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E-COMMERCE ADOPTION
BY SMALL MEDIUM ENTERPRISES: RURAL AND REGIONAL
GENERAL PRACTICES

A thesis submitted in partial fulfilment of the
requirements for the award of the degree of

Master of Information and Communication Technology (Research)

From

University of Wollongong

By

SANGEETHA RAMU

SCHOOL OF INFORMATION TECHNOLOGY AND COMPUTER SCIENCE
FACULTY OF INFORMATICS

2006

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ABSTRACT

There is a crisis in healthcare provision in remote and rural locations, as more and more GPs are leaving the countryside for positions in metropolitan centres. E-commerce may help to overcome the lack of services and remoteness of a country practice. But rural and regional GPs are not adopting E-Commerce at the same rate as other Small to Medium Enterprises (SMEs). This study aims to answer the question: *What are the major issues faced by rural and regional General Practice in adopting E-commerce?*

The study presents the results of a survey of E-commerce adoption by GPs in a rural location (South East NSW) and a regional location (The Illawarra region of NSW). The survey gathers data on the business characteristics of the GPs and their perception of the factors influencing E-commerce adoption and the benefits and disadvantages of E-commerce adoption. Statistical analysis of the results has confirmed some of the trends found in the literature but, more interestingly, our analysis also challenges some of the most widely observed trends. Overall, the results show that rural and regional GPs (SMEs) perceive E-commerce adoption differently to their metropolitan counterparts. In addition, there are differences in the perception of E-commerce adoption by service-oriented SMEs (GPs) compared to other industry sectors, such as manufacturing, retail etc.

University of Wollongong

Thesis Declaration

I, Sangeetha Ramu, being a candidate for the degree of Masters by Research hereby declare that work described in the attached thesis is my own work and has not been submitted for any other degree at the University of Wollongong or for any degree in any other university or institution.

Signature

Date

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CHAPTER 1

INTRODUCTION

1.1 Introduction

All across Australia, people and businesses are moving from the bush to the big city. This is equally true of General Practitioners many of whom are giving up their country practice for a more lucrative, less demanding practice in major metropolitan centres. This is leading, albeit slowly, to a crisis in healthcare in remote Australia. Indeed this phenomenon is a global healthcare issue affecting all those countries with remote rural populations.

One possible solution to this problem is the use of ICT and more specifically, E-commerce. In a number of industry sectors including transport, mining and manufacturing, E-commerce is effectively reducing the problems of distance and lack of local services. But neither ICT nor E-commerce is a panacea. The effectiveness of ICT and E-commerce varies from one industry to another. Moreover, rural and remote communities often claim to be disadvantaged by lack of bandwidth and poor support services. So, the very distances which ICT and E-commerce might minimise, may also undermine the use of these technologies.

This research seeks to determine how effective ICT and E-commerce are in assisting service industries such as GPs in non metropolitan centres such as in rural and regional Australia.

1.2 Background

E-commerce has been described as the process of buying and selling, transferring, or exchanging products, services and or information via computers including the Internet. E-commerce offers a variety of potential benefits including increased sales, reduced costs, better service and support from suppliers, greater customer satisfaction and ability to participate in international markets. While most organisations adopt E-commerce because they hope to achieve these benefits, many organisations have been

influenced in their decision to adopt E-commerce by other factors such as: pressure from customers and suppliers, pressure from competitors who use E-commerce, the desire to strengthen their relationship with business partners, the need to improve business efficiency etc. By adopting E-commerce, a company in a rural location can provide its products or services to customers anywhere and can gain access to international markets at the click of a mouse.

This is not to say that E-commerce is not without its problems. The major disadvantages arising out of E-commerce adoption are incurring on-going costs, maintenance costs, security concerns, lack of technical support, and extreme reliance on technology. Despite these disadvantages, E-commerce has been a general success and many organisations have gained greatly from adopting E-commerce.

But not all organisations have adopted E-commerce in the same way. Variations in the adoption of E-commerce have been ascribed to the differences between individual organisations, to different sized organisations, and to organisations in different locations. It has been observed that the business needs of an individual organisation influence both the level of E-commerce adoption and the speed with which the organisation moves from one level of adoption to the next. Similarly, the uptake of E-commerce by SMEs is lower than in large organisations. The reasons for this include lack of financial resources, E-commerce is a low priority for investments, resistance from employees, lack of skilled staff, lack of time etc. The adoption rates have been found to differ from one location to another. It has been noted that organisations of rural and remote locations are much slower in adopting E-commerce compared to organisations located in urban areas. Rural and regional SMEs do not have the same resources and infrastructure that SMEs in metropolitan locations are facilitated with.

There have also been differences in the rate of E-commerce adoption by different sectors. E-commerce has been adopted on a large scale by businesses in primary industries, manufacturing, transport and product-

oriented industries which are most likely to engage in online sales. The more successful businesses in the service sector which have adopted E-commerce are tourism, banking, finance etc. while the less successful service sector industries include businesses requiring more personal, face-to-face contact with customers, such as law, management consulting and healthcare, including General Practices.

In service oriented industries, particularly in the case of General Practices, providing quality service is considered to be extremely important. So, we might expect the reasons for adopting E-commerce would be different for those parts of the service sector. For example, a rural or regional General Practitioner (GP) might not aim to increase the patient base through adoption of E-commerce. Use of E-commerce can reduce the problems of remote, rural or regional location. Rural Australia remains critically under-supplied with General Practitioners (GPs) (ABS, 2002 cat. no 8685.0) and retention of GPs in rural, regional and remote locations has become a challenging issue (AMA, 2003). The shortage in medical workforce places a great demand on the quality of the health services delivered. Compared to their counterparts in metropolitan areas, rural and regional GPs are faced with additional problems in accessing medical information. The General Practices in these areas are situated far apart and GPs and patients may have to travel long distances.

E-commerce has helped SMEs especially of rural and regional locations to realize some of the benefits, so it is proposed that use of E-commerce in General Practices would be able to overcome the problems faced by the GPs as well as patients and would also reduce the problems of a remote location. A review of the literature reveals that E-commerce has not been widely adopted by rural and regional GPs of Australia, however, a report by GP Red Tape Taskforce (2003) found that GPs have started using computers in their practices for communication purposes and that this use of ICT in General Practices provides them easy access to medical records (electronic health records (EHR), electronic medical records (EMR)) and quick and efficient communication with the patients.

The term ICT adoption is used in the literature to describe both a preliminary step in the process of E-commerce adoption and the adoption of a range of technologies which includes E-commerce, itself. This poses a problem in the current study of rural and regional GPs. Use of the term E-commerce may lead GPs who have not yet adopted E-commerce to believe that the study is not relevant to them, but in fact it is, as they have embarked on that preliminary step to E-commerce adoption without necessarily realising it. So, for these participants, it is more appropriate to use the term ICT adoption.

In the case of GPs who have already adopted E-commerce, the term ICT adoption will be understood as including both the preliminary step and subsequent steps in the full E-commerce adoption cycle. Hence the term ICT adoption will be correctly understood by these participants as well. Consequently, although the focus of this study is primarily on E-commerce adoption, the term ICT adoption has been used to include both sets of participants.

