

The impact of mobile devices on SMEs in Auckland, New Zealand

Haiteng Huang

2008

The impact of mobile devices on SMEs in Auckland, New Zealand

Haiteng Huang

**A dissertation submitted in partial fulfillment of the requirements for
the degree of Master of Computing**

Unitec New Zealand, 2008

Abstract

Business is selling goods and services to customers (Thefreedictionary, 2008). Wholesale Small and Medium Enterprises (SMEs) are doing business and having the latest information is very important for their business. The ones that have the latest information will get the latest products and will increase their market share. Mobile devices provide data transfer ability and allow immediate access anywhere and anytime. Mobile devices are becoming important for communication in their business. This research investigated the impact of mobile devices on SMEs in Auckland, New Zealand (NZ). Data was gathered by interview. Fifteen SMEs were invited to interview. Thirteen participants in eight SMEs agreed to be interviewees. The findings of the interviews pointed out that most SMEs were using mobile devices for communication and most SMEs were using Bluetooth for data transfer. This study may help SMEs to appreciate the role of mobile devices as important communication tools in their business. The study findings may be useful for manufacturers and application developers to target mobile devices especially for SMEs market.

Acknowledgements

I would like to thank my principal supervisor Hira Sathu and associate supervisor Julia Ngatuere. They have given me a lot of new ideas and helped me in every step. Without their help, I could not have completed my dissertation.

I would like to thank the interviewees who agreed to be interviewed for my research. Without their help the data for doing this research would not have been available, and the consequent study would not have been possible.

Finally, I would like to thank my family members who have supported me and given me a chance to finish my master's degree.

Declaration

I hereby certify that this material, which I submit for assessment on the programme of study leading to the award of Master of Computing, is entirely my own work.

Table of Contents

Abstract	i
Acknowledgements	ii
Declaration	ii
List of Tables	v
List of Figures	vi
List of Acronyms	vii
1. Introduction	1
2. Literature Review	2
2.1 Mobile Devices Definition	2
2.1.1 Cell Phone Definition	3
2.1.2 PDAs Definition	3
2.1.3 Smart Phone Definition	4
2.1.4 Mobile Data Technologies	4
2.1.5 3G Evolution	6
2.2 Classification of SMEs	8
2.2.1 Defining SMEs Worldwide	8
2.2.2 SMEs in NZ	9
2.3 Impact of Mobile Devices on SMEs Worldwide	10
2.5 Impact of Mobile Devices on NZ SMEs	14
3. Research Methodology	20
3.1 Research Question	20
3.2 Data Collection Methods	21
3.3 Method of Study	21
4. Data Gathering	25
4.1 Position of Respondents	25
4.2 Core Business	26
4.3 Use of Mobile Devices (by Type)	28
4.4 Mobile Device Functions/Services	32
4.5 Mobile Date Technologies (MDTs)	34
4.6 Mobile Devices Usage in Business (by Function)	37
4.7 Advantage and Disadvantage of Mobile devices in Enterprises	38
4.8 Decision to Use Mobile Devices	39
4.9 Other Issues about Mobile Devices	40
5. Data Analysis & Interpretation	40
5.1 Position of Respondents	41
5.2 Core Business	41
5.3 Use of Mobile Devices (by Type)	42
5.4 Mobile Device Functions / Services	43
5.5 Mobile Data Technologies (MDTs)	44
5.6 Mobile Devices Usage in Business (by Function)	44
5.7 Advantage and Disadvantage of Mobile Devices in SMEs	45
5.8 Decision to Use Mobile Devices	45
6. Summary of Findings	46
6.1 The Impact of Mobile Devices on Wholesale Trade SMEs in Auckland Region	46
6.2 Mobile Device Types Currently Used by SME Owners and Employees	46
6.3 Functions / Services of Mobile Devices Used by SME Owners and Employees	47
6.4 What Purposes Do the Mobile Devices Serve	48
7. Conclusion	50
7.1 Limitations	50
7.2 Implications and Recommendations for Future Study	50
Appendices	52
Interview Questions	52
Information Sheet	55

Consent Form	57
References.....	59

List of Tables

Table 1:	ANZSIC Classifications (Ministry of Economic Development, 2005).....	9
Table 2:	ANOVA Differences between Adopter Levels (Harker & Van Akkeren, 2002).....	15
Table 3:	Full-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002).....	16
Table 4:	Partial-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002).....	17
Table 5:	Non-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002).....	18
Table 6:	Number of full-time employees	27
Table 7:	Number of part-time employees.....	28
Table 8:	Size of the enterprises	41

List of Figures

Figure 1:	ANZSIC Classifications (Ministry of Economic Development, 2005).....	10
Figure 2:	Framework of SME Adoption of Innovations (Van Akkeren & Cavaye, 1999).....	11
Figure 3:	Business-based m-commerce framework scenario (Shih & Shim, 2002).....	13
Figure 4:	WAP communication schema (Shih & Shim, 2002).	14
Figure 5:	Back ground of respondents.....	25
Figure 6:	Percentage of Wholesale enterprises.....	26
Figure 7:	Types of wholesale enterprises.....	27
Figure 8:	Types of mobile devices.....	29
Figure 9:	Number of cell phones.....	29
Figure 10:	Number of Smart Phones.....	30
Figure 11:	Number of PDAs.....	30
Figure 12:	Percentage of employees operating cell phones.....	31
Figure 13:	Percentage of employees operating Smart Phones.....	31
Figure 14:	Percentage of employees and business owners operating PDAs.....	32
Figure 15:	Functions and services of Mobile devices.....	33
Figure 16:	Types of MDTs.....	34
Figure 17:	Number of respondents using 3G Mobile Data usage.....	35
Figure 18:	Number of respondents using GPRS.....	35
Figure 19:	Number of respondents using Wi-Fi.....	36
Figure 20:	Number of respondents using Bluetooth.....	36
Figure 21:	Number of respondents using IrDA.....	37
Figure 22:	Mobile device usage in Enterprises.....	38
Figure 23:	Initiation for using mobile devices.....	40
Figure 24:	Size of Enterprises.....	42

List of Acronyms

1G: First Generation Mobile Network

2D: Two Dimensions

2G: Second Generation Mobile Network

3D: Three Dimensions.

3G: Third Generation Mobile Network

ANOVA: Analysis of Variance

ANZSIC: Australian and New Zealand Standard Industrial Classification

APs: Access Points

CDMA: Code Division Multiple Access

CPU: Central Processing Unit

EDGE: Enhanced Data rates for GSM Evolution

GPS: Global Positioning System

GSM: Global System for Mobile Communications

HSDPA: High-speed Downlink Packet Access

HTML: Hypertext Markup Language.

IE: Internet Explorer.

IEEE 802.11: Institute of Electrical and Electronics Engineers 802.11

IR: Infrared

LAN: Local Area Network

M-commerce: Mobile commerce

Mbps: Megabyte per second

MANs: Metropolitan Area Networks

MED: Ministry of Economic Development

MDT: Mobile Data Technologies

MMS: Multimedia Messaging Service

NZ: New Zealand

PC: Personal Computer

PDA: Personal Digital Assistant

PSP: Play Station Portable

RAM: Random Access Memory

ROM: Read Only Memory

SMEs: Small and Medium sized Enterprises

SMS: Short Message Service

TD-SCDMA: Time Division-Synchronous Code Division Multiple Access

UMTS: Universal Mobile Telecommunications System

UK: United Kingdom

US: United States

USB: Universal Serial Bus

W-CDMA: Wideband Code Division Multiple Access

WAP: Wireless Application Protocol

Wi-Fi: Wireless Fidelity

Wireless-LAN: Wireless Local Area Network

WiMax: Worldwide Interoperability for Microwave Access

WML: Wireless Markup Language

1. Introduction

The number of mobile device is about 5 to 10 times the number of personal computers (PCs) in the market (Bracey & Culver, 2005). Mobile devices are growing faster than PCs along with growth in information technology. Mobile devices such as cell phones are easily available to every one and this has led to their growth. The focus of this dissertation is to research the impact of mobile devices in Wholesale trade Small and Medium Sized Enterprises (SMEs) in Auckland, New Zealand (NZ).

Mobile devices have gained popularity in the present world (Geser, 2004). Non IT professionals such as students, farmers and doctors use mobile devices (Brewer et al., 2005). Mobile devices can be used for long distance communication (Kristoffersen & Ljungberg, 1999). First generation cell phones allowed people to talk and listen to each other anywhere and anytime without the wire (Rafael, 2003). The third generation (3G) phones allow people to see each other anywhere and anytime in addition to exchange of speech (audio) (BBC, 2004).

Previously wholesale trading SMEs manually recorded information for their business (Chau & Turner, 2001). Wholesale trade SMEs spent lots of time and human resource in this. In spite of manual work, they made mistakes. Lately they have started using computers instead of manual work. Internet has also been adopted as a part of this change. With greater use of in mobile devices, SMEs are able to work differently from how they used to do earlier.

2. Literature Review

This section will begin with defining mobile devices and then go on to review the literature related to different mobile device technologies. This section will also cover mobile device in SMEs around the world. The discussion on mobile devices with special emphasis being used by SMEs in NZ will follow thereafter.

2.1 Mobile Devices Definition

A mobile device is a handheld pocket sized computing device with a small screen for out put and a mini keyboard or touch screen as an input device, such as a cell phone, smart phone, PDA or any other portable computing device (Paelke, Reimann, & Rosenbach, 2003; Sarker & Wells, 2003).

Hand held mobile devices that will be chosen for this research are those that affect SMEs. These could cover cell phones, PDAs and the like. These devices are expected to influence SMEs' business performance. Mobile devices used exclusively for entertainment are not included in this study, such as Play Station Portable (PSP) and MP3 players. Those devices are developed for entertainment only not for business. Some old mobile devices are not chosen either such as calculator and cordless phones.

In view of many / diverse mobile devices, this sub section undertakes to define the scope of mobile devices for the purpose of this dissertation. Devices that are included for this study will cover:

- Cell phones
- Smart phones, such as Sony Ericsson Smartphone, BlackBerry, iPhone
- PDAs

Mobile devices that are excluded are:

- Handheld Music Players, such as Mp3, CD-Player
- Handheld game consoles, such as PSP, gameboy
- Handheld televisions

- Calculators
- Cordless phones (extension of common landline phones).
- Other IP phones
- Table PC

2.1.1 Cell Phone Definition

A cell phone is an electronic telecommunication mobile device that uses radio waves or satellite transmission to communicate over a wireless analog or digital network. Cell phones can commonly be named mobile phones or cellular phones. A cell phone supports voice communication, Short Message Service (SMS), Multimedia Message Service (MMS), Web browsing and email (Jupitermedia, 2007; PhoneServiceReviews.com, 2007).

2.1.2 PDAs Definition

A Personal Digital Assistant (PDA) is a small size mobile device that fits in the hand and has a touch screen and a small keyboard. PDAs support voice communication, fax capability and email service via a wireless network connection. PDAs support software applications such as Internet Explorer (IE) and Calendar. PDAs have evolved and incorporate cell phone and 3G functions (Bytown, 2007; CITES, 2007).

Most current PDAs incorporate cell phone features such as the PDA phone which was released during the 2.5 G mobile phone. Some new PDAs are built with 3G features as well. They can connect to Internet with faster speed via 3G and IEEE802.11 / 16 / 20 Wireless Network standards (Chu & Ganz, 2005).

Some PDAs have two inputs which are mini keyboard and touch screen. For example, I-mate's JasJam is a PDA with 3G features. The device includes 400MHz Central Processing Unit (CPU), 128MB of onboard Read Only Memory (ROM) and 64MB of

Random Access Memory (RAM), 2-megapixel camera, 2.8-inch 320*320 pixel display, keyboard, Wi-Fi, Bluetooth, quad-band Global System for Mobile communications (GSM), 3G - Universal Mobile Telecommunications System (UMTS), Enhanced Data rates for GSM Evolution (EDGE) and High-Speed Downlink Packet Access (HSDPA) (Vodafone.co.nz, 2007a).

2.1.3 Smart Phone Definition

A smart phone is a hand held mobile device which combines cell phone and PDA functions. Smart phones include backlit colour screen, Wi-Fi, Bluetooth, large RAM, large ROM and use advanced operating systems which can support running advance applications. It is also possible to insert memory sticks (Hair, 2006; Holzinger, Nischelwitzer, & Meisenberger, 2005; Zheng & Ni, 2006). The other subsections that follow cover different mobile data technologies below.

2.1.4 Mobile Data Technologies

Mobile data can be divided into 3G, General Packet Radio Service (GPRS), Wireless Fidelity (Wi-Fi), Worldwide Interoperability for Microwave Access (WiMax), Bluetooth, and Infrared Data Association (IrDA).

3G mobile data is based on packet data. 3G cell phone connecting speed can be up to 2Mbps. This feature can be used for developing new applications. IE browser can browse Internet as fast as PCs' IE browser and is able to accommodate high speed broadband. Windows Media Player can play live TV by high speed Internet connection. 2G cell phones using GPRS speed is about 54 Kbps. The 2.5G cell phone connecting speed can be about 114kbps (Halonen & Meler, 2003; M-indya.com, 2007). In New Zealand, Vodafone provides 3G mobile broadband with a maximum speed of 3.5 Mbps and average speed between 800 Kbps and 1.4 Mbps (Vodafone.co.nz, 2007b). NZ Telecom provides mobile broadband average download speed of 800 Kbps and upload speed of 300 Kbps (Telecom.co.nz, 2007).

