-	3rd
Banking and other admin.	3rd	2nd	2nd
Monitoring business premises	3rd	3rd	-
Trade with suppliers	3rd	-	1st

Broadly, small businesses have needs for **communication** (email), **e-commerce** (trade with customers and suppliers) and **security** (monitoring business premises) when considering MDT.

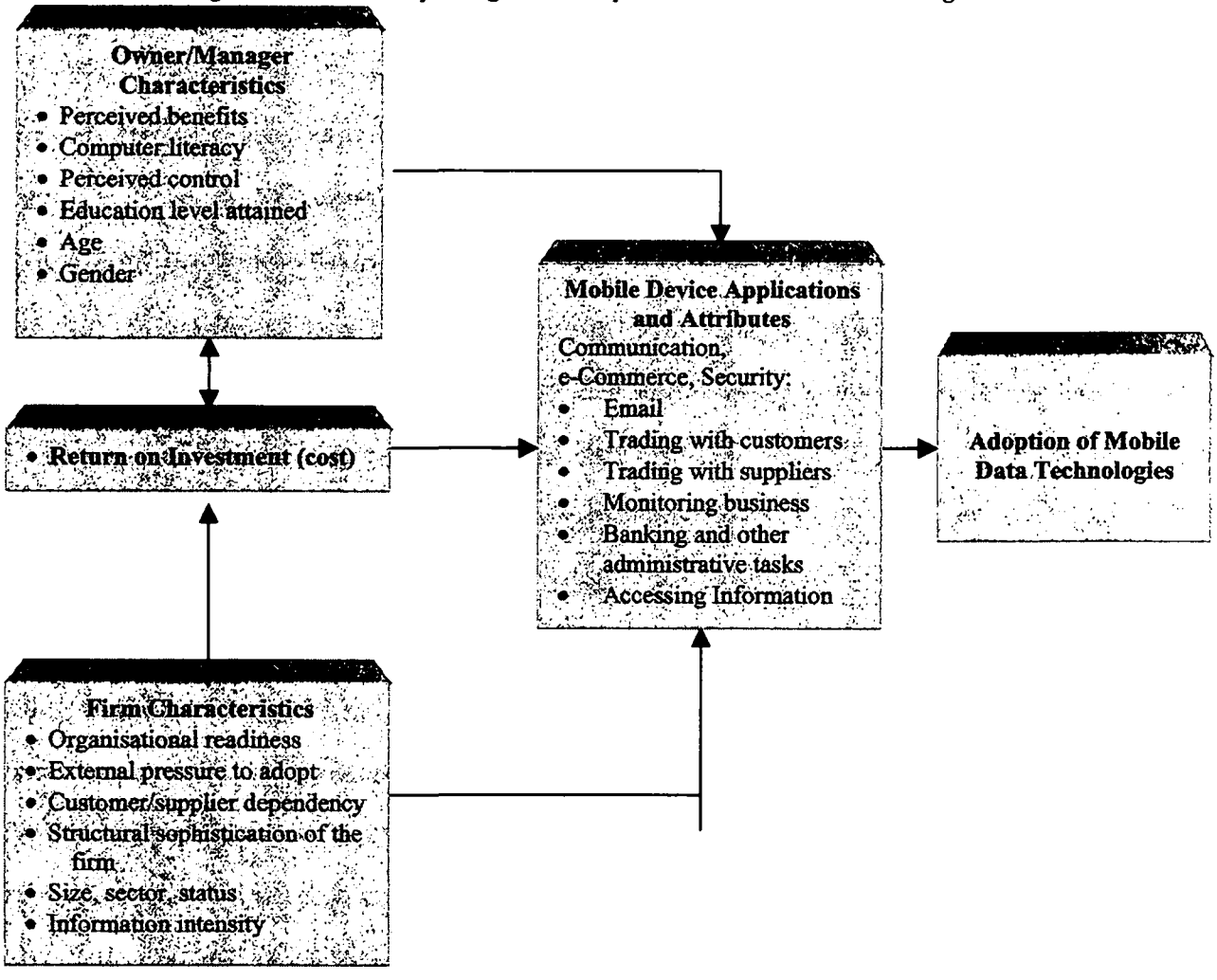
The industry sector to which respondents belonged also had some influence on attitudes towards MDT and this supports findings in previous studies that industry sector will influence adoption (Thong 1999, Yellow Pages 1999). Interest in acquiring the technologies was strongest in the Transport and Storage, Communication, and Personnel and Other Services sectors.