Adoption of Information and Communication technologies has the potential to overcome the limitations of the location of the General Practices and provide them many benefits. Adoption of ICT is considered as an initial step towards future E-commerce adoption. In future, GPs could be seen interacting with their suppliers online involving electronic transactions and General Practices would no longer remain behind other service industries in E-commerce adoption.

1.3 Objectives of the research

Given this background, the current research addresses the question: *What are the major issues faced by rural and regional General Practice in adopting E-commerce?*

To address the above question, the objectives are as follows:

1. To determine which factors most influence the adoption of ICT by rural and regional GPs

2. To determine which benefits of ICT adoption contribute most to the viability of rural and regional General Practices
3. To determine which disadvantages of ICT adoption are the most significant for rural and regional GPs
4. To determine if the business profile of individual rural and regional General Practices have any association with the factors, benefits or disadvantages of ICT adoption.

1.4 Scope of this study

This study focuses on rural and regional General Practices of Australia only. This study is a part of a larger study intended to gather data about General Practices across Australia. Issues such as broadband connectivity, computer availability, Internet connections are not included. Also the study does not try to compare the adoption of E-commerce by rural and regional General Practices with that of metropolitan General Practices. Such comparison studies could be conducted in the future.

1. 5 Organisation of Thesis

Chapter 1 provides a brief overview of this research and defines the scope of the study. It states the research question and defines 4 objectives that will contribute to answering the research question.

Chapter 2 presents a comprehensive review of the literature on the concepts which underpin the current research. These concepts include

- E-commerce,
- Small to Medium Enterprises (SMEs), particularly General Practices
- Adoption of E-Commerce by SMEs, particularly General Practices
- Rural and regional locations, particularly as defined in Australia.

Chapter 3 presents a description of the research methods followed, the choice of the locations for the study, the construction of the research instrument (questionnaire) used for this study and the statistical techniques used to

analyse the collected data. The chapter explains the design of the questionnaire in detail and the procedures followed in conducting the survey.

Chapter 4 presents an analysis of the responses to the questionnaire administered in a regional setting, namely the Illawarra region of NSW, Australia.

Chapter 5 presents an analysis of the responses to the questionnaire administered in a rural setting, namely, the South East region of NSW, Australia.

Chapter 6 presents the conclusions drawn from the study, identifies the limitations of the study and suggests future direction for research

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 Introduction

The previous chapter demonstrated that the adoption of E-commerce has been slower among SMEs than in large organizations. It has also shown that the rate of adoption of E-commerce by SMEs varies from one industry to another e.g. manufacturing, production, retail, service sector etc. One important group of SMEs in the service sector has been overlooked in previous research, namely General Practices. This research aims to address the issues of E-commerce adoption by General Practitioners (GPs). Before doing so, it is necessary to understand the principal concepts related to this research, namely, E-commerce, Information and Communication Technologies (ICT), Small to Medium Enterprises and General Practices of rural and regional locations. These concepts are shown in the conceptual framework and explained in this chapter.

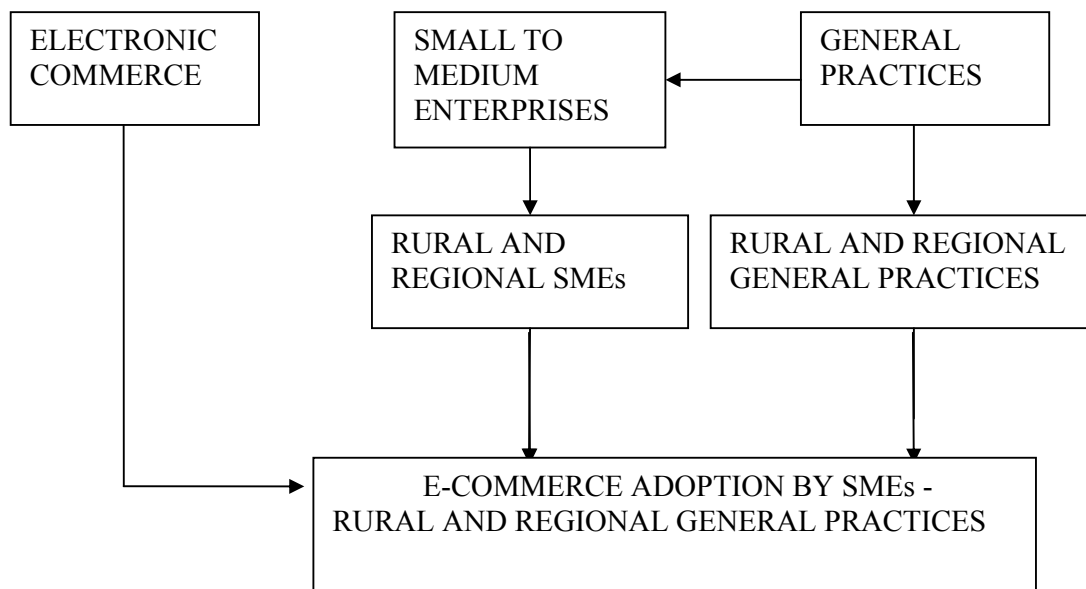


Figure 2.1 Conceptual Framework for the current research

2.2 Background

Most of the studies (MacGregor, 2004; Cooper and Burgess, 1998; Lawson et al, 2001) on E-commerce adoption by SMEs have focussed on SMEs belonging to the retail, manufacturing and production sectors. Most types of industries in these sectors have adopted E-commerce at an early stage and the literature provides numerous studies about their adoption of E-commerce. Very few studies (OECD, 2004; European Commission, 2005) have discussed the issues of E-commerce adoption in service oriented sectors and few, if any, have focussed on medical General Practices.

Most studies of SME adoption (Sensis Business Index Special Report, 2005; Yellow Pages Small Business Index, 2000) have focussed either intentionally or unintentionally on SMEs in metropolitan centres. This is strange, as the proposed benefits of E-commerce adoption should apply even more to businesses in regional or rural locations. A regional or rural retailer who has access to inexpensive freight services could use E-commerce to sell goods anywhere in the world. So, theoretically, the location of a provider should not affect the uptake of E-commerce. In rural and regional locations, particularly in Australia, General Practices are usually situated far apart and GPs have to travel long distances to make a "house call". The use of E-commerce should be of enormous potential benefit to such GPs. E-commerce is claimed to provide ubiquitous availability of data and facilitate easy communication between Practices and patients and also with other Practices, suppliers etc. It is important to find out how E-commerce can facilitate and contribute to the viability and sustainability of running of General Practices in rural and regional locations, particularly those in Australia.

The few studies (Cooper and Burgess, 1999; Sensis Business Index Special Report, 2005) to date on GPs' adoption of E-commerce have focussed on ICT adoption (a necessary step in E-commerce adoption) and have analysed the use of ICT in clinical treatment and disease management. Very few studies (GP Red Tape task force, 2003; Queensland Rural Medical Support Agency,

2002) have attempted to find out the factors, benefits and disadvantages of ICT adoption that are relevant to GPs. This research aims to examine these factors, barriers, benefits and disadvantages as they relate specifically to GPs in rural and regional locations.