GPRS is the packet-switched extension of Global System for Mobile Communications (GSM). “*GPRS was developed for IP-based services compared to existing circuit-switched services provided by GSM*” mobile data which is for (GSM) cell phone users. It only can provide 54Kbps. It provides data transfer for MMS, email and Internet browsing (Kalden, Meirick, & Meyer, 2002).

Wi-Fi is wireless technology for local area network. It uses IEEE 802.11 Standards. Wi-Fi supports wireless network for PCs, laptops, PDAs, Cell phones with built-in wireless features. PDAs and Cell phones only use the IEEE 802.11b standard for the wireless network. It can only support 11Mbps for network connection. Some homes and offices have Wi-Fi wireless networks that can provide networks for PDAs and cell phones. If PDAs and cell phones are beyond the ranges of the wireless hubs / Access Points (APs), they will not be able to connect to the Internet (Wi-Fi Alliance, 2007a).

WiMax is short for Worldwide Interoperability for Microwave Access. It can provide high speed Internet connection for a large number of users over a large area (Ghosh, Wolter, Andrews, & Chen, 2005). It can provide about 31 miles range for full mobile cellular type access from point-to-point. A popular WiMax standard is IEEE 802.16. WiMax is used for mobile as well as point-to-multipoint wireless communication (Vaughan-Nichols, 2004). The footprint and ranges of WiMax are longer than Wi-Fi. For distances around 10 km, speeds of up to 10Mbps can be achieved (Wi-Fi Alliance, 2007b). If there are too many users connected to WiMax at the same time, the range will be limited and speed lowered. WiMax provides broadband communication for mobile devices. It enables mobile devices to be connected to the Local Area Network (LAN) and even Metropolitan Area Networks (MANs). It will also result in lower costs Internet connection as compared to 3G or GPRS (Wi-Fi Alliance, 2007b).

Bluetooth is a wireless standard for interconnecting devices to a small (personal) network for mobile devices. It only provides short ranges. The data frequency used is 2.4 GHz and it enables ranges of up to 30 feet (Bluetooth.com, 2008; Wi-Fi Alliance, 2007b). Bluetooth provides data transfer speed around 1Mbps (Haartsen, Allen, & Inouye, 1998).

IrDA uses the Infrared frequency spectrum to transfer data between different devices. In 1993, international standards for IrDA software and hardware have been made for infrared communication links. IrDA provides a wireless data communication for different mobile devices, laptops, digital cameras and other devices (Kane, 2007).

2.1.5 3G Evolution

The first generation of cell phone has features of voice communication only. The features of second generation (2G) cell phones are basic first generation features plus short message service (SMS). The features of 2.5 generation cell phones are 2G features plus multimedia message service (MMS) and basic low speed browsing service. Some 2.5G cell phones also have digital camera functionality as well. Third generation cellular technology is based on 2.5G technology plus video calling and high speed broadband connection features. 1G, 2G and 2.5G are using GSM and CDMA. 3G network have several standards. These are: W-CDMA, CDMA2000 and TD-SCDMA. W-CDMA is short for Wideband Code Division Multiple Access. CDMA2000 is short for code division multiple access. TD-SCDMA is short for Time Division-Synchronous CDMA (21cn.com, 2002). 3G technology provides high speed for the video communication. This “*satisfies the stringent requirements of real-time, low-delay interactive conversational video services*” (Basso, 2006). Main features of 3G technology cover packet switching technology, extensive Internet coverage, high Internet connection speed, new and better applications and service access.

- Packet Switching technology

The information (data) is separated into different packets before transfer. Before the information is received, the packets will be reassembled. The packets “*are all related and fit together, but the way they are transported and assembled varies. Packet switched data formats are much more common than their circuit switched counterparts*” (M-indya.com, 2007). Package switching standards includes X.25, Frame Relay and Asynchronous Transfer Mode (ATM).

- Extensive Internet coverage:

Cell phones can be connected to the Internet anytime extensively. The Internet provides the means for people to contact friends or customers. Land line (fixed line) limits Internet access ability. Even where wireless laptops are used the access ability is limited to the availability of Wi-Fi / WiMax access and availability of laptop device. Cell phones can connect to the Internet in any place which has cellular signal coverage.

- Higher Internet connection speed:

3G Cell phone connecting speed can be up to 2Mbps. This feature can be used for developing new applications. IE browser can browse Internet very fast as PCs' IE browser, is capable to accommodate high speed broadband. Windows Media Player can play live TV by high speed Internet connection. 2G cell phones using GPRS speed is about 54 Kbps. The 2.5G cell phone connecting speed can be about 114kbps.

- New applications

Because of high speed 3G possibilities, new applications are available, that can connect to internet at any time and also can be updated any time. They can also be used to control remote servers as terminals over Internet.

- Service access

The specific components system needed for using 3G technology mentioned by M-indya in 2007 is covered below:

- A 3G mobile device or terminal
- 3G telephone network such as WCDMA (including UMTS (3GSM) and FOMA), UMTS-TDD (including TD-CDMA and TD-SCDMA), HSPA (including HSDPA and HSUPA), HSPA+, GAN (UMA) and Mobile WiMax (WiBro)
- Understanding of the 3G mobile devices functions and knowledge of how to use software and hardware in 3G mobile devices
- Smart phone and PDA phone can access both WML and HTML pages and applications can get data from internet immediately and direct.
- *“Use of Third Generation (3G) must be enabled for that user. Automatic access to the 3G may be allowed by some mobile network operators, others will charge a monthly subscription and require a specific opt-in to use the*

service as they do with other nonvoice mobile services ” (M-indya.com, 2007).

2.2 Classification of SMEs

In this section, SMEs will be classified with regard to worldwide and NZ. Definition of SMEs worldwide will be based on the discussion and definition of SMEs in different countries. In NZ, SMEs will be discussed based on their classification by Ministry of Economic Development (MED).

2.2.1 Defining SMEs Worldwide

SMEs have different definitions. These definitions can be based on capital investment, the number of employees, economic, cultural and social dimensions (Ahmed & Salaheldin, 2005; Ghose, 2001; Lindner & Bagherzadeh, 2004).

United Kingdom (UK) has only one legal definition for SMEs that is defined in the Act of 1985 (Shoniregun, 2004). SMEs are defined as having less than 250 employees, turn over of no more than £ 22.8 million and a balance sheet total of no more than £ 11.4 million. In UK 99.9% enterprises are SMEs. The definition of SMEs in Europe is similar as in UK with regard to employee numbers, viz.: employees are less than 250, but the turn over is no more than 50 million euros and balance sheet total is around 43 million euros (University of Strathclyde Library, 2007). In United States (US), SMEs are defined as having less than 75 employees and turn over of no more than \$25 million. In Australia, SME employees must be no more than 200 (Burgess, 2003).

2.2.2 SMEs in NZ

The Ministry of Economic Development (MED) is a department of NZ government that manages NZ economic data. MED's purpose is *“to foster economic development and prosperity for all New Zealanders”* (Ministry of Economic Development, 2006).

There is no legal definition in NZ for SMEs. MED has classified SMEs to have no more than 19 employees. Most enterprises in NZ are SMEs: around 96.4% (Ministry of Economic Development, 2007). The number of employees in small enterprises is no more than 5. The percentage of small enterprises is about 86.8% of all enterprises. The number of employees in medium enterprises is from 6 to 19. The percentage of medium enterprises is 9.6% of all enterprises (Ministry of Economic Development, 2007).

MED has made a report about SMEs and industry sectors using the Australian and NZ Standard Industrial Classification (ANZSIC – see Table 1).

A	Agriculture, forestry and fishing
B	Mining
C	Manufacturing
D	Electricity, gas and water supply
E	Construction
F	Wholesale trade
G	Retail trade
H	Accommodation, cafes and restaurants
I	Transport and storage
J	Communication services
K	Finance and insurance
L	Property and business services
M	Government administration and defence
N	Education
O	Health and community services
P	Cultural and recreational services
Q	Personal and other services

Table 1: ANZSIC Classifications (Ministry of Economic Development, 2005).

In 2005, MED had presented a classification of enterprises based on the number of

employees as a percentage of ANZSIC. These details are reflected in the table below.

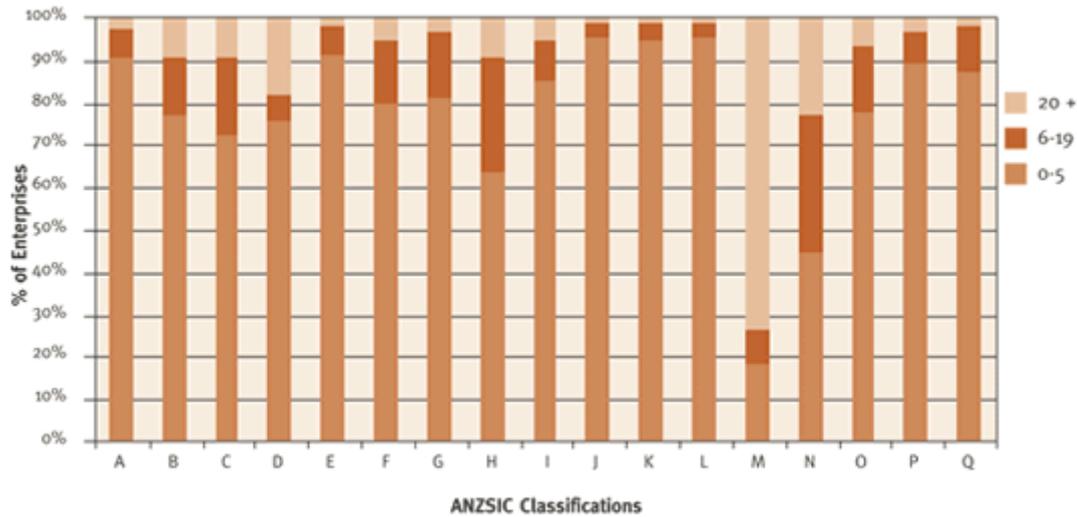


Figure 1: ANZSIC Classifications (Ministry of Economic Development, 2005).

Figure 1 shows that 80% of wholesales trade enterprises have 0-5 employees and 15% of wholesales trade enterprises have 6-19 employees. So 95% of wholesales trade enterprises are SMEs and only 5% of wholesales trade enterprises are Large Enterprises.

2.3 Impact of Mobile Devices on SMEs Worldwide

The impact of mobile devices in SMEs can be divided between mobile data and mobile device functions. SMEs can be divided into three types: classical SMEs, SMEs adopting IT/eCommerce and SMEs adopting mobile data technologies.

2.3.1 Conventional SMEs

Some SMEs still exist in the classical mould. They still use conventional practices for communication. The mobile devices in these SMEs are playing only a limited role in doing their business. Mobile devices are the most important way of communication between SMEs and customer. Mobile devices also help communication within SMEs. These SMEs use only some mobile device functions to improve their communication. Mobile devices can be used for recording information and reminding people. The impact of mobile devices on this functioning of SMEs is mainly for personal

communication. It is unlike the impact of mobile data on SMEs which is only for business. However, mobile devices improving personal communication helps the SMEs indirectly.

2.3.2 Current SMEs

Some SMEs have been upgraded for doing eCommerce. The factors of adopting IT/eCommerce can be divided into two parts. The first part relates to internal factors and the second part relates to external factors.

2.3.2.1 Internal Factors

Internal factors depend on owner/manager’s behavioural and attitudinal factors.

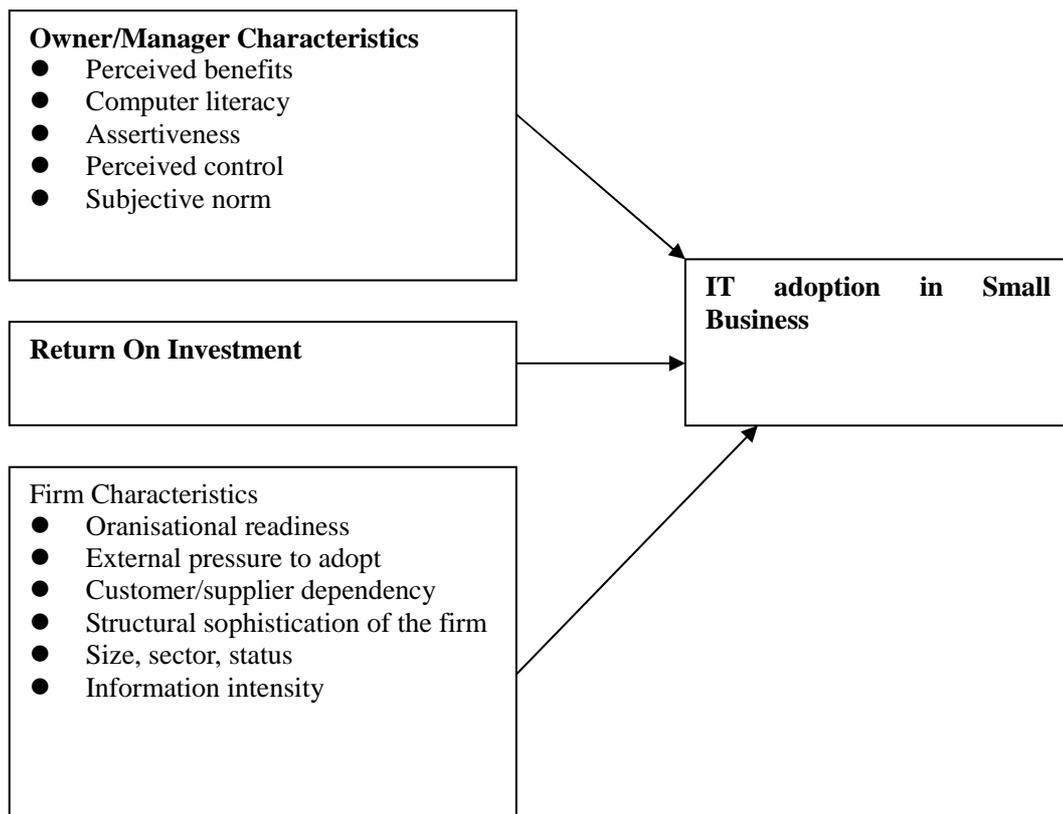


Figure 2: Framework of SME Adoption of Innovations (Van Akkeren & Cavaye, 1999)

Figure 2 shows how businesses adopt IT in their business.