Overall the reaction to the new technology was very positive as, in every industry except one, more than half of the respondents were either 'very interested' or 'interested' in acquiring mobile data technologies. (The industry least interested in acquiring the technology was Construction at 46%). Within these industry sectors, the top ranking applications that support the underlying principle of mobile data technologies (business anywhere, anytime) were consistently noted as email (communication), trading with customers, trading with suppliers, banking and other administrative tasks (e-commerce), and monitoring business premises (security).

CONCLUSION

Findings from this study have allowed refinement and development of the model presented earlier (figure 1). The refined model, figure 2, incorporates a range of factors impacting on regional SME adoption of MDT specifically and it is hoped that this model can provide direction for future research on the adoption and diffusion of MDT for SMEs.

Figure 2 – Factors impacting SME Adoption of Mobile Data Technologies



SMEs, by definition, do not have the luxury of time and money that bigger firms do. If they are going to invest money in new technology, whether it be a mobile phone, computer, PDA or MDT, they need to be able to reap immediate rewards. The most important aspects of SME owner/manager's daily business lives are concerned with communication and being in constant contact with the business in order to pursue contacts, orders, invoices and so on. However, they are also aware of the way the world is changing and, thus, identified a need of being e-commerce capable. These managers recognise the inherent cost savings of conducting electronic business and banking and this is important to them. Finally, security is an vital issue for most SMEs; their business premises are their livelihood and any untoward actions (such as staff pilfering, burglaries) have an immediate and dramatic effect on their bottom-line.

Findings from this research project make both theoretical and practical contributions. Theoretically we now know more about the adoption of the newest innovation, MDT, in the context of regional SMEs. This work has contributed to the disciplines of information systems, marketing and small business. In practical terms, both marketers and developers of MDT can learn from the findings presented here and strive to continue to be customer-focused.

LIMITATIONS AND FURTHER RESEARCH

Despite attempts to instil the utmost rigour into research designs, all studies will inevitably have limitations, and this one is no different. The two major limitations of this research are concerned with the data collection method employed and the lack of knowledge by respondents about this very new technology.

The data collection method employed in this study was selected as being the most practical, given the nature of the task. The cost and time involved in conducting face-to-face interviews with 500 small and medium sized enterprises would have been prohibitive, and the poor response rates of mail surveys are well documented. Thus, telephone interviewing was selected and the needs of the respondents were given great consideration. The interviews were no longer than ten minutes and the questionnaire utilised both open-ended and scaling questions to assist in time management. However, the drawbacks of this type of data collection technique with this population are that owner/managers of SMEs have little time to spend discussing new technologies over the phone, as they are very busy people.

The second limitation of this study relates to the implications associated with conducting research into very new technology. Whilst most people interviewed were aware of current technologies such as the Internet, mobile phones and computers, knowledge of the new mobile data technology was obviously limited. This situation inevitably had an effect on soliciting views about the technology.

Whilst these two limitations are significant, every effort was made to make the data collected both relevant and rigorous.

This project has far-reaching implications in terms of further research and a number of directions are proposed below for other researchers to pursue:

1. Replicate this study in a metropolitan environment.
2. Replicate this study in other regional areas.
3. Replicate this study in other countries.
4. Tracking studies, say, in 6 months, then one year:
   a. to test changes in adoption status.
   b. to test changes in needs and wants in terms of applications.
   c. to test changes in attitudes and needs of different industry sectors.
5. Industry-specific needs study.
7. Focus on adopter groups.

All of these areas of further research will elicit information that will be useful to the development and adoption of MDT in Australia. Each area of further research is a significant project in its own right and different research methodologies should be employed to uncover the truth in each case.

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