2.3 Electronic Commerce

Electronic commerce or E-commerce as it is popularly known has been in use since the early 1960s, when Electronic Data Interchange (EDI) was introduced. EDI is defined as “the exchange, using digital media, of structured business information between buyers and sellers” (Chaffey, 2002, pg 5).

There are many definitions of E-commerce in the literature. PricewaterhouseCoopers (1999) defines “E-commerce as the use of computers and electronic networks to conduct business over the Internet or another electronic network.” Making a comparison between traditional ‘bricks and mortar’ stores, International Engineering Consortium (IEC, 2000) says “E-commerce is an emerging model of new selling and merchandising tools in which buyers are able to participate in all phases of a purchase decision, while stepping through those processes electronically rather than in a physical store or by phone.” The IEC’s definition of E-commerce mentions ‘merchandising tools’ in general; some other definitions of E-commerce specifically relate to buying and selling of products and services. Kalakota and Whinston (1996) define E-commerce as “the buying and selling of information, products, and services via computer networks”. Turban et al (2000) define E-commerce as the process of buying and selling, transferring, or exchanging products, services and or information via computers including the Internet. According to Clayton (1998), E-commerce refers to the use of electronic means to do business. This includes using the Internet to buy and sell products and services, exchange information and establish networks with suppliers.

One of the most comprehensive definitions of E-commerce is given by Clarke (2001) who defines E-commerce as “an integrative concept, designed to draw

together a wide range of business support services, including inter-organisational email; directories; trading support systems for commodities, products, customised products and custom-built goods and services; ordering and logistic support systems; settlement support systems; and management information and statistical reporting systems.”

Schneider’s definition (2002, pg. 12), which is brief but comprehensive, says that “E-commerce includes all the business activities conducted using electronic data transmission”. GPs use computers and the Internet for communication and information sharing, and use of E-commerce can facilitate online services such as generating prescriptions, appointment reminders and treatment guidelines etc. The definition of E-commerce, defined by Schneider is used in this study. E-commerce in General Practices would refer to all electronically mediated transactions.

The terms E-business and E-commerce are sometimes used interchangeably in the literature. OECD (2002) differentiates E-commerce and E-business. It defines E-business as "automated business processes (both intra-and inter-firm) over computer mediated networks. E-business is more than E-commerce in that e-business includes internal processes within the company as well as processes between companies" (OECD, 2002). Chaffey (2002, pg. 6) states that “many of the transactions within a business, such as processing a purchase order, are not strictly E-commerce, and should be considered to be part of E-business.”

ICT are fully integrated in E-business. ICT refers to “the technologies and services that enable information to be accessed, stored, processed, transformed, manipulated and disseminated, including the transmission or communication of voice, image and/or data over a variety of transmission media” (ABS, 2005 cat. no 8126.0). The above definition of ICT is used in this study. ICT adoption in health care facilitates better and easy access to clinical knowledge, medical records, health information etc.

According to Cooper and Burgess (1998), ICT infrastructure forms the basis for the diffusion of E-commerce in the future. A similar view is expressed by Wong (2003), who found that investment in ICT infrastructure has facilitated the subsequent development of E-commerce. In this study, ICT adoption is considered to be one of the early stages in adopting E-commerce. ICT adoption could take place either as a preliminary or a parallel step in adopting E-commerce.

The different stages of E-commerce adoption are explained in the next section. Some researchers use the term 'Internet Commerce' interchangeably with "Electronic Commerce". This study does not distinguish between them.

2.3.1 E-commerce Stages

A number of studies have proposed models for the different stages of E-commerce development in organisations. The "Model of Internet Commerce Adoption (MICA)" formulated by Cooper and Burgess (1999) explains that there are three levels of adoption of E-commerce the first level is promotional, the second level is provisional and the final level is processing. According to them, ICT comprise the early stages of electronic trade facilitating communication between the suppliers and buyers.

Rayport and Jaworski (2002) divide E-commerce development into four stages namely "Being in the Internet", "Interaction", "Transactions" and "Cooperation" and "Collaboration". Levy and Powell (2002) also proposed a four-stage model of E-commerce adoption by SMEs. The first stage is efficiency where IT is adopted for control, primary financial. The second stage involves co-ordination to improve customer care through technological integration. The third stage is collaboration focussing on relationships along the industry value chain. The fourth stage consists of innovation which is an integral and tightly woven part of business strategy.

Table 2.1 Summary of 3 models of the stages of E-commerce adoption

Cooper & Burgess	Rayport & Jaworski	Levy & Powell
Promotional (use ICT & Internet)		ICT for internal use
	Internet	
Provisional	Interaction	
Processing	Transaction	Co-ordinate with customers
	Collaboration	Collaboration
		Innovation

The 3 models shown in Table 2.1 are premised on the idea that businesses evolve through a number of successive stages in adopting E-commerce. However, businesses need not evolve progressively through each of the stages; some adopt the advanced stages much later and some of them adopt all of the stages in the beginning. According to the Actinic Electronic Commerce report (2004), the degree of adoption of E-commerce varies from industry to industry and it also depends on the products and services offered. This is supported by the OECD report (2002) which states that ICT and E-commerce adoption depends on the nature of the business. "ICT and the Internet can play a substantial role in implementing companies' major strategies for growth and implementation of E-commerce" (OECD, 2002).

Not all SMEs adopt E-commerce in a multi-staged process. Availability of financial resources and business needs determine the extent of adoption of E-commerce by SMEs. Gulrez (2003), in his empirical study of SMEs adoption of E-commerce technologies, states that SMEs who adopt the initial levels of E-commerce technologies are unlikely to adopt more sophisticated E-commerce technologies if they are not familiar with the more basic ones. Small business owners can easily incorporate entry-level E-commerce technologies into the business.

2.3.2 Types of E-commerce

There are different types of E-commerce. The four major types of E-commerce are described below.

Business to Business (B2B)

In Business to Business E-commerce, the two businesses pass information electronically to each other (Chaffey, 2002). This includes companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers. B2Bs serve as hubs for economic transactions amongst businesses e.g. organisational sites like DELL.

Business to Consumer (B2C)

Business to Consumer E-commerce includes commercial transactions between an organisation and its customers e.g. Amazon, Cisco etc.

Consumer to Business (C2B)

Consumer to Business E-commerce is seen where the consumer requests a specific service from the business e.g. Priceline.com

Consumer to Consumer E-commerce (C2C)

C2C includes interactions between customers on a website. Some E-commerce sites like E-bay specialize in bringing buyers and sellers together, rather than selling products from their own inventories. The consumer lists items for sale with a commercial auction site. Other consumers access the site and place bids on the items. The site provides a connection between the seller and buyer to complete the transaction.