1. Owners/managers perceive benefits of IT adoption which can be helpful and useful.
2. Owners/managers’ personal characteristics like assertiveness, rationality and

interaction influence the adoption of IT (Harker & Van Akkeren, 2002).

3. When the enterprise grows too large, control of staff and resources becomes difficult. Owners/managers also perceive mobile technologies as part of IT to help control staff and resources.

2.3.2.2 External Factors

External factors are based on economic considerations or Return on Investment.

Trading partners or customers may force the SME owner/manager to adopt IT. If the trading partners or suppliers only allow placing orders online, SMEs must learn how to use IT.

“The structural sophistication of the firm in terms of centralisation and complexity will influence technology adoption in its ability to incorporate new technologies into its work practices”.

When the size, sector and status of the enterprises are growing, enterprises will consider adopting IT. Mobile devices as a part of IT will be adopted as well.

“The level of information intensity within the organisation may influence the owner to adopt or not adopt a technology” (Harker & Van Akkeren, 2002).

2.4 The Impact of Mobile Data Technologies on SMEs

Mobile data technologies are wireless technologies which are built in mobile devices and provide data connection between mobile devices and other devices or networks.

The impact of mobile devices in SMEs results from the mobile device functions and mobile data. Mobile data technologies can improve the eCommerce as they are not limited by place and time. *“Mobile data technologies (MDT) which “marries” mobile phones and eCommerce technologies is seen as eliminating time and distance as barriers for regional businesses in their adoption of these technologies”* (Van Akkeren & Harker, 2002). MDT makes the eCommerce happen on mobile devices. Mobile devices are acting as computers and MDT are acting as networks. Wireless Application Protocol (WAP) is a MDT protocol that provides communication and application protocol for wireless applications (Shih & Shim, 2002).

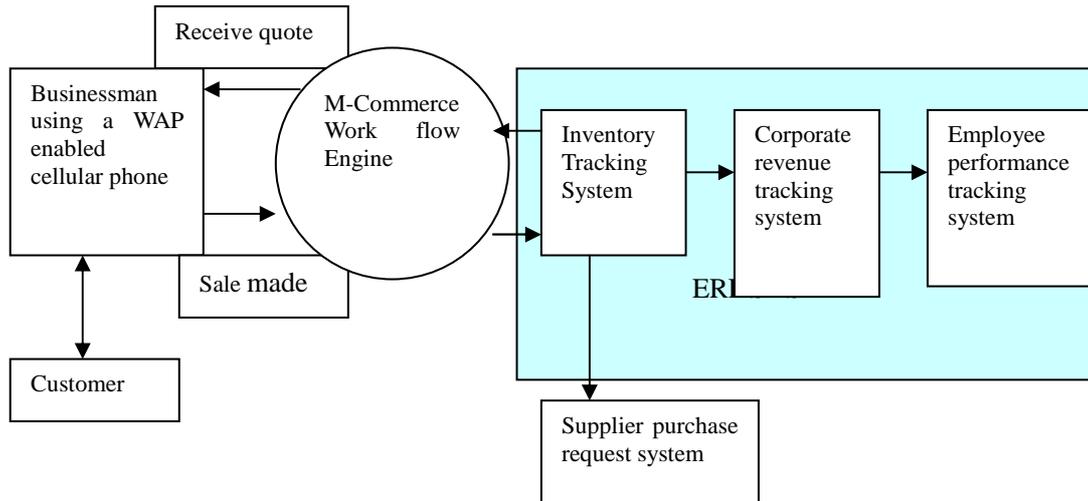


Figure 3: Business-based m-commerce framework scenario (Shih & Shim, 2002, p200).

“A travelling businessman in a business meeting can use a cellular phone to receive inventory information and product quotes; thus providing his/her client with real-time quotes of products. If a sale is made, the transaction information could be sent back to a corporate inventory tracking system and be propagated through a company’s ERP system. If necessary, the sale information may be forwarded to manager’s computer, fax, printer, PDA, or the pagers in a corporation headquarter for an approval. If a sold item results in an inventory back order, then the system can automatically trigger a purchasing request to its vendor as depicted in figure 3” (Shih & Shim, 2002). Shih’s article discusses how browsing in cell phones, Wireless Markup Language (WML) and WAP protocol may help business and enable m-commerce to come true. M-commerce is able to do the sales jobs which were introducing products, checking stock availability and making orders. M-commerce helps management of products and stock. MDT is a bridge between customer and ERP system. It provides communication anytime and anywhere without the dependence on a wired connection.

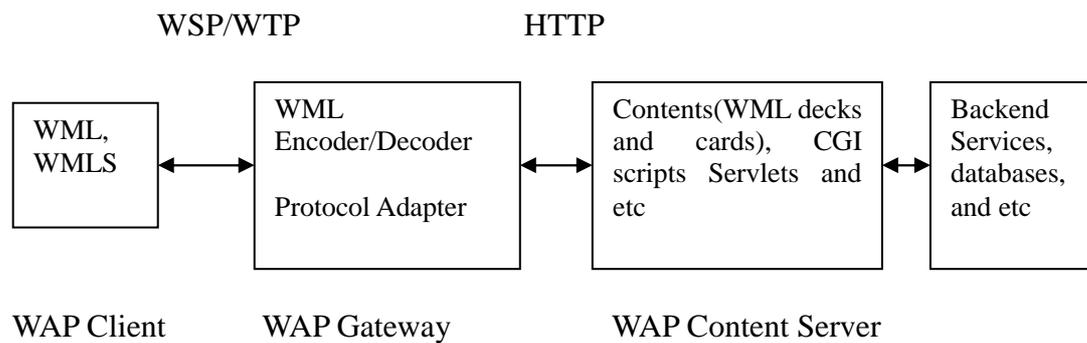


Figure 4: WAP communication schema (Shih & Shim, 2002, p201).

- The clients use cell phones application to write WML/WMLS to input a request.
- The request will be encoded to “*minimize network transmission load*” (Shih & Shim, 2002). Then it will be sent to the server.
- The WAP gateway will decode the request before transforming it into a HTTP compliant request by the protocol adapter.
- The content server will receive the HTTP request and process the request. The request will be sent to the backend services. After processing the request is completed, the response will be sent back to the client.
- The WAP gateway will encode and decode the response.
- The client will get the response in decoded WML/WMLS. The result will be showed to clients.

Not only does GPRS make m-commerce successful, but also 3G mobile data provide more effective services for m-commerce as 3G mobile data provide up to 40 times speed greater than GPRS. Wi-Fi and WiMax technologies provide lower cost and faster speed for mobile devices for access to the Internet and LANs.

2.5 Impact of Mobile Devices on NZ SMEs

An earlier survey of SMEs adopting IT was done in Australia and NZ SMEs (Harker & Van Akkeren, 2002). This survey includes deployment of MDT.

The survey covers 3 types: non-adopters, partial-adopters and full-adopters. “*Non-adopters were defined as those respondents, who did not use computers for business purposes. Partial-adopters were those respondents who used computers for*

business purposes, however did not use an Internet connection for business purpose. Full-adopters were defined as those respondents who used a computer and an Internet connection for business purposes, based on current usage of IT and then focused on the needs of these three categories in relation to the newest, Mobile Data 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. ” (Harker & Van Akkeren, 2002, p22). The final sample size was 482. Fifteen percent of SMEs were non-adopters. Twenty-eight percent of SMEs were partial-adopters. Fifty-seven percent of SMEs were full-adopters. Only four percent of SMEs used MDT in full-adopters. Eighty-two percent SMEs used mobile phone for business purposes. Only a small proportion did not use mobile phone and were non-adopters. Twenty-five percent of those that used a mobile phone only used voice calling function. Fourteen percent of those that used a mobile phone made over 30 calls per day.

Mobile phones were most popular in the SMEs and over eighty-two percent of SMEs used them. Some SMEs did not use computers and Internet. Not many SMEs adopted MDT. Below is a table, which shows the Analysis of Variance (ANOVA) between adopter levels, and their relation to MDT by IT adopter level (Harker & Van Akkeren, 2002)

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

Table 2: ANOVA Differences between Adopter Levels (Harker & Van Akkeren, 2002, p24)

*Only statistically significant results are shown.

From Table 2, it is apparent that full-adopters were most excited about MDTs in this category of SMEs. “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 with a set of statements” (Harker & Van Akkeren, 2002, p24).

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	18
	Overall interest in acquiring	60

Table 3: Full-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002, p24)

About eighty-six percent full-adopters will wait before investing. Almost eighty percent of full-adopters are interested in using mobile device to access email. Sixty-four percent of owners/managers feel excited about MDTs. Around sixty percent of full-adopters use MDTs for trading with customers, suppliers, and for banking and other administration, including the monitoring of business premises. Over fifty percent of participants are able to access the Internet, monitor or operate

equipment. About fifty-two percent adopt MDTs because of competitive pressure. Only thirty-five percent of participants do not want this technology.

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

Table 4: Partial-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002, p25)

Over ninety percent of partial-adopters will wait before investing. “*However, when focused on how the technology could help them in their business, partial-adopters mainly felt that being able to deal with email (Sixty-four percent), banking (Sixty percent), and monitoring their business premises (fifty-six percent), all in a remote fashion, would be advantageous*” (Harker & Van Akkeren, 2002, p25). About sixty percent of partial-adopters are interested in acquiring this technology.

Rank	Statement	Non-Adopter % (n=70)
1	Wait before investing	87
2	Being able to email	62
3	Owner/Manager feels excited	52
4	Trade with customers	51

5	Banking and other admin	51
6	Trade with suppliers	47
7	Monitoring business premises	45
8	Being able to navigate	45
9	Being able to access the net	44
10	Being able to monitor or operate equipment	44
11	Competitive pressure to adopt	43
12	Live 2-way video	43
13	No need for this technology	42
14	Being able to shop	30
15	Staff would feel threatened	29
	Overall interest in acquiring	44

Table 5: Non-Adopters who ‘Strongly Agree’ or ‘Agree’ with Statements (Harker & Van Akkeren, 2002, p26)

Fifty-four percent of participants were interested in acquiring MDT.

A recent study about eCommerce adoption in small business in NZ was done in 2007 (Al-Qirim, 2007). There were three groups of eCommerce adopters in SMEs. The first group was classified as “low level adopters”, second group as “advanced level adopters” and the third group as “high adopters”. Low level SMEs were only adopting simple email and web pages. Advanced level SMEs were adopting fully functional and interactive websites. High adopter SMEs were adopting different eCommerce technologies including fully functional and interactive website, Intranet and Extranet technologies. (Al-Qirim, 2007)

Al-Qirim in an earlier study of 2005 discusses factors that significantly influence eCommerce adoption in SMEs. These are stated below:

1. Relative advantage
2. Cost
3. Compatibility
4. Size
5. Information intensity of products
6. Support from technology vendors
7. Pressure from suppliers / buyers

8. Competition
9. CEO's innovativeness
10. CEO's involvement (Al-Qirim, 2005)

Julia Ngatuere's research (Ngatuere, 2006) relating to ICTs in NZ SMEs in 2004, states that about two out of six SMEs had business plans which were out-of-date. Only two SMEs had business plans and IT plans (also out-of-date) and only one SME had budgeted for ICT every year. *"These two MEs and one SE stated that they knew how to write an ICT plan and would plan for a long period of time, yet the SE did not have a plan at all. The other three interviewees would only plan for a short period of time."* None of the SMEs had a current ICT plan. As per Julia's research, use of ICT in NZ SMEs was not so popular (Ngatuere, 2006).

IT adoption is an integral part of eCommerce. MDTs could further help SMEs with increased chances to upgrade eCommerce to mCommerce and thereby improve business productivity.

3. Research Methodology

A qualitative research methodology (case study) was adopted. Primary data were gathered from interviews.

“Qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives or advocacy/ participatory perspectives or both. It also uses strategies of inquiry such as narratives, phenomenologies, ethnographies, grounded theory studies, or case studies. The researcher collects open-ended, emerging data with the primary intent of developing themes from the data” (Creswell, 2003).

The case study is the most popular qualitative method that has been used in information systems research. A case study is *“an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”* (Yin, 2002).

The case study includes six steps. They are:

1. *“Determine and define the research questions*
2. *Select the cases and determine data gathering and analysis techniques*
3. *Prepare to collect the data*
4. *Collect data in the field*
5. *Evaluate and analyze the data*
6. *Prepare the report”* (Soy, 2006).

3.1 Research Question

The primary research question of this study was: “What is the impact of mobile devices on wholesale trade SMEs in the Auckland region?” This study was intended to answer secondary questions such as:

1. What type of mobile devices do they use?
2. What type of functions / services of this mobile device(s) are used?
3. What purpose(s) do the mobile devices serve?

3.2 Data Collection Methods

Two types of data were collected for this research. Primary data were obtained by interviewing employees, managers and owners of SMEs to answer the research questions. In gathering primary data, the interview technique was selected as a tool for data collection. Interviews will involve people being interviewed individually (face-to-face or by telephone) or in groups:

The secondary data were analysed from the literature review. This literature included books, periodicals, electronic sources, government documents, and product manuals. The literature sources for this research were:

1. Libraries (UNITEC libraries, North shore city Library)
2. Database (EBSCO HOST, ACM, Book24x7)
3. Internet search engines (Google, msn, yahoo, Baidu).
4. Bookshops.

3.3 Method of Study

This study discusses the impact of mobile devices (including cell phones, smart phones and PDAs) on SMEs in Auckland, NZ. Different mobile devices have different impact on SMEs. Defining mobile devices and SMEs are basic to understanding before discussing their impact. After defining mobile devices and SMEs, this study focuses on the impact of mobile devices in SMEs.

Fifteen wholesale businesses within the Auckland region were approached by phone or email for the interview process. Five of them were selected from wholesale trade section in the Auckland Yellow Pages phone book. Another five were selected from the wholesale advertising section in the NZ Herald and Mandarin Times. The last five were found on the Internet by using Google and the keywords "Auckland, NZ Wholesale SME". Eight (53%) wholesale businesses that were contacted agreed to interviews.

Of the eight wholesale businesses, one wholesale business was invited for a pilot interview. From this initial interview, one question was deleted and three questions were modified.

The question “What do you use mobile devices for?” was deleted.

The first question was modified from:

“How many people are employed full-time?

None 1-5 6-19 20 or more”

to:

“How many people are employed full-time?

None Other (Please specify) _____”

The second question was modified from:

“How many people are employed part-time?

None 1-5 6-19 20 or more”

to:

“How many people are employed part-time?

None Other (Please specify) _____”.

The third question was modified from:

“What cell phone, smart phone and PDA functions / services does the organisation use?

None Voice Calling Video Calling SMS MMS
 Email Internet Listen to music Entertainment
 Addressing Book Calendar Other (Please Specify) _____”

to:

“What cell phone, smart phone and PDA functions / services does the organisation use?

None Voice Calling Video Calling SMS MMS
 Email Internet Listen to music Entertainment
 Addressing Book Calendar Advertising Banking

- Accessing Information Other (Please Specify) _____”

The finalised interview questions were used with the other wholesale SMEs. Twelve participants completed the interview from the remaining seven companies. Overall 13 participants from eight companies were interviewed.

The final version of questionnaire had 22 questions. It was divided into 3 types of questions, *one option questions* (10), *one or more options questions* (8) and *open questions* (3). *One option questions* were such that respondents had to select one option from a list. *One or more option questions* were such that respondents could select one or more option from a list. *Open questions* did not include lists of options, so respondents could answer as they wished.

One option questions are listed below:

- How many people are employed full-time?
- How many people are employed part-time?
- Does your business belong to wholesale trade enterprise?
- Location of business?
- How many cell phones are there?
- How many smart phones?
- How many PDAs?
- How many employees operate these cell phones?
- How many employees operate these smart phones?
- How many employees operate these PDAs?

One or more options questions are listed below:

- Position held?
- Which products do you deal with as your main business?
- Does the business use a mobile device?
- What cell phone, smart phone and PDA functions / services does the organisation use?
- What type of mobile connection does the business use?
- Which functions of mobile devices are used to communicate with employees?

- Which functions of mobile devices are used to communicate with your supplier to place orders / purchase?
- Which functions of mobile devices are used to communicate with customers?

Open questions are listed below:

- What benefits if any, has your business gained from using a mobile device (cell phone, smart phone and PDA)?
- Do you see any barriers that are stopping you from using a mobile device (cell phone, smart phone and PDA) for your business?
- In your organisation who made the decision for use of cell phone or smart phone or PDA?

Lastly, is there any other information that you think I should know that would help me understand your business and the use of mobile devices (cell phone, smart phone and PDA) for this business?

4. Data Gathering

This section will discuss primary data gathering, analysis and interpretation. Data gathering will cover how the data was obtained and the kinds of data obtained and analysed.

The results of data gathering are shown by pie and bar charts from thirteen respondents. Pie chart shows the options, number of respondents and percentage related to the number of respondents for each question.

4.1 Position of Respondents

This question related to the position of the participants in the organisation being interviewed. The respondents were the 13 participants.

4.1.1 Question 1:

“Position held?”

Owner Employee Manager

Other (please specify)_____”

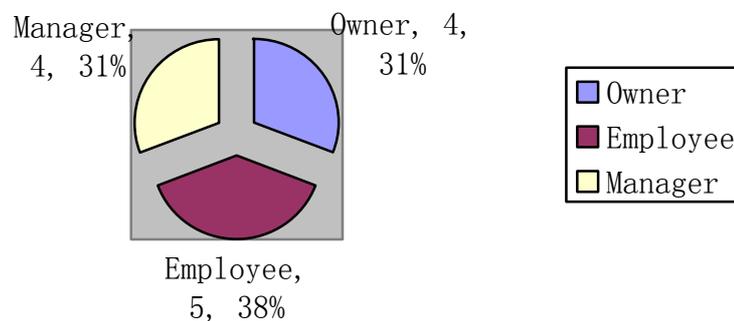


Figure 5: Back ground of respondents

Four (31%) respondents selected “owners”, four (31%) respondents selected “manager”, five (38%) respondents selected “employee”. No respondents selected

other.

4.2 Core Business

There are two questions for core business. The question related to businesses. The respondents were the 8 businesses. One business could include one or more participants who responded with the same answer since it dealt with the factual information pertaining to the business.

4.2.1 Question 2.1:

“Does your business belong to wholesale trade enterprise?”

Yes No”

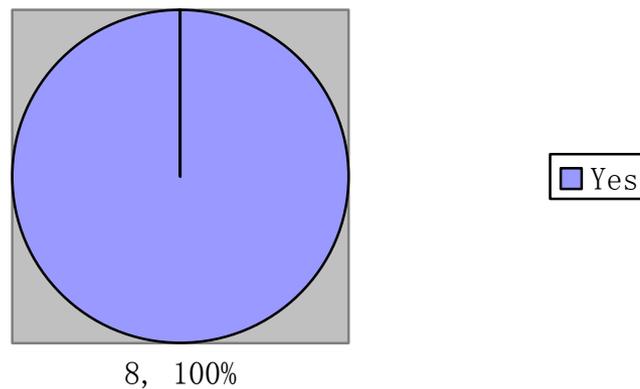


Figure 6: Percentage of Wholesale enterprises

All Eight (100%) businesses selected “Yes”. No business selected “No”.

4.2.2 Question 2.2:

“Which products do you deal with as part of your main business?”

Clothes Shoes Bags Kitchen Products Jewellery
 Stationery Toys Cars Wood Tools
 Food Furniture Other (Please specify) _____”

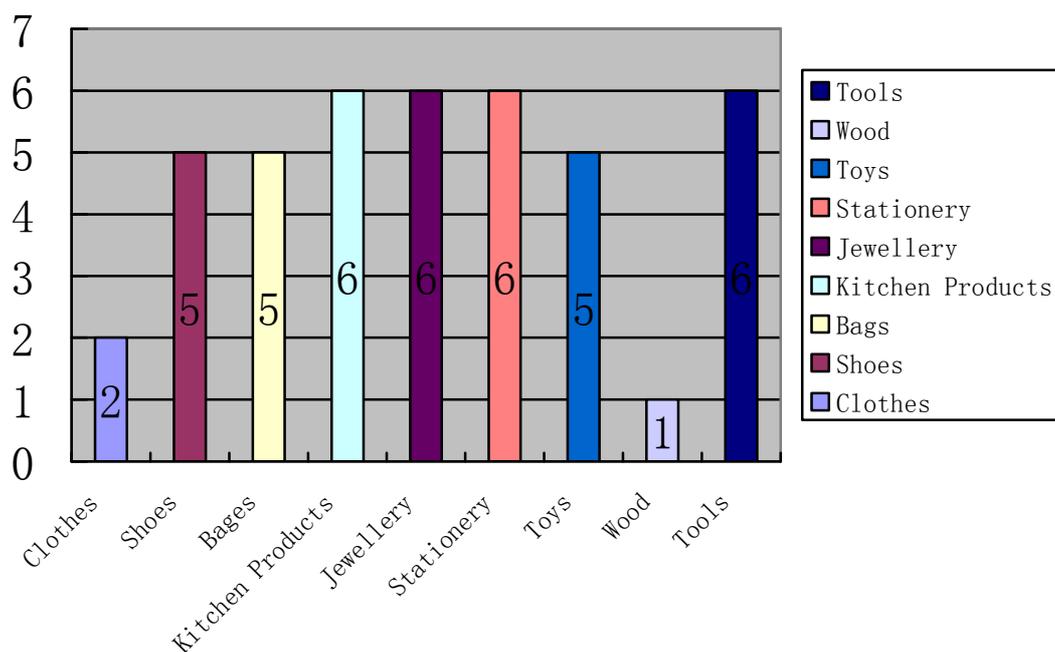


Figure 7: Types of wholesale enterprises

Six (75%) businesses selected “Kitchen Products”, “Jewellery”, “Stationery” and “tools”. Five (63%) businesses selected “shoes”, “bags” and “toys”. Two (25%) businesses selected “clothes”. One (12.5 %) business selected “wood”. No business selected “cars”, “food”, “furniture” and “other”.

4.2.3 Question 3:

“How many people are employed full-time?”

None Other (Please specify) _____”

SME	Number of full-time employee
SME 1	3
SME 2	5
SME 3	10
SME 4	6
SME 5	4
SME 6	None
SME 7	4
SME 8	1-5 (pilot business)

Table 6: Number of full-time employees

4.2.4 Question 4:

“How many people are employed part-time?”

None *Other (Please specify) _____”*

SME	Number of part-time employee
SME 1	2
SME 2	None
SME 3	1
SME 4	None
SME 5	2
SME 6	None
SME 7	None
SME 8	1-5 (sample respondent)

Table 7: Number of part-time employees

4.2.5 Question 5:

“Location of business

Auckland *Other (Please specify) _____”*

All the businesses selected Auckland. No business selected “other”.

4.3 Use of Mobile Devices (by Type)

4.3.1 Question 6:

“Does the business use a mobile device?”

Cell Phone *Smart phone* *Personal digital assistant (PDA)*

Don't know”

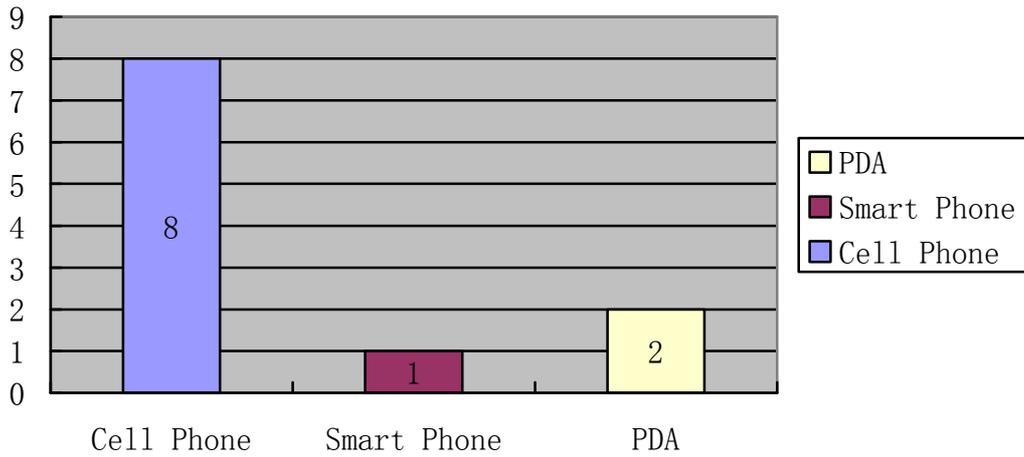


Figure 8: Types of mobile devices

All (100%) business selected “cell phone”. Two (25%) businesses selected “PDA”. One (13%) selected “smart phone”.

4.3.2 Question 6.1:

“How many cell phones are there?”

None 1 or 2 3-5 5 or more”

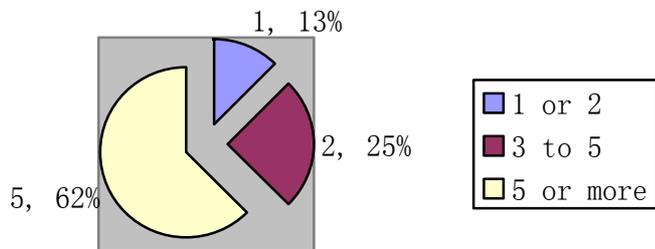


Figure 9: Number of cell phones

Five (62%) businesses selected “5 or more”. Two (25%) business selected “3 to 5”. One (13%) business selected “1 or 2”. No business selected “none”.