2.4 Small to Medium Enterprises (SMEs)

Small to Medium Enterprises (SMEs) play a major role in any country's economy. SMEs can be classified on the basis of the number of employees, revenue, turnover rate, maturity etc. The definitions of SMEs vary across countries, industries, sectors and studies. In the United States, "small businesses" are generally defined as independent businesses having fewer than 500 employees. However, different definitions, based on employment size, sales and annual turnover, apply when dealing with various government programmes, such as contracting (U. S. Small Business Administration, 2002). The European Commission (2003) defines micro, small and medium-sized enterprises as the category consisting of "enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million" (European Commission, 2003).

Because Australia has a far smaller population than the US and most European countries, the size range for SMEs in Australia is considerably smaller than US and European counterparts. The Australian Bureau of Statistics (ABS, 2002) uses the following classifications:

- Small businesses have less than 20 employees. They include:
 - Non-employing businesses, in which one person or two or more partners work, but there are no employees.
 - Micro businesses employ less than 5 people, including non-employing businesses.
- Medium businesses have between 20 and 199 employees.
- Small to medium enterprises (SMEs) have less than 200 employees (ABS, 2002, cat. no 1321.0)

Given that this study focuses on the Australian context, the ABS definitions for 'Small to Medium Enterprises', 'small business' and 'small firms' are used. The National Office for the Information Economy (NOIE), states in its annual

report that SMEs “are vitally important to Australia’s economic and social prosperity” (NOIE, 2002).

2.4.1 Characteristics of SMEs

SMEs possess characteristics quite different from large enterprises. Numerous studies have identified the prominent characteristics of SMEs. SMEs

1. have less resources (Poon and Swatman, 1999; Abell and Lim, 1996; Actinic Electronic Commerce Report, 2004)
2. are risk averters (Walczuch et al, 2000; Dennis , 2000)
3. are slow to adopt technology (Actinic Electronic Commerce Report 2004; OECD, 2004)
4. are typically family owned (ABS, 2002 cat. no 1321.0)
5. are reluctant to spend on IT (Sensis Business Index Report, 2005)
6. have flattened organisation structure with few staff (Culkin and Smith, 2000)
7. have limited market share (Quayle, 2002)
8. have little or no ICT skill (OECD, 2002)

Some characteristics of SMEs make them flexible in adapting to change and some other characteristics pose barriers in adopting E-commerce. The size of the smaller firms has been found to be influential in organisational decisions and formulation of strategies. Some studies observe that smaller firms can quickly respond to changing markets. On the other hand, other researchers consider the size of SMEs to be a disadvantage in adopting E-commerce. There are numerous studies dealing with E-commerce adoption by SMEs. The next section presents an overview of those studies and later sections (see Section 2.6) discuss the adoption of E-commerce by SMEs in detail.

2.4.2 SMEs and E-commerce

SMEs, because of their size are believed to easily adopt new technologies. Researchers who believe that the size of SMEs is an advantage argue that smaller size makes SMEs flexible and fewer difficulties are faced in changing to a new system. The flattened structure of SMEs enable faster decision

making. Contrary to this view, there are studies which state that the smaller size of SMEs acts as a barrier in adopting E-commerce. Those studies (OECD, 2002, Culkin and Smith, 2000) argue that smaller size means limited staff and, consequently, it is unlikely that most SMEs have ICT skilled staff. Lack of skills (OECD, 2004) and lack of financial resources (Cragg and King, 1993) makes it difficult for SMEs to adopt E-commerce. Studies on E-commerce adoption have found that bigger firms adopt new technologies faster as they had greater access to resources compared to the smaller firms. Werthner and Bichler (2001) state that while large companies usually have a large IT staff at their disposal; SMEs cannot rely on similar resources. This in turn can affect the expenditure on IT by SMEs. SMEs need to provide training or hire ICT skilled staff when adopting E-commerce. Thus, it is appropriate to find out the importance of IT training implemented by SMEs and the percentage of total costs spent on training.

E-commerce has influenced SMEs' activities because it provides them with access to new customers (Poon and Swatman, 1997) and markets exposing them to global competition. Research has shown that SMEs achieve significant long-term benefits by adopting E-commerce. Mustaffa and Beaumont (2004) state that Internet uptake among SMEs has increased their business efficiency and resulted in long-term benefits to the firm with ample future opportunities. They further state that SMEs' perception of the long term benefits have influenced their adoption of E-commerce. Similar views are expressed by Grandona and Pearson (2004) who identified four factors that influence E-commerce adoption namely organizational readiness, external pressure, perceived ease of use, and perceived usefulness. Poon and Swatman (1999) conducted multiple case studies into the uptake of what they called Internet Commerce among Australian small businesses. They found that industry and product specificity have influenced how involved SMEs were in using the Internet to support their business operations (Poon and Swatman, 1999).

The rate of E-commerce adoption by SMEs varies depending on the size, the location of the business and certain other factors. The 'location' of the

business is of specific interest for the purpose of this study as our focus is on rural and regional SMEs.

2.4.3 Effects of Location on E-commerce adoption by SMEs

The literature reveals that there exists a 'digital divide' between the level of ICT and E-commerce adoption in rural and regional locations compared with metropolitan areas. The locations play a major role in an organisation's business strategy and decision-making process. E-commerce has opened up global opportunities for SMEs located in remote areas enabling them to compete with large businesses on an international scale. E-commerce allows regional and rural businesses "to improve productivity, revenues, and competitiveness by being more efficient and flexible in conducting their internal operations, meeting the needs and expectations of their customers" (Parker and Papandrea, 2002, pg.12). The 2005 SENSIS business report of Australia found that 86% per cent of regional businesses are connected to the Internet. Its findings report that the adoption rate of ICT by rural and regional SMEs is increasing but at a slower pace compared with metropolitan areas. E-commerce adoption in the Australian regional SME sectors has remained relatively low. Strategies and policies are formulated by the government to help SMEs in remote locations to realise the benefits of E-commerce.

2.4.4 SMEs adoption of E-commerce by industry

As stated earlier, the degree or extent of E-commerce adoption varies from one industry to another. SMEs in manufacturing industries and product-oriented industries have adopted E-commerce on a larger scale than SMEs in service oriented industries, like restaurants, tourism, other hospitality industries and, presumably, General Practices. The nature of the industry plays an important role in adoption of E-commerce (OECD, 2002). Studies conducted in the manufacturing industry and transport industries have identified the potential benefits of E-commerce in terms of reducing costs, increasing productivity, expanding the business and increasing the customer base etc. The service sector may derive similar or different benefits from that of product oriented sectors by adopting E-commerce.

2.4.5 Summary

In summary, then,

- SMEs possess different characteristics to large enterprises.
- SMEs of a particular sector are quite different to SMEs of another sector.
- Business needs and industry specific factors influence SME's adoption of E-commerce.

2.5 General Practices

Although the functions performed by General Practitioners (GPs) vary a little from one country to the next, GPs typically provide consultation-based services in the surgery, house calls and nursing home visits and also perform tasks like practice management and administration. General Practices are an integral part of Australia's health system and play an important role in primary care. The Royal Australian College of General Practitioners defines a GP as one who "provides primary comprehensive and continuing care to patients and their families within the community" (RACGP, 1998). So, the main functions of a GP include: primary care and locally based affordable and accessible illness treatments. The following sections discuss the uses and benefits of ICT in health care, particularly in General Practices.