4.3.3 Question 6.2:

“How many smart phones are there?”

None 1 or 2 3-5 5 or more”

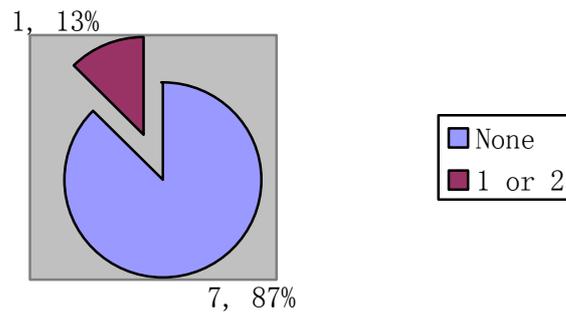


Figure 10: Number of Smart Phones

One (13%) business selected “1 or 2”. Seven (87%) businesses selected “none”. No business selected “3-5” and “5 or more”.

4.3.4 Question 6.3:

“How many PDAs are there?”

- None 1 or 2 3-5 5 or more”

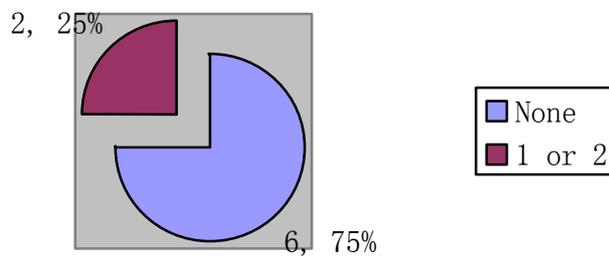


Figure 11: Number of PDAs

Two (25%) businesses selected “1 or 2”. Six (75%) businesses selected “none”. No business selected “3-5” and “5 or more”.

4.3.2.1 Question 6.1.1:

“How many employees operate these cell phones?”

- None 1 or 2 3-5 5 or more”

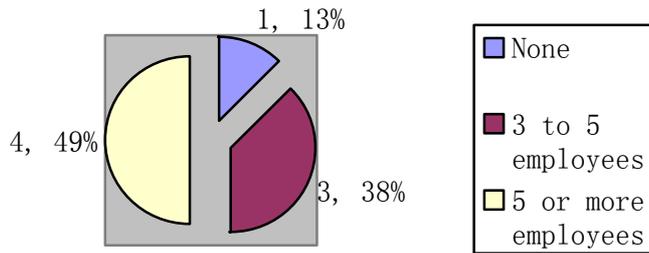


Figure 12: Percentage of employees operating cell phones

One (13%) business selected “none”. Three (38%) businesses selected “3 to 5” and four (49%) businesses selected “5 or more”. No business select “1 or 2”.

4.3.3.1 Question 6.2.1:

“How many employees operate these smart phones?”

None 1 or 2 3-5 5 or more”

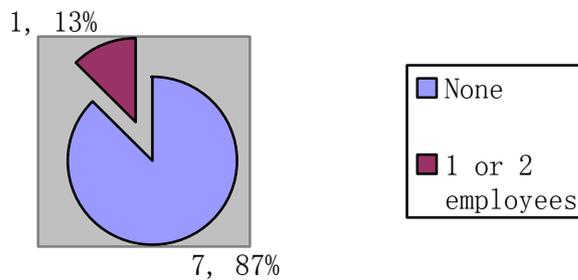


Figure 13: Percentage of employees operating Smart Phones

Seven (87%) businesses selected “none”. One (13%) business selected “1 or 2”. No business selected “3 to 5” and “5 or more”.

4.3.4.1 Question 6.3.1:

“How many employees operate these PDAs?”

None 1 or 2 3-5 5 or more”

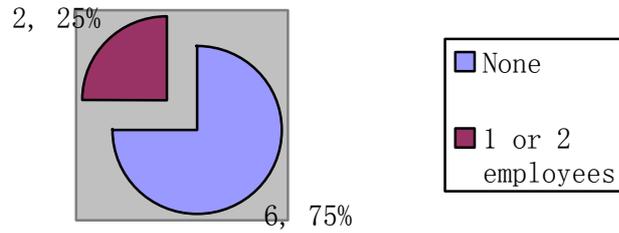


Figure 14: Percentage of employees and business owners operating PDAs
 Two (25%) businesses selected “1 or 2”. Six (75%) businesses selected “none”. No business selected “3 to 5” and “5 or more”.

4.4 Mobile Device Functions/Services

4.4.1 Question 7:

“What cell phone, smart phone and PDA functions / services does the organisation use?”

- None Voice Calling Video Calling SMS MMS
 Email Internet Listen to music Entertainment
 Addressing Book Calendar Advertising Banking
 Accessing Information Other (Please Specify) _____”

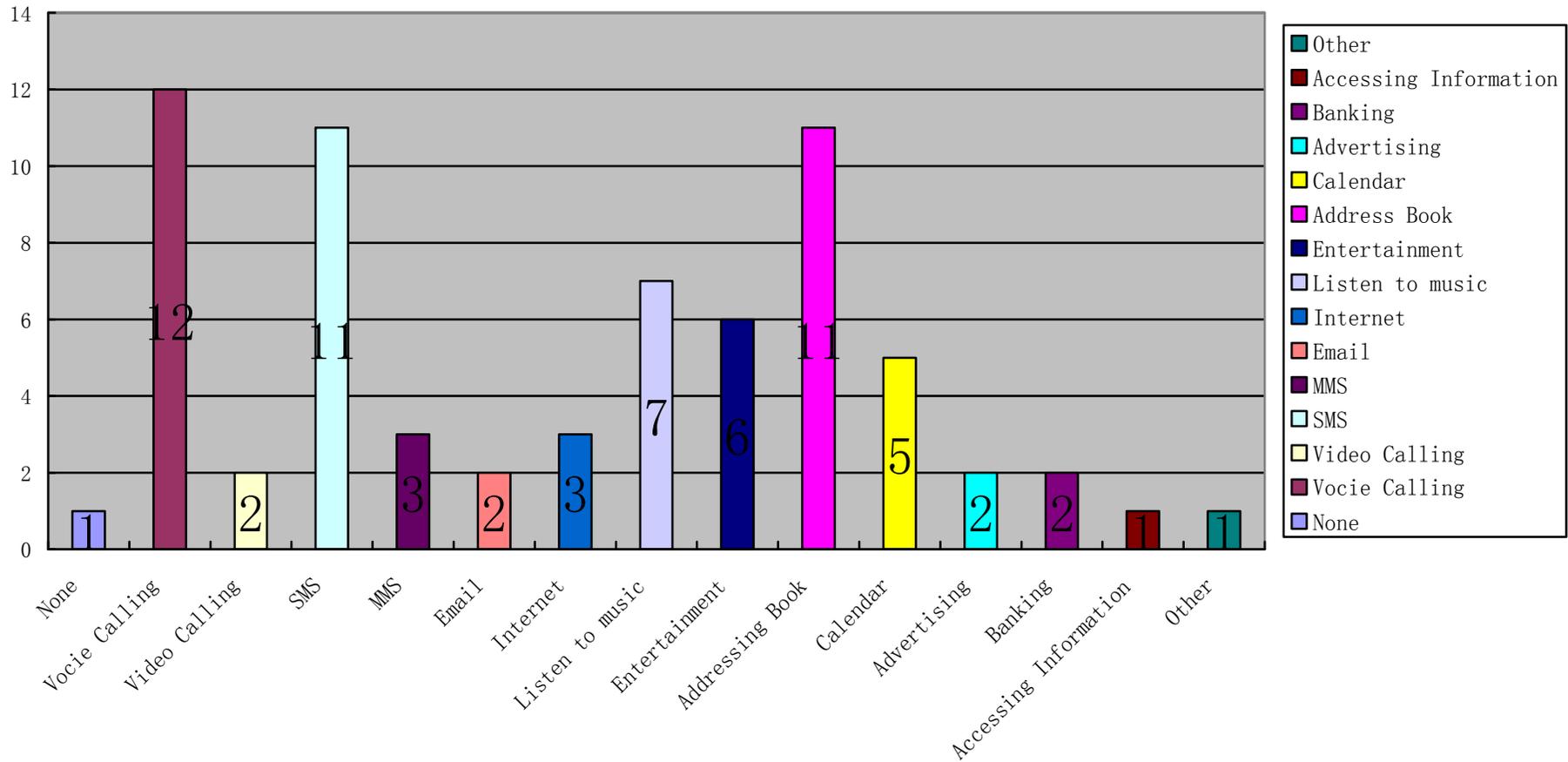


Figure 15: Functions and services of Mobile devices

Twelve (92%) respondents selected “voice calling”. Eleven (85%) respondents selected “SMS” and “address book” feature of mobile devices. Two (15%) respondents selected “video calling”, “email”, “advertising” and “banking”. Three (23%) respondents selected “MMS” and “Internet”. Seven (54%) respondents selected “listen to music”. Six (46%) respondents selected “entertainment”. Five (38%) respondents selected “calendar”. Two (15%) respondents selected “advertising” and “access mobile banking”. One (8%) respondent selected “accessing information” and “other”.

4.5 Mobile Date Technologies (MDTs)

4.5.1 Question 8:

“What type of mobile connection does the business use?”

- 3G Mobile Data General Packet Radio Service (GPRS)
 Wireless Fidelity (Wi-Fi) Bluetooth Infrared Data Association (IrDA)
 Worldwide Interoperability for Microwave Access (WiMax)

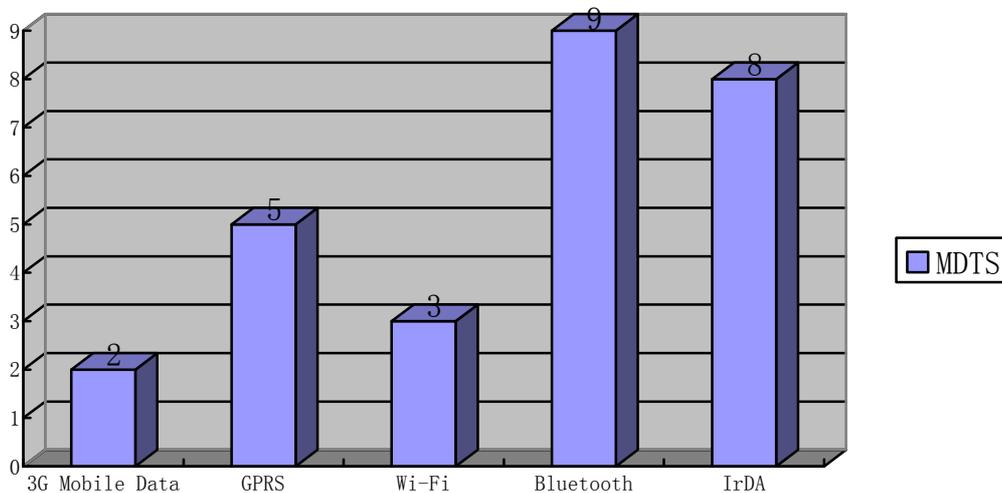


Figure 16: Types of MDTs

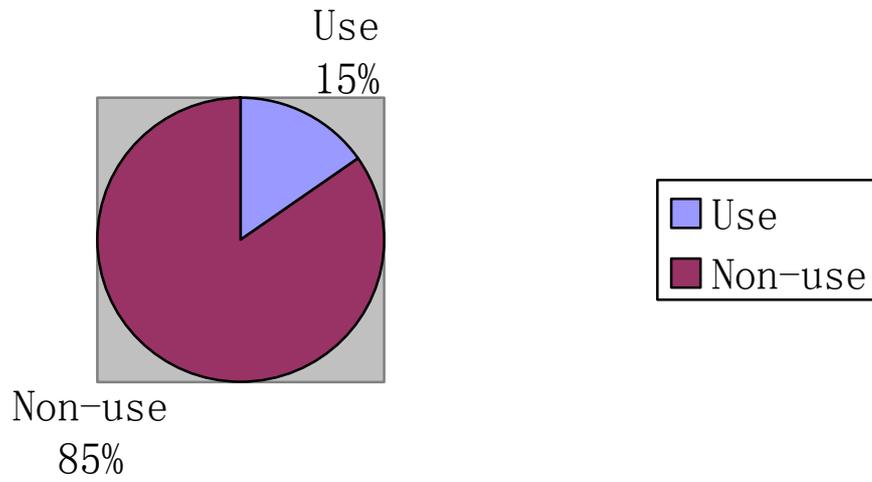


Figure 17: Number of respondents using 3G Mobile Data usage
Two (15%) respondents selected “3G mobile data”.

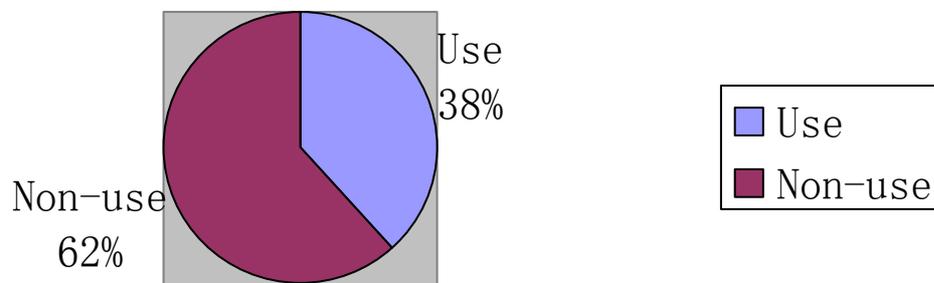


Figure 18: Number of respondents using GPRS
Five (38%) respondents selected “GPRS”.

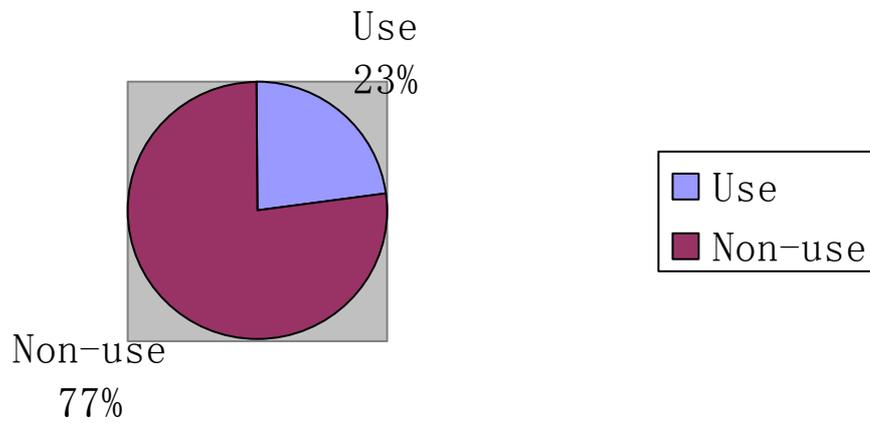


Figure 19: Number of respondents using Wi-Fi

Three (23%) respondents selected “Wi-Fi”.

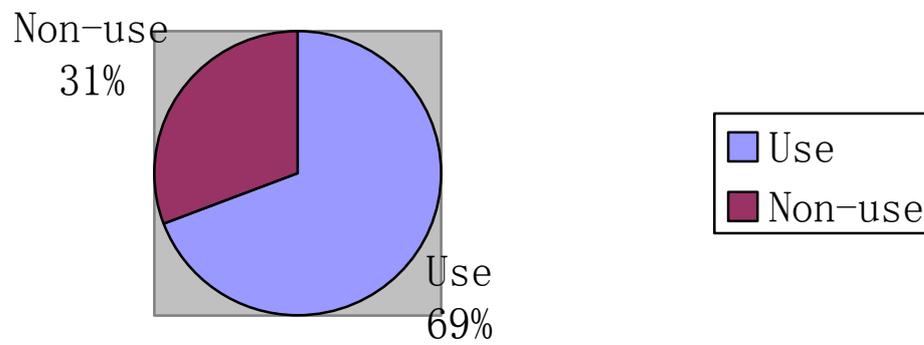


Figure 20: Number of respondents using Bluetooth

Nine (69%) respondents selected “Bluetooth”.

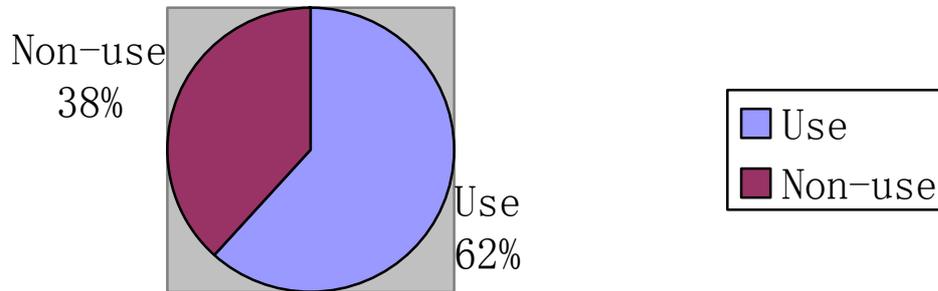


Figure 21: Number of respondents using IrDA

Eight (61%) respondents selected “IrDA”.

Nobody (0%) selected Microwave Access (WiMax) hence this mobile device technology does not show in Figure 16 above.

4.6 Mobile Devices Usage in Business (by Function)

4.6.1 Question 9:

“Which functions of mobile devices are used to communicate with employees?”

Voice Calling Video Calling Short Message Service (SMS)

Multimedia Messaging Service (MMS) Email Internet”

4.6.2 Question 10:

“Which functions of mobile devices are used to communicate with your supplier to place orders / purchase?”

Voice Calling Video Calling SMS MMS Email

Internet”

4.6.3 Question 11:

“Which functions of mobile devices are used to communicate with customers?”

□ Voice Calling □ Video Calling □ SMS □ MMS □ Email
 □ Internet”

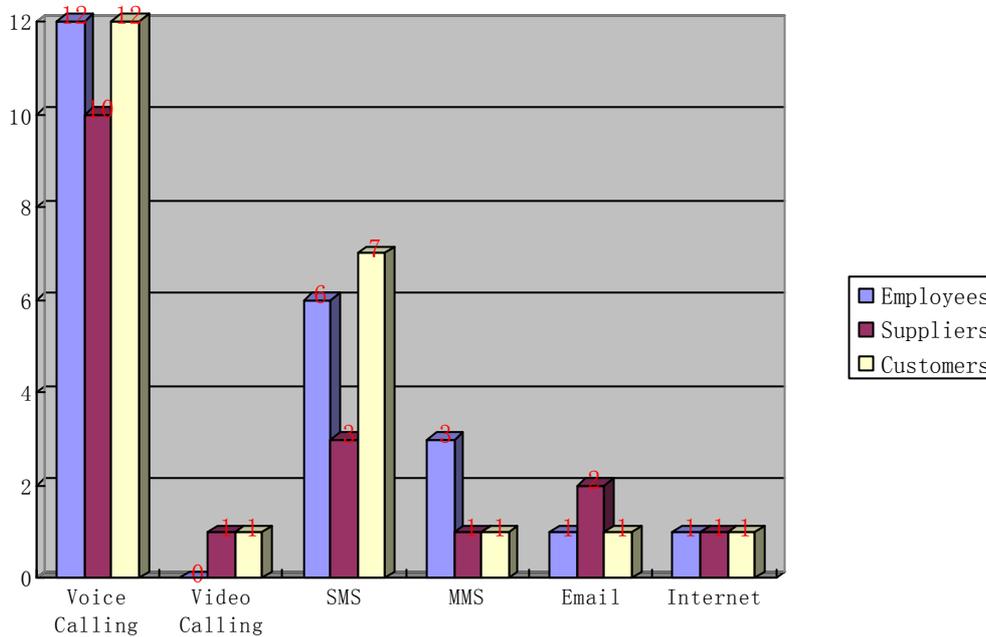


Figure 22: Mobile device usage in Enterprises

Twelve (92%) respondents selected “voice calling” to contact Employees and customers. Ten 77% respondents selected “voice calling” to contact suppliers. Seven (54%) respondents selected “SMS” to contact customers. Six (46%) respondents selected “SMS” to contact employees. Three (23%) respondents selected “SMS” to contact suppliers. Three (23%) respondents selected “MMS” to contact employees. Two (15%) respondents selected “email” to contact suppliers. One (8%) respondent selected “video calling”, “MMS”, “Internet” to contact with suppliers and customers. One (8%) respondent selected “email” and “Internet” to contact with employees and customers. None of the respondents use “video calling” to contact with employees.

4.7 Advantage and Disadvantage of Mobile devices in Enterprises

4.7.1 Question 12:

“What benefits if any, has your business gained from using a mobile device (cell phone, smart phone and PDA)?”

Answers were received for advantage of mobile devices:

1. Can access work out of office.
2. Easy and fast communication
3. Keeping in touch
4. Anywhere any time communication
5. Contacts customer directly instead of classical land line.

Most respondents indicated that easy and fast communication was possible.

4.7.2 Question 13:

“Do you see any barriers that are stopping you from using a mobile device (cell phone, smart phone and PDA) for your business?”

Answers were received for disadvantage of mobile devices:

1. No disadvantages
2. Not good for health
3. Costs too much
4. Battery time too short (frequent charging of battery required)
5. Customers calling after hours

Thirty-one percent of respondents thought there were no disadvantages associated with the use of mobile devices. Another thirty-one percent of respondents thought mobile devices were not good for health. Fifteen percent of respondents thought they cost too much. Only seven percent of respondents thought the battery required frequent charging.

4.8 Decision to Use Mobile Devices

4.8.1 Question 12:

“In your organisation who made the decision for use of cell phone or smart phone or PDA?”

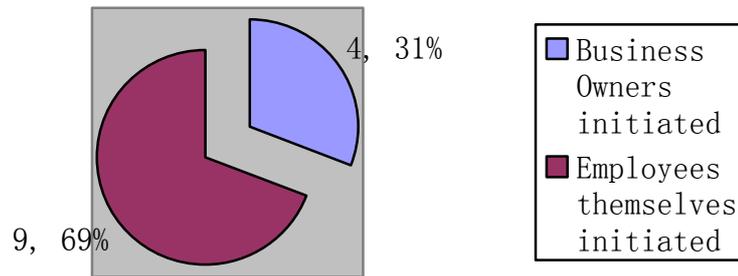


Figure 23: Initiation for using mobile devices

Nine (69%) respondents stated that employees themselves decided to use the mobile devices. Four (31%) respondents stated that business owners initiated the use of mobile devices.

4.9 Other Issues about Mobile Devices

4.9.1 Question 12:

“Lastly, is there any other information that you think I should know that would help me understand your business and the use of mobile devices (cell phone, smart phone and PDA) for this business?”

Answers are below:

Take photo easily.

Cost should be cheap.

More choices for customers

When we are away, it is possible to access our work.

Sixty-nine percent of respondents (9) did not respond to this question.

5. Data Analysis & Interpretation

Analysis of the data gathered from the interviews covered above, is divided into 8 parts in this section. The data gathered from the 13 interviewees has been analysed across all 8 enterprises as well as within the enterprises themselves.

5.1 Position of Respondents

All Participants were divided into three groups viz: owners, managers and employees. The respondents were evenly split with one third belonging to owners, one third belonging to managers and one third belonging to employees group.

5.2 Core Business

All 8 businesses belonged to wholesale trade enterprise.

Over two thirds of the companies were selling Kitchen Products, Jewellery, Stationery and tools. Over half of them (5 companies) were selling shoes, bags and toys. A quarter of them (2 companies) were selling clothes. Only one company was selling wood.

Number of employees of enterprise was calculated in terms of number of equivalent full-time employees. Two part-time employees were counted as one full-time employee. If the enterprise's number of employee is 0 to 5, the enterprise is classed as a small enterprise. If the enterprise's number of employees is 6 to 19, the enterprise is classed as a medium enterprise. If the enterprise's employee number is over 19, the enterprise is classed as a large enterprise.

Size of enterprise	Numbers of Employees	Respondents
Small Enterprises	0-5	6
Medium Enterprises	6-19	2
Large Enterprises	Over 19	0

Table 8: Size of the enterprises

Table 8 shows that all the enterprises which were interviewed are SMEs.

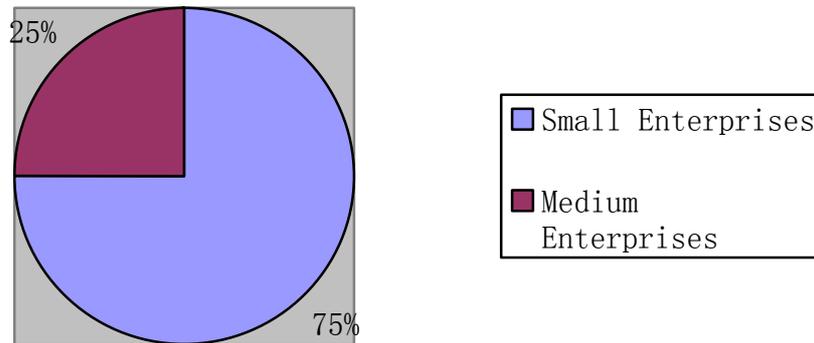


Figure 24: Size of Enterprises

Figure 24 shows the percentage of small enterprises and medium enterprises. About 75% of enterprises are small enterprises. Other 25% of them belong to medium enterprises.

Location of all enterprises was in Auckland.

5.3 Use of Mobile Devices (by Type)

Cell phone is the most popular mobile device because cell phones have the longest history in mobile devices. All SMEs were using cell phones. Only one (13%) SME was using a smart phone. Smart phones were developed much later than cell phones. Many respondents did not know what a smart phone was. About 25% of the SMEs were using PDAs. Most respondents knew about PDAs, but did not have any due to costs being too expensive and functions being too complicated.

All SMEs in this interview have cell phones. About 13% of the SME have 1 or 2 cell phones. About 25% of the SMEs have 3 to 5 cell phones. Over half, about 62% of the SMEs have more than 5 cell phones.

Smart phones are not as popular as cell phones. Around 13% of the SMEs have 1 or 2

smart phones.

Most SMEs knew about PDAs. Around 25% of the SMEs have 1 or 2 PDAs. 75% of SMEs don't use PDAs.

Half of the SMEs have over 5 employees operating cell phones. About 13% of respondents have no employee operating the cell phones. This 13% of the SMEs have cell phone but business owners were operating / using those cell phones. About 38% of SMEs have 3 to 5 employees operate cell phones.