2.5.1 Use of ICT in Healthcare

While most of the product-oriented sectors have integrated their businesses to become E-businesses, the healthcare sector is predominantly service oriented. Armstrong et al. (2004) stated that, for reasons that are complex, the healthcare sector lags behind the rest of the world in its use of ICT. The 'complex' reasons include the fact that the medical field involves more personal care and that complete replacement of healthcare services by computer is not possible.

The common uses of ICT in health care are to use Electronic Medical Records (EMR), to exchange clinical data, to access patient records (non-EMR format)

and to generate treatment reminders. The main uses of ICT by GPs are to access medical guidelines and to generate online prescriptions. A survey of ICT use among GPs conducted by the University of Queensland in 2002 found that 89 per cent of Australian General Practices use computers and noted that computer usage is greatest for general administrative use. A health care survey named BEACH, a continuous cross-sectional survey of General Practice activity in Australia between November 2003 and March 2005, found that the majority of GPs use computers at work for electronic prescribing, ordering tests and keeping some patient data in EMR (Henderson et al, 2006).

In New Zealand, there have been tremendous advances in Health Information Communication Technology. Subramanian (2005) notes that the operation of an “innovation dynamic” between software developers, academic institutions and the Ministry of Health have contributed to the advancement of Health Informatics and that General Practice has been integrally involved.

A study of Scottish GPs in 2004 reported that 94% of them frequently use a computer and make frequent use of computers for a variety of clinical and practice management activities. A survey of US General Practitioners (Ash and Bates, 2005) found that General Practices are using computers mainly for clinical practices and maintaining an EMR.

2.5.2 Major benefits of ICT in Healthcare

Harnessing the full range of capabilities of ICT can improve the quality and efficiency of health care services. Use of ICT in healthcare

- reduces medical errors (AIHW, 2002)
- reduces administrative costs (Armstrong et al, 2004)
- helps in maintaining efficient documentation. (Joslyn, 2001)
- facilitates communication (RDAA, 2003)
- provides streamlining of billing (Subramanian, 2005)
- provides online medicare payments (AIHW, 2002)
- facilitates remote patient monitoring (AIHW, 2002)

- enables cyber health services (RDAA, 2003). Online services can include questions from the patients seeking online help, call-backs, appointment scheduling etc.

The extent of use of information system and online services in healthcare depends on the type of services offered and also on the patients' participation.

2.5.3 Rural and Regional General Practices

Physical location places an additional demand on the quality of healthcare services. Rural GPs have to face additional challenges like professional isolation, lack of access to educational opportunities and excessive workloads. Other disadvantages of rural and regional locations include “socio-economic disparities; small, sparsely distributed population; problematic access to hospitals; lack of specialists; and the special health needs of the indigenous population” (NSW Rural Health Report, 2002)

Rural locations may be considered as a disadvantage by patients as well as by GPs. Australian Rural Health Education Network (2005) found that many families and patients living in rural and remote locations incurred a significant cost in travelling to hospitals and finding accommodation before and after procedures. Rural practitioners are found: to work harder than their urban colleagues, to require a broader range of clinical skills, to work in a different socioeconomic environment, and to have more difficulty accessing continuing medical education.

The AMA Annual report (2003) says that, in Australia, people living in remote locations have inadequate access to medical services and are demanding more and better healthcare services. Its findings also indicate that the GP workforce has been dwindling over the past years. The dwindling number of GPs fuels the issues of quality health care services. The other prominent issues for rural and regional GPs include low doctor: patient ratios in some areas and the inability to attract and retain GPs. In recent years, GPs of rural and regional areas have started moving to metropolitan centres for a number of reasons. To meet with the growing demands of healthcare services in

regional and rural areas and address GP workforce shortages, the Australian government has taken measures like recruitment of a large number of overseas trained doctors. Also, a number of associations are formulating strategies for using ICT in hospitals, clinics and General Practices. The NSW Rural Doctors Network (RDN) of Australia, under the E-commerce Information Technology on Line (ITOL) program, has formulated strategies to promote the use of ICT in healthcare services in rural, regional and remote locations. The Australian Commonwealth government has formulated strategies for the retention of General Practitioners in rural, regional and remote areas. The Commonwealth has financially supported the implementation of ICT in General Practice through a number of programs like the Practice Incentive Program (PIP) and has promoted the use of computers in General Practices.

2.5.4 GPs as SMEs

SMEs differ across industries, sectors and regions. General Practice is very different from SMEs of other sectors. Some of the characteristics of SMEs of other industries may or may not be present in General Practices. In Australia, the majority of GPs are self-employed and family owned. Private General Practices differ in size. The typical characteristics of SMEs (as described in section 2.4.1) which can be found in General Practices are:

- Family owned. (ABS, 2002; cat. no. 8685)
- Slow in adoption of technology
- Have centralised management

Given that GPs do not have the same broad set of characteristics as other SMEs, the perceived benefits of E-commerce adoption by GPs could very well be different. For example, most SMEs aim to expand their business and increase the customer base by adopting E-commerce. An interview with medical personnel of the Illawarra Division of General Practice (IDGP) revealed that GPs are not interested in increasing their patient base (Ramu, 2005). Increasing the customer base has been cited as one of the major 'factors' of E-commerce in many studies (Poon and Swatman, 1999 ;OECD, 2002; Ritchie and Brindley, 2001; Mustafa and Beaumont, 2004) of other sectors. For SMEs of retail or manufacturing sector, reduction in time is

considered to be one of the drivers of E-commerce adoption. But being a GP involves lot of personal care, more face-to-face consultations, and services are 'complex', particularly in the case of major health problems. While the time taken to do the repetitive and complex administrative tasks might be reduced by the use of ICT, the time spent with patients cannot be reduced and still maintain the quality of patient care.

ABS (2002) found that GPs in rural and remote areas are working longer hours than their metropolitan counterparts. It is of interest to know whether GPs of rural and regional areas believe that the use of ICT can give them more leisure time and would like to reduce or share their workload. Certain factors, barriers, benefits and disadvantages of E-commerce adoption which apply to SMEs in other sectors may or may not be applicable to General Practices. It is appropriate to find out the sector specific factors influencing adoption of E-commerce by GPs.

2.6 E-Commerce Adoption by SMEs

E-commerce adoption by SMEs has been the topic of interest of many studies in the past and continues to be. The focus of this study is E-commerce adoption by GPs. Almost all General Practices in Australia are classified as SMEs (ABS, 2002, cat. no. 8685.0). A review of the literature revealed that E-commerce is not adopted on a large scale by GPs at present compared to SMEs in other sectors. Nonetheless, the use of ICT in General Practice is gaining momentum and adoption of ICT in General Practices can be considered as a step towards the adoption of E-commerce in the future.

The major factors influencing E-commerce adoption by SMEs cited in the literature include:

- improve business efficiency, (Abell and Lim, 1996)
- increase in productivity ,(SETEL, 2001)
- reduce business costs, (Abell and Lim, 1996; SETEL,2001)
- reduce paperwork, (OECD, 2002)
- access to international markets (Poon and Swatman, 1999)

The importance of these factors varies from one industry to another and from one organisation to another.

E-commerce offers many benefits over traditional paper-based commerce. All government agencies, large corporations, small businesses and other service and product oriented sectors throughout the world have started conducting business through E-commerce. They have adopted E-commerce because it can help them increase sales, profits and reduce costs (Chaffey, 2002).

Some of the prominent benefits of E-commerce for SMEs are summarized below. E-commerce facilitates

- Reduction of costs, (Abell and Lim, 1996; Chaffey, 2002)
- Increased sales, (Abell and Lim,1996)
- Expansion of business reaching wider markets, (Quayle, 2002)
- Improved marketing, (Quayle, 2002)
- Reduction of both lag time and paperwork, (Poon and Swatman, 1997)
- Ease of communication, (Poon and Swatman, 1997)
- Improved customer service. (Al Qirim, 2003)

SMEs have to face several challenges or overcome a range of barriers to realise the benefits of adopting E-commerce. The major barriers to E-commerce adoption by SMEs include

- lack of technical skilled staff (Chaffey, 2002)
- lack of financial resources (OECD, 2004)
- cost of implementation (MacGregor et al, 1998)
- privacy and security issues (Lawson et al, 2001)
- resistance from employees. (Sensis E-business Report, 2005)

A number of inherent disadvantages of E-commerce adoption for SMEs are found in the literature, including:

- resistance to usage of new technology by staff, (OECD, 2002)
- higher costs, (Chaffey, 2002)
- ongoing technical difficulties, (OECD , 2002)

- security concerns, (Ritchie and Brindley ,2001)

The next sections discuss in detail the factors, barriers, benefits and disadvantages of E-commerce adoption by SMEs and relate these to the adoption of E-commerce by GPs.

2.6.1 Factors influencing E-commerce adoption

This section discusses the major factors affecting E-commerce adoption by SMEs identified in previous studies conducted among different industries. The main factors influencing the adoption of E-commerce by SMEs are summarised in the following Table 2.2.

Table 2.2 Factors influencing adoption

PricewaterhouseCoopers (1999) found that the perception by SMEs of the opportunities and benefits offered by E-commerce, such as greater access to international markets, motivates them to adopt E-commerce. This view is supported by Mustaffa and Beaumont (2004) who state that SMEs' perception of the long-term benefits have influenced their adoption of E-commerce. They also found that Internet uptake among SMEs has increased their business efficiency and resulted in long-term benefits including improved relations with customers, access to global markets and reduced costs.

Competition is one of the driving forces for many SMEs to adopt E-commerce. PricewaterhouseCoopers (1999) found that there have been many changes to business competition because of increased foreign investors leading to a rapid ICT investment growth in various business sectors to stay competitive.

Many studies (Grandona and Pearson, 2004; Mustaffa and Beaumont, 2004; SEAMATE, 2004) have attempted to categorise the list of factors that influence SMEs to adopt E-commerce. Broad categories of factors include organisational factors, environmental, socio-economic factors and technological factors. The organisational factors are internal to the organisation and include the organisational culture. The technological factors include availability of software, hardware, broadband connectivity etc. The socio-economic factors constitute the institutions and government bodies external to the organisation.

Some of the factors are internal to the business and some others are external. The internal factors include the business needs, organisational structure, and the owner's and the business's characteristics. External factors include competition from other organisations and market or industry related factors. Industry specific factors include the industry forces, business scalability, competition existing in that industry etc. Also within an industry, factors influencing E-commerce adoption are mostly sector specific. "Potential small business benefits and organisation and sector-specific strategies drive the adoption and use of ICT and E-commerce "(OECD, 2004, pg.1).

The SETEL E-commerce report (2000) suggests that the SME sector needs substantial encouragement to become productively involved in E-commerce. To help SMEs reap the full benefits of E-commerce, governments and other institutions can play a major role by providing business incentives, particularly in developing countries (Al Qirim, 2006).

This is particularly pertinent to our study of Australian GPs because the Australian government, in order to retain more GPs in rural areas, has formulated strategies and the Commonwealth of Australia has provided more than \$400 million through a number of policies to support the use of ICT in General Practice, especially in remote locations. Even in metropolitan locations with better health infrastructure and healthcare services, people prefer to go to nearby medical Practices and consult their 'family doctor'. The nature of the industry involves a lot of personal care, which does not seem to be achievable using E-commerce, which negatively affects the motivation of GPs to the adoption of E-commerce.

The OECD report (2004) recommends SMEs to go online by making use of e-government initiatives but suggests that those incentives need to be "seamless and integrated" into the business activities.

2.6.2 Barriers of E-commerce Adoption

For any business to realise the full benefits of a technology it has to overcome the barriers to implementing the technology. In the previous section it was seen that perceived benefits is one of the major factors of E-commerce adoption by SMEs. Sometimes, the owners of SMEs fail to perceive the benefits of E-commerce. The owner's attitude (reluctance towards technology etc.) strongly influences their adoption of E-commerce.

Lack of financial resources (MacGregor, 2004; Poon and Swatman, 1997; Al Qirim, 2006; Ifinedo, 2005) and lack of skilled staff (Stansfield and Grant, 2003) have been cited as the major barriers for SMEs in adopting E-commerce. When there is lack of knowledge and skill in the organisation, then the adoption of E-commerce is not encouraged. OECD (2004, pg.5)

reports that “lack of ICT skills and business skills are widespread impediments to effective uptake once adoption decisions are made. Lack of availability of ICT competencies within the organisation, and availability and cost of appropriate interoperable small-organisation systems, network infrastructure and Internet-related support services also act as barriers.” The other common barriers to E-commerce and ICT adoption include unsuitability for the type of business (Abell and Lim, 1996; MacGregor, 2004), lack of time (Ifinedo, 2005). The barriers are listed in Table 2.3.

Table 2.3: Barriers of E-commerce adoption

Just as for the factors affecting E-commerce adoption, the barriers to adoption are also industry and sector specific. Some of the barriers faced and perceived by service industries are quite different from manufacturing, sales or production industries. Even across service industries the perceived barriers vary from organisation to organisation. In businesses where sales are the primary functions, the barriers for moving to on-line sales include “lack of personnel with appropriate ICT skills, concerns over unbalanced costs and benefits, insufficient customer access to Internet and technology concerns, such as on-line security”. (OECD, 2004).

Some of the typical characteristics of SMEs act as barriers in adopting E-commerce. They include

- Lack of knowledge and ICT skills among employees. (Stanfield and Grant, 2003; OECD, 2004; Mirchandani and Motwani ,2001)
- Lack of resources: human as well financial (OECD, 2002)
- Less familiarity with the technological and management issues (Actinic Electronic Commerce Report, 2004)
- Limited market scope (Al Qirim, 2006; Bunker and MacGregor, 2000)

To take advantage of E-commerce, the threats need to be converted to opportunities. Porter's (1985) theory of five forces has to be understood to know about the threats and opportunities that exist in any industry.

Werthner and Bichler (2001) argue that while large companies usually have a large IT staff at their disposal, SMEs cannot rely on similar resources. They found that the implementation costs and ongoing costs restrain SMEs from adopting E-commerce. Hence SMEs need external support mainly from government. For SMEs to overcome all the external barriers, governments should play a leading role in addressing skill deficiencies in the workforce through training and education (European Commission, 2005).

2.6.3 Benefits of E-commerce adoption

E-commerce offers many benefits over traditional paper-based commerce. All government agencies, large corporations, small businesses and other service and product oriented sectors throughout the world have started conducting business through E-commerce. They have adopted E-commerce because it can help them increase sales, profits and reduce costs (Chaffey, 2002).

Some of the prominent benefits of E-commerce are summarized in Table 2.4.

Table 2.4 Benefits of E-commerce adoption

The most important benefits of E-commerce adoption, as identified by many studies (Abell and Lim, 1996; Chaffey, 2002; Quayle, 2002) are increased sales and reduced costs. The benefits derived can be tangible or intangible. Reduction of costs in supply chain, administration is considered to be a tangible benefit. Improving customer service, being more responsive to markets, and having better information management are intangible benefits. The perceived benefits of E-commerce by organisations encourage them to adopt E-commerce (Mustaffa and Beaumont, 2004). The benefits can be short-term as well long-term. The short-term benefits include effective communication, improved information sharing etc. The long-term benefits include improved relation with customers, reach of global markets and reduced costs etc. Some of the benefits listed in the Table 2.4 are expected to be applicable to rural and regional General Practices. It should be acknowledged, however that the benefits realised by all organisations are not identical; benefits vary across industries.

2.6.4 Disadvantages of E-commerce adoption

E-commerce adoption has its disadvantages too. The major disadvantages reported in most of the studies are incurring ongoing costs and dissatisfaction of employees (Chaffey, 2002) As discussed in Section 2.6.2, SMEs have fewer financial and human resources and hence it is more difficult to overcome the inherent difficulties of E-commerce. Higher ongoing costs, including maintenance costs, were reported by MacGregor et al (1998) as major disadvantages.

Table 2.5 shows some of the major disadvantages identified by various studies.

Table 2.5 Disadvantages incurred through adoption of E-commerce

The disadvantages found in the literature are of a general nature and would appear to apply to any industry sector and are expected to apply for General Practices as well. The GP red tape task force (2003) identified additional infrastructure, maintenance, support, education and training costs and changes to and increases in administrative work Practices as burdens arising out of adopting ICT in General Practices.

2.7 Business Profile Characteristics

Many studies of E-Commerce and ICT adoption have noted that there are statistically significant associations between a variety of attributes of the organisations being studied and their attitudes to the various factors, benefits,

barriers and disadvantages. These attributes include demographic characteristics like the size, age and location of the business or the age, gender and ICT skills of the owner. These characteristics are often described in the literature as business characteristics or owner characteristics, respectively. For the purposes of this study, we wish to consider a number of these characteristics, which we will refer to as Business Profile Attributes. This is not a terminology found in the literature; it is merely a collective name for the range of characteristics that we wish to consider as part of this study. The attributes that make up the Business Profile are described below.

2.7.1 Business Attributes

Business attributes that have been found to affect E-commerce adoption include the age, size and location of the business and the client /customer base.

Business Size

Size of organisations has been identified as an important factor by many studies (Caskey et al, 2000; Culkin and Smith, 2000; Matlay and Fletcher, 2000; Boyle and Alwitt, 1999). A medium sized organisation with 20-199 employees serving a regional market has an organizational structure that differs from that of micro sized organisations with less than 5 employees. The organisation's size is significantly associated with the adoption of E-commerce. Some studies found that the size of SMEs is positively related to the degree of adoption of E-commerce. Caskey et al (2000) state that SMEs have a flattened organisational hierarchy and hence they can be more easily involved in any business process re-engineering and strategy formulation. Contrary to this view, some studies (Boyle and Alwitt, 1999; European Commission, 2005) state that the smaller size of SMEs acts as a barrier in adopting E-commerce. Studies on E-commerce adoption have found that bigger organisations adopted new technologies faster as they had greater access to resources compared to the smaller organisation (Werthner and Bichler, 2001). It is evident that size of SMEs has a significant role to play in E-commerce adoption.

Business age has been found to influence SME's adoption of IT (Kai-we-Brock, 2000). Older businesses do not adopt technologies that are perceived to interfere with their work practices.

2.7.2 Owner attributes

Owner attributes that have been found to affect perceptions about E-commerce and ICT adoption include:

Gender

Most of the studies of E-commerce have taken gender into account (MacGregor , 2004 ; Poon and Swatman, 1999; Grandona and Pearson, 2004; Watson, 2003) and they have found significant differences in the way and level of E-commerce adoption by businesses run by males and females. Studies conducted in the manufacturing and retail industries conclude that male owners of small organisations are risk takers and adopt technologies more readily than their female counterparts. Rietz and Henrekson (2000) have found that female owned businesses generally under perform male owned businesses on a variety of measures such as revenue, profit, growth, and discontinuance rates. In this research it is of interest to find out the influence that the gender of the General Practitioners of rural and regional locations has on adoption of E-commerce. It is significant to observe that in all the studies of E-commerce adoption that had reported gender differences, the female participation rate was found to be less. In general, the samples consisted of more males than females. According to AMA report (2003), in the medical field, the "feminisation" of the workforce is the most significant factor that will impact on participation rates into the future and also in the adoption rates of technologies.

Age

Some studies (Stanfield and Grant, 2003; Culkin and Smith, 2000) have focused on the age group of the owners of SMEs and relate the success of the organisations to the age of the owner. It has been inferred in those studies that the young and middle aged owners are more successful in adopting E-commerce than the older age groups.

ICT skill levels

The level of ICT skills within the business was found to influence the adoption of IT by Thong et al (1996). Turner et al (1993) found that the computer literacy of the owners influenced the extent of adoption of E-commerce.

2.8 Conclusion

This chapter has reviewed the literature on E-commerce, SMEs and the adoption of E-commerce by SMEs. It has enumerated the factors affecting E-commerce adoption, the barriers to E-commerce adoption, the benefits offered by E-commerce adoption and the disadvantages incurred through E-commerce adoption, particularly by SMEs.

It has been observed that there are very few studies of the adoption of E-commerce by service sector industries, particularly those in rural or regional settings. More specifically, the literature has almost nothing to say about E-commerce adoption by GPs in rural and remote regions. This is a significant gap in the body of knowledge because there is a growing need to support GPs in rural and regional areas. Moreover, E-commerce should be able to address many problems faced by GPs in these areas but little or nothing is known about the use of E-commerce by rural and regional GPs,

Consequently, the objectives of this study are:

1. To determine which factors most influence the adoption of ICT by rural and regional GPs
2. To determine which benefits of ICT adoption contribute most to the viability of rural and regional General Practices
3. To determine which disadvantages of ICT adoption are the most significant for rural and regional GPs
4. To determine if the business profile of individual rural and regional General Practices have any association with the factors, benefits or disadvantages of ICT adoption.

The next chapter will explain in detail the methodology used to meet the objectives of this research.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The previous chapter presents a review of the literature concerning ICT and E-commerce adoption by SMEs. The issues specific to rural and regional General Practice's adoption of ICT were discussed. This chapter describes the research methods adopted for the current study and explains the procedures followed. The chosen research methods are aligned with the objectives of the study.

The objectives of this research, as stated in Chapters 1 and 2 are:

1. To determine which factors most influence the adoption of ICT by rural and regional GPs
2. To determine which benefits of ICT adoption contribute most to the viability of rural and regional GPs
3. To determine which disadvantages of ICT adoption are the most significant for rural and regional GPs
4. To determine if various business profile attributes of rural and regional GPs have any association with the factors, benefits and disadvantages of ICT adoption.

3.2 Research Methods

A number of research methods could have been used to gather data to achieve the objectives above. These include case studies, direct observation, questionnaires and interviews, among others.

For this research, a questionnaire was deemed to be the most appropriate method for the following reasons:

1. The business profile attributes i.e. the business attributes, the owner attributes, the level of ICT skill and the level of ICT support and training were all to be found in the literature and were all well defined in the literature. Hence there was no need to observe or interview GPs or to

analyse their documents to determine the exact nature of these business profile attributes.

2. Similarly, the adoption factors, the barriers, the benefits and the disadvantages and ICT adoption by SMEs were also to be found in the literature and were well defined. It is entirely possible that other adoption factors, barriers, benefits and disadvantages may apply to rural and regional GPs, however, the discovery of such new factors was not the aim of this research. Instead, this research aims to determine if the factors, benefits, barriers and disadvantages identified for SMEs in other industry sectors also apply to rural and regional service sector industries, particularly to GPs. Consequently, more probing methods, like interviews, document analysis or direct observation were not necessary.
3. The objectives of this research require quantitative data, particularly for the analyses required by objective 4. Questionnaires are the method of choice for the collection of well defined quantitative data.
4. By definition, a study of rural and regional GPs requires data to be gathered from GPs across two separate locations, both of which were themselves somewhat remote. Moreover, the locations were not single locations but collections of towns and suburbs spread over quite a broad area. Consequently, any methods that required actually visiting each of these towns and suburbs, such as interviewing or observing the GPs were highly impractical.
5. Finally, we need data from as many GPs as possible to achieve an acceptable sample size for statistical analyses. Given that all the dependent and independent variables were well known, a questionnaire is an ideal method a) for reaching a large number of users and b) gathering the maximum amount of data from them in a limited amount of time. The latter was deemed to be significant as GPs are often too busy to participate in lengthy interviews or other data gathering techniques.

Questionnaires can be designed and pilot tested before being administered to a large number of respondents irrespective of their locations. In this study, we had the opportunity to distribute the questionnaire through the mail.

3.3 Choice of Locations

The current study is a pilot study in a much wider study of rural and regional General Practices across Australia. The goal of the pilot study was to validate the survey instrument and to establish that there were, in fact, differences between rural and regional GPs and other rural and regional SMES. Consequently, the current study did not attempt to carry out comprehensive data gathering across multiple rural and regional settings. Instead it was decided to choose one location for each setting i.e. one rural location and one regional location.

The decision to limit the study to Australian General Practices was made for three reasons. Firstly, the current study is a pilot study in a nationwide study of ICT adoption by Australian rural and regional General Practices. Secondly, the attributes of rural and regional General Practices in Australia do not appear to differ greatly from those found in other large countries, such as US, Canada, Russia, China, South Africa etc. Finally, the definitions of rural and regional communities used in this study are the Australian definitions. While these definitions would be understood in other geographically large countries, the terminology used in those countries may be somewhat different.

In choosing a rural and regional location within Australia, certain parameters were considered. For a location to be classified as regional, using the Australian definition, it needs to have the following facilities:

- Chamber of Commerce
- Accessibility to Essential Services (like hospitals etc)
- Educational institutions like universities, TAFE
- Industrial Infrastructure

Conversely, rural locations do not typically have the above facilities and they are typically quite far from the nearest metropolitan centre. Inaccessibility of essential services in case of emergencies is a major disadvantage for people living in rural locations. The locations chosen for this study are the Illawarra, which meets the criteria for a regional location, and South East New South Wales, which is typical of a rural location. For brevity sake, we will refer to South East New South Wales as “SE NSW”.

In addition to satisfying the definitions of rural and regional centres, the two locations must also have sufficient GPs to make it likely that the response rate would yield sufficient responses to give a viable sample size. In addition, the GPs being surveyed must be SMEs i.e. no very large medical practices would be involved in the study. Both locations have a sufficient number of General Practices and all of those General Practices are classified as SMEs (according to the ABS classification of SMEs, see Section 2.3.1).

This is the first study to investigate E-commerce adoption by General Practices in either the Illawarra or SE NSW. There are a few studies of SMEs in the Illawarra. MacGregor (2004) carried out an exploratory study of the role of small business strategic alliances in the adoption of E-commerce by SMEs in the city of Wollongong (situated in the Illawarra). Adoption of Internet Commerce by SMEs in the Illawarra was studied by Dowler and Slater (1999). Not surprisingly, there are no studies concerning E-commerce adoption by SMEs in South East NSW to be found in the literature.

A brief profile of each location is provided.

Illawarra

The Illawarra region is located approximately sixty five kilometres south of the Sydney central business district, with the northern boundary of the region being common with that of the southern Sydney metropolitan area. The main industries in the Illawarra include:

- Iron and Steel Manufacturing
- Local university and Technology Centre
- School Education
- Specialised Food Retailing
- Government Administration
- Hospitals and Nursing Homes

The Illawarra region satisfies our criteria for a regional location by having a chamber of commerce and services enabled infrastructure which includes educational institutions, industries and hospitals. The Illawarra region is centred on the city of Wollongong. Although Wollongong meets the Australian definition of a city, it is far smaller than any metropolitan cities in Australia, having a population of only a few hundred thousand people. In global terms, Wollongong might be considered to be a very large town. The Illawarra region also contains a number of large towns, including Kiama, Shellharbour, Gerrigong, Jamberoo and Gerroa. A number of General Practices are located in each of these towns and throughout the suburbs and CBD of Wollongong.

The Illawarra Division of General Practice (IDGP) includes 238 registered General Practitioners. The Illawarra population is ageing and in turn placing a demand on health workforce and health care services. (AIHW Report, 2002).

South East NSW

SE NSW is approximately 300 kilometres south of the centre of Sydney. It has no direct air service or rail service to Sydney. Most of the businesses in these regions are sole traders or partnerships. A small percentage of them are part of national networks or franchises. However, SE NSW still consists predominantly of small, independent locally owned businesses, including dairy farming, fishing and timber cutting. SMEs comprise about