Only 13% of SMEs have 1 or 2 employees operating smart phones. Most SMEs, about 87% of SMEs do not have smart phones.

About 25% of the SMEs have 1 or 2 employees operating PDAs. About 75% of the SMEs do not have PDAs.

5.4 Mobile Device Functions / Services

Figure15 shows the usage of mobile device functions and services in SMEs. About 92% of the respondents used mobile devices for voice calling because voice calling is the basic function of mobile devices. About 85% of the respondents used SMS and address book feature of mobile devices. SMS is very common function after mobile device technology 2G. There were 15% of the respondents using video calling. The latest mobile device technology 3G was not used by most respondents. MMS, Internet and Email are used by about 23% of respondents Around half of the respondents used mobile devices to listen to music, play games (entertainment) and arrange meetings (calendar). Lots of entertainment features were combined in mobile devices. About 15% of the respondents used mobile devices to send SMS to customers for advertising and to access mobile banking.

5.5 Mobile Data Technologies (MDTs)

3G Mobile Data technology was used by only 15% respondents. 3G Mobile Data technology was a new technology. Not many respondents knew about it.

About 38% of the respondents used GPRS. Most respondents were aware of GPRS. Due to the costs being high, not many respondents used it.

About 23% of the respondents used Wi-Fi to contact the office LAN or home LAN. Not many mobile devices have Wi-Fi features. Not many offices or homes had wireless LAN.

Most popular MDT was Bluetooth which was used by 69% of the respondents. Most mobile devices have Bluetooth features. Mobile devices can transfer data between different mobile devices. It does not require a wireless LAN or other devices.

Second popular MDT was IrDA used by 62% of the respondents. IrDA is an earlier technology. Most mobile devices and laptops have this feature. People can easily use IrDA feature to transfer data between different mobile devices or mobile devices to laptop.

In spite of WiMax being a new technology, it was not very popular in the market. None of the respondents used WiMax at all.

5.6 Mobile Devices Usage in Business (by Function)

Voice calling is the most important function for SMEs contacting employees, suppliers and customers. About 92% percent of respondents used voice calling to contact employees and customers. About 77% of the respondents used voice calling to contact suppliers. Around 50% of the respondents used SMS to contact employees and customers. Only 23% of the respondents used SMS to contact suppliers because overseas suppliers may not be able to receive SMS. About 8% of the respondents used video calling to contact suppliers and customers because 3G phone were not very

popular. MMS was used by 23% of the respondents to contact employees, and 8% of the respondents to contact suppliers and customers because MMS was not popular and cost too much. Only 8% respondents contact employees and customers by email using mobile devices. About 15% of the respondents contact suppliers by email in mobile devices. Most respondents were using PCs to send email. Only 8% of the respondents used mobile Internet to contact employees, suppliers and customers. Most respondents were using PCs to connect to Internet.

5.7 Advantage and Disadvantage of Mobile Devices in SMEs

Answers were received for advantage of mobile devices:

Most respondents felt mobile devices provided an easy and fast communication tool instead of the classical land line.

Answers were received for disadvantage of mobile devices:

About 31% of the respondents thought there were no disadvantages of mobile devices. About 31% of the respondents thought that mobile devices were not good for health. A small proportion (15%) of the respondents thought they cost too much. Only 7% of the respondents thought the battery required frequent charging.

5.8 Decision to Use Mobile Devices

Mobile devices were very popular in the market and most respondents had them. About 69% of the respondents stated that employees themselves decided to use the mobile devices. About 31% of the respondents stated that business owners initiated the use of mobile devices. These 31% thought mobile devices were used for business purposes so business owner should supply mobile devices to employees.

6. Summary of Findings

The analysis and interpretation of the data gathered revealed findings as summarised below.

6.1 The Impact of Mobile Devices on Wholesale Trade SMEs in Auckland Region

The impact of mobile devices on wholesale trade SMEs can be traced to SMEs respondents' research questionnaire relating to the advantages and disadvantages.

Most respondents, about ninety-two percent thought mobile devices provided easy, fast and anywhere anytime communication. Mobile devices improved communication among SMEs employees, as well as communication between SMEs and their customers and suppliers. Mobile devices provided greater business opportunities for SMEs. The annual turnover of SMEs had also increased as a result of these additional business opportunities.

Mobile devices provided additional benefits to SMEs but also brought in some concerns. Thirty-one percent of respondents thought mobile devices were not good for health. Seven percent of respondents thought the battery required frequent charging hence an impediment. Concerns included mobile devices shutting off due to battery being low while important things were being discussed. Another seven percent of respondents noted that customers called after hours, as a result of which the mobile devices had a nuisance value

6.2 Mobile Device Types Currently Used by SME Owners and Employees

The usage type of mobile devices along with their respective usage percentages are

covered below:

Cell phones are used by ninety-two percent of respondents.

Smart phones are used by eight percent of respondents.

PDAs are used by twenty-three percent of respondents.

Most respondents are using cell phones. Smart phones were new cell phones combined with PDA features but most respondents did not know what smart phones were. However, most respondents knew what a PDA was, but only twenty-three percent of respondents were using PDAs.

6.3 Functions / Services of Mobile Devices Used by SME Owners and Employees

Functions / services of mobile devices which are used in SMEs are included below:

1. Voice Calling
2. Video Calling
3. SMS
4. MMS
5. Email
6. Internet
7. Listen to music
8. Entertainment
9. Addressing Book
10. Calendar
11. Advertising
12. Banking
13. Accessing Information
14. Calculator
15. MDTs

Ninety-two percent of respondents were using voice calling in mobile devices. Eighty-five percent of respondents were using SMS and address book in mobile

devices. Voice calling, SMS and address book were the main services and functions for communication in mobile devices from 2G technology. Around fifty percent of respondents were using mobile device to listen to music, playing games (entertainment) and arrange meetings (calendar). Technologies that followed 2G technology, presented mobile devices that not only provided calling, but also provided additional functions for work and entertainment. Only twenty-three percent of respondents were using video calling, MMS, email and Internet because of these services were latest technologies and cost too much. No more than fifteen percent of respondents were using mobile device for advertising, accessing information and calculator.

Later MDTs included 3G mobile data technology, GPRS, Wi-Fi, Bluetooth, IrDA, WiMax. Over sixty-two percent of respondents used Bluetooth and IrDA for data transfer between different mobiles or mobile devices and laptops. These two MDTs did not involve any additional recurring cost, hence they were very popular. Thirty-eight percent of respondents used GPRS. GPRS is the older technology since it is 2G. There were not many people using GPRS because the cost of GPRS was comparatively expensive. Wi-Fi and 3G mobile data technology are later technologies. Not many respondents seemed to be aware of these technologies, and only twenty-three percent of respondents used them. None of the respondents used WiMax because WiMax is not very popular in the market currently.

6.4 What Purposes Do the Mobile Devices Serve

The main purpose that mobile devices serve is communicating with employees, suppliers and customers.

Mobile device services for communication include voice calling, video calling, SMS, MMS, email and Internet. Voice calling is the main service of communication. Ninety-two percent of respondents used voice calling to contact employees and customers and seventy-seven percent of respondents used voice calling to contact suppliers. Around fifty percent of respondents used SMS to contact employees and customers, but only twenty-three percent of respondents used SMS to contact

suppliers. Using mobile device contacting suppliers was less than for contacting employees and customers because most suppliers were overseas. Possibly the contractual nature of commercial transactions between suppliers and the SMEs may be yet another reason. The cost of mobile device calling overseas was more expensive than landline so they used the landline more than mobile device for calling overseas. SMS was perceived as a feature not guaranteed to be received overseas. Due to the cost of video calling, MMS, email and Internet being too expensive, there were not many respondents who used video calling, MMS, email and Internet to contact employees, suppliers and customers.

7. Conclusion

Mobile devices are becoming more powerful and more important in the IT industry. (Barnes, 2002) From data analysis and interpretation, this study was found some limitations.

7.1 Limitations

Survey limitation

There were only 13 respondents from 8 SMEs covered in this survey, which is a rather small sample size for a large population base of SMEs in the Auckland region.

Technology limitation

Some technologies have yet to be released fully in the market such as WiMax and are not very popular as yet in Auckland, NZ.

Knowledge limitation

Lots of owners, managers and of SMEs are not aware of new technologies. They also use only simple straightforward features of their mobile devices.

Scope

This being a six month dissertation study, the scope has been accordingly limited to achieve the desired objectives.

Language limitation

As English is the second language of the author, a lot of trouble with English grammar and spelling was encountered.

7.2 Implications and Recommendations for Future Study

This study includes literature reviews that cover IT adoption in SMEs (Van Akkeren

& Cavaye, 1999), impact of MDTs on SMEs (Shih & Shim, 2002) and discusses the adoption of MDTs on SMEs of Australia and NZ (Harker & Van Akkeren, 2002). Ngatuere's study relating to how NZ SMEs use ICT stated wide variations of ICT use by SMEs. Such as one SME said "*the deployment of IT is dependent on the owner of the business and how far they want to go in terms of updating and using the latest technology, how much time and cost they are prepared to do*" (Ngatuere, 2006). ICT is a large area and growing fast. Keeping up with the latest technology, would require time and money.

This study covers MDTs and associated mobile devices with different functions and services of the MDTs. This study also brings to light information regarding benefits of mobile devices and MDTs to SMEs. SMEs may be prompted to adopt new mobile devices and MDTs to enhance their productivity.

This study focused on the impact of mobile devices on Auckland, SMEs. It included types of mobile devices, functions and services, and the purpose of using the mobile devices.

This study may also help mobile device manufactures and application developers to target the marketing of mobile devices especially for SMEs.

Future studies could cover mobile device usage for accessing orders and checking stock, and development of management systems. SMEs could use MDTs to achieve immediate access to the management system anywhere and anytime. To design such a management system, future studies may consider questions as covered below:

- What kind of programming language should be used in the system?
- What kind of database should be used in the system?
- What and how would security and maintenance be carried out in the system?

Mobile devices have become an important part of SMEs not only for communication but also for data transfer. Growth of mobile devices is faster than other devices such as PCs in the IT industry.

Appendices

Interview Questions

Background of respondent

1. Position held?

- Owner Employee Manager
 Other (please specify) _____

Background of business

2. Core business

2.1 Does your business belong to wholesale trade enterprise?

- Yes No

2.2 Which products do you deal with as in your main business?

- Clothes Shoes Bags Kitchen Products Jewellery
 Stationery Toys Cars Wood Tools
 Food Furniture Other (Please specify) _____

3. How many people are employed full-time?

- None Other (Please specify) _____

4. How many people are employed part-time?

- None Other (Please specify) _____

5. Location of business

- Auckland Other (Please specify) _____

Mobile devices usage within the business

6. Does the business use a mobile device?

- Cell Phone Smart phone Personal digital assistant (PDA)
 Don't know

6.1 How many cell phones are there?

- None 1 or 2 3-5 5 or more

6.2 How many smart phones?

- None 1 or 2 3-5 5 or more

6.3 How many PDAs?

- None 1 or 2 3-5 5 or more

6.1.1 How many employees operate these cell phones?

- None 1 or 2 3-5 5 or more

6.2.1 How many employees operate these smart phones?

- None 1 or 2 3-5 5 or more

6.3.1 How many employees operate these PDAs?

- None 1 or 2 3-5 5 or more

7. What cell phone, smart phone and PDA functions / services does the organisation use?

- None Voice Calling Video Calling SMS MMS
 Email Internet Listen to music Entertainment
 Addressing Book Calendar Advertising Banking
 Accessing Information Other (Please Specify) _____

8. What type of mobile connection does the business use?

- 3G Mobile Data General Packet Radio Service (GPRS)
 Wireless Fidelity (Wi-Fi) Bluetooth Infrared Data Association (IrDA) Worldwide Interoperability for Microwave Access (WiMax)

9. Which functions of mobile devices are used to communicate with employees?

- Voice Calling Video Calling Short Message Service (SMS)
 Multimedia Messaging Service (MMS) Email Internet

10. Which functions of mobile devices are used to communicate with your supplier to place orders / purchase?

- Voice Calling Video Calling SMS MMS Email
 Internet

11. Which functions of mobile devices are used to communicate with customers?

- Voice Calling Video Calling SMS MMS Email
 Internet

12. What benefits if any, has your business gained from using a mobile device (cell phone, smart phone and PDA)?

13. Do you see any barriers that are stopping you from using a mobile device (cell phone, smart phone and PDA) for your business?

14. In your organisation who made the decision for use of cell phone or smart phone or PDA?

15. Lastly, is there any other information that you think I should know, that would help me understand your business and the use of mobile devices (cell phone, smart phone and PDA) for this business?

Information Sheet

My name is Haiteng Huang and I am a student enrolled in the Master of Computing Programme at Unitec. I am carrying out research for my dissertation.

My research project is concerned with understanding the factors that influence the effective use of mobile devices in SMEs (small and medium sized enterprises) in NZ. The focus will be on analysing the use of the features of different mobile devices (Cell Phones, Smart Phones, PDAs) in SMEs in NZ

You are invited to participate in a face-to-face interview in my research project by agreeing to provide data about how you use mobile devices in your business.

The main question being researched is: what is the impact of mobile devices on NZ wholesale trade SMEs?

The sub questions are below:

1. What is the impact of mobile devices on NZ wholesale trade SMEs in the Auckland region?
2. What type of mobile devices do they use?
3. What type of functions / services of this mobile device(s) are used?
4. What purpose(s) do the mobile devices serve?

The primary researcher is Haiteng Huang. The research will be supervised by two lecturers from Unitec

The interview will be taped and will be transcribed (typed) later. All features that could identify you will be removed and the tape used will be erased once the transcription is done. The interview will take about half an hour.

Your name and information that may identify you will be kept completely confidential. All information collected from you will be stored in a secure place and only you, the researcher and the two supervisors will have access to this information.

Please contact me or my supervisor if you have any questions.

Student name: Haiteng Huang

Address: 23 Leiden Pl, Glenfield, Auckland

Email: huanghaiteng@gmail.com Phone: 021426031 (mobile phone)

Supervisor name: Hira Sathu

Phone: 8494180

Email: hsathu@unitec.ac.nz

UREC REGISTRATION NUMBER: (2007.xxx)

This study has been approved by the UNITEC Research Ethics Committee from (2 October 2007) to (1 October 2008). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 7248). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Consent Form

My research project is concerned with understanding the factors that influence the effective use of mobile devices in SMEs (small and medium sized enterprises) in NZ. The focus will be on analysing the use of the features of different mobile devices in SMEs in NZ

Name of Participant:.....

I have seen the Information Sheet for people taking part in the Mobile Devices in SME in NZ research project. I have had the opportunity to read the contents of the information sheet and to discuss the project with Haiteng Huang. I am satisfied with the explanations I have been given. I understand that taking part in this project is voluntary (my choice) and that I may withdraw from the project at any time up to final draft stage.

I understand that I can withdraw from the interview if, for any reason, I want this.

I understand that my participation in this project is confidential and that no material that could identify me will be used in any reports on this project.

I agree that the interview may be audio-taped.

I have had enough time to consider whether I want to take part.

I know whom to contact if I have any questions or concerns about the project.

The principal researcher for this project is Haiteng Huang- email: henry@56598.co.nz , phone 09 4419195 (home), 021426031(cell)

Signature.....(participant)(date)

The participant should retain a copy of this consent form.

This study has been approved by the UNITEC Research Ethics Committee from July 2007 to December 2007. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the Secretary (ph: 09 815-4321 ext 8041). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

UREC REGISTRATION NUMBER: (2007.xxx)

This study has been approved by the UNITEC Research Ethics Committee from (2 October 2007) to (1 October 2008). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 7248). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

References

- 21cn.com. (2002). *3G standards*. Retrieved July 28, 2007, from <http://tel.21cn.com/news/topic/2002-11-19/838713.html>
- Ahmed, A. K. M., & Salaheldin, S. I. (2005). *Small - medium enterprises in Qatar: An exploratory study*. Retrieved December 8, 2007, from <http://www.qu.edu.qa/doc/business/projects/Dr.abdulkader.pdf>
- Al-Qirim, N. (2005). An empirical investigation of an e-commerce adoption-capability model in small businesses in New Zealand. *Electronic Markets*, 15(4), 418-437.
- Al-Qirim, N. (2007). A research trilogy into e-Commerce adoption in small businesses in New Zealand. *Electronic Markets*, 17(4), 263-285.
- Attewell, J. (2005). *Mobile technologies and learning*. Retrieved January 14, 2008, from <http://www.m-learning.org/docs/The%20m-learning%20project%20-%20technology%20update%20and%20project%20summary.pdf>
- Barnes, S. J. (2002). Provision of services via the Wireless Application Protocol: A strategic perspective. *Electronic Markets*, 12(1), 14-21.
- Basso, A. (2006). Beyond 3G video mobile video telephony. *Multimedia Tools and Applications Archive*, 28(1), 173-185.
- BBC. (2004). *The 3G phone child abuse threat*. Retrieved October 12, 2007, from <http://news.bbc.co.uk/2/hi/technology/3388715.stm>
- Bluetooth.com. (2008). *Glossary*. Retrieved March 01, 2008, from <http://bluetooth.com/Bluetooth/Technology/Glossary/>
- Bracey, B., & Culver, T. (2005). *Harnessing the potential of ICT for education: A multistakeholder approach* (Vol. 28). New York: United Nations Publications.
- Brewer, E., Demmer, M., Du, B., Ho, M., Kam, M., Nedevschi, S., et al. (2005). The

- case for technology in developing regions. *Computer*, 38(6), 25-38.
- Burgess, S. (2003). *A definition for small business*. Retrieved December 10, 2007, from
<http://www.businessandlaw.vu.edu.au/sbirit/IRMA%20SRC%20-%20Small%20Bus%20and%20IT%20-%20Research%20Issue%201%20-%20What%20is%20Small.doc>
- Bytown. (2007). *Glossary*. Retrieved November 21, 2007, from
<http://www.bytowninternet.com/glossary>
- Chau, S. B., & Turner, P. (2001). *A four phase model of EC business transformation amongst small to medium sized enterprises*. Paper presented at the 12th Australasian Conference on Information Systems, Coffs Harbour, Australia.
- Chu, Y., & Ganz, A. (2005). *Mobile telemedicine systems using 3G wireless networks*. Retrieved November 20, 2007, from
<http://www.touchbriefings.com/pdf/1251/ACF7326.pdf>
- CITES. (2007). *Glossary of acronyms and technical terms*. Retrieved November 21, 2007, from <http://www.cites.uiuc.edu/glossary/>
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method approaches* (2nd ed.). London: SAGE Publications.
- Geser, H. (2004). *Towards a sociology of the mobile phone. Sociology in Switzerland: Sociology of the mobile phone*. Retrieved November 12, 2007, from
http://socio.ch/mobile/t_geser1.pdf
- Ghose, A. K. (2001). SMEs and environment protection. *Productivity*, 42(2), 121-163.
- Ghosh, A., Wolter, D. R., Andrews, J. G., & Chen, R. (2005). Broadband wireless access with WiMax/802.16: Current performance benchmarks and future potential. *Communications Magazine, IEEE*, 43(2).
- Haartsen, J., Allen, W., & Inouye, J. (1998). *Bluetooth: Vision, goals, and architecture. Mobile Computing and Communications Review*. Retrieved October 21, 2007, from

http://ssrnet.snu.ac.kr/course/cs4541_682-06-01/presentation/2006-03-22_blue_tooth.pdf

Hair, N. (2006). *The impact of the internet on the smartphone industry*. Retrieved November 30, 2007, from [http://www.chafic.net/attachments/projects/Industry%20Audit%20-%20How%20the%20Internet%20adds%20Value%20to%20the%20Smartphone%20Industry%20\(Author%20-%20Chafic%20Chahine\).pdf](http://www.chafic.net/attachments/projects/Industry%20Audit%20-%20How%20the%20Internet%20adds%20Value%20to%20the%20Smartphone%20Industry%20(Author%20-%20Chafic%20Chahine).pdf)

Halonen, T., & Melero, J. (2003). *GSM, GPRS and EDGE performance: Evolution towards 3G/UMTS* (2nd ed.). Chichester, West Sussex, England ; Hoboken, NJ, USA: Wiley.

Harker, D., & Van Akkeren, J. (2002). Mobile data technology for small business: Needs, uses and adoption. *Australasian Journal of Information Systems*, 9(2), 17-30.

Holzinger, A., Nischelwitzer, A., & Meisenberger, M. (2005). Mobile phones as a challenge for m-Learning: Examples for Mobile Interactive Learning Objects (MILOs) *Third IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOMW'05)*, 307-311.

Jupitermedia. (2007). *Mobile phone*. Retrieved November 21, 2007, from http://webopedia.com/TERM/M/mobile_phone.html

Kalden, R., Meirick, I., & Meyer, M. (2002). Wireless Internet access based on GPRS. *Personal Communications, IEEE*, 7(2), 8-18.

Kane, B. (2007). *IrDA*. Retrieved February 11, 2008, from <http://searchmobilecomputing.techtarget.com/dictionary/definition/214041/IrDA.html>

Kristoffersen, S., & Ljungberg, F. (1999). *Mobile use of IT*. Retrieved October 10, 2007, from http://www.flytip.com/blogs/mobility/documents/Mobile_Use.pdf

Lindner, A., & Bagherzadeh, M. (2004). *SME statistics: Towards a more systematic statistical measurement of SME behaviour*. Background report prepared for the

2nd OECD Conference of Ministers Responsible for Small and Medium Enterprises (SMEs), Istanbul.

M-indya.com. (2007). *3G features and detailed discussion of 3G*. Retrieved October 14, 2007, from http://www.m-indya.com/3g/3g_features.htm

Ministry of Economic Development. (2005). *SMEs and industry sectors*. Retrieved February 6, 2008, from http://www.med.govt.nz/templates/MultipageDocumentPage_2823.aspx

Ministry of Economic Development. (2006). *Our purpose and vision*. Retrieved February 14, 2008, from http://www.med.govt.nz/templates/Page_13311.aspx

Ministry of Economic Development. (2007). *Defining small and medium-sized enterprises*. Retrieved November 28, 2007, from http://www.med.govt.nz/templates/MultipageDocumentPage_2814.aspx

Ngatuere J. (2006). Use and choice of information and communication technology by selected New Zealand small and medium enterprises in the trades sector

Paelke, V., Reimann, C., & Rosenbach, W. (2003). *A visualization design repository for mobile devices*. Paper presented at the 2nd International Conference on Computer Graphics, Virtual Reality, Visualisation and Interaction, Cape Town.

PhoneServiceReviews.com. (2007). *Phone service reviews glossary of terms*. Retrieved November 21, 2007, from <http://www.phoneservicereviews.com/staticpages/index.php/0Glossary>

Rafael, V. (2003). *The cell phone and the crowd: Messianic politics in the contemporary Philippines*. Retrieved October 9, 2007, from http://communication.ucsd.edu/people/f_rafael_cellphonerev_files.htm

Sarker, S., & Wells, J. D. (2003). Understanding mobile handheld device use and adoption. *Mobile Commerce Opportunities and Challenges*, 46(12), 35-40.

Shih, G., & Shim, S. (2002). Mobile networks and applications, A service management framework for m-commerce applications. *Mobile Networks and*

Applications, 7(3), 199-212.

Shoniregun, C. A. (2004). *Classification and taxonomy of TEISMEs*. Paper presented at the 6th International Conference on Electronic Commerce, Delft.

Soy, S. (2006). *The case study as a research method*. Retrieved August 6, 2007, from <http://www.gslis.utexas.edu/~ssoy/usesusers/l391d1b.htm>

Telecom.co.nz. (2007). *How fast is it?* Retrieved November 20, 2007, from <http://www.telecom.co.nz/content/0,8748,203480-202857,00.html>

Thefreedictionary. (2008). *Business*. Retrieved March 15, 2008, from <http://encyclopedia.thefreedictionary.com/business>

University of Strathclyde Library. (2007). *Small and medium-sized enterprises: Definitions*. Retrieved November 27, 2007, from <http://www.lib.strath.ac.uk/busweb/guides/smedefine.htm>

Van Akkeren, J., & Cavaye, A. L. M. (1999). Factors affecting entry-level Internet adoption by SMEs: An empirical study. *Australasian Conference in Information Systems*, 2, 1716-1728.

Van Akkeren, J., & Harker, D. (2002). Mobile data technologies and SME adoption and diffusion: An empirical study on barriers and facilitators. *Australasian Journal of Information Systems*, 9(2), 1-16.

Vaughan-Nichols, S. J. (2004). Achieving wireless broadband with WiMax. *Computer*, 37(6), 10-13.

Vodafone.co.nz. (2007a). *I-mate JasJam*. Retrieved November 10, 2007, from http://store.vodafone.co.nz/Mobile_details_Summary.aspx?ptrecno=2925

Vodafone.co.nz. (2007b). *How fast is Vodafone 3G broadband?* Retrieved November 21, 2007, from http://vodafonenz.custhelp.com/cgi-bin/vodafonenz.cfg/php/enduser/std_adp.php?p_faqid=3619&p_created=1157512355&p_sid=I6Cld_i&p_accessibility=0&p_redirect=&p_lva=&p_sp=cF9zcmNoPSZwX3NvcnRfYnk9JnBfZ3JpZH NvcnQ9JnBfcm93X2NudD0yOTcmF9wcm9kezc0mcF9jYXRzPSZwX3B2PS

[ZwX2N2PSZwX3NIYXJjaF90eXBIPWFuc3dlnMuc2VhcmNoX25sJnBfcGF
nZT0xJnBfc2VhcmNoX3RleHQ9M2cgQnJvYWRIYW5kIEZhcXM*&p_li=
&p_topview=1](http://www.wi-fi.org/knowledge_center/backgrounder)

Wi-Fi Alliance. (2007a). *Backgrounder*. Retrieved February 11, 2008, from http://wi-fi.org/knowledge_center/backgrounder

Wi-Fi Alliance. (2007b). *Glossary*. Retrieved February 11, 2008, from http://wi-fi.org/knowledge_center_overview.php?type=3

Yin, R. K. (2002) *Case Study Research, Design and Methods*, 3rd ed. Newbury Park, Sage Publications

Zheng, P., & Ni, L. M. (2006). The rise of the smart phone. *IEEE Distributed Systems Online*, 7(3), 1-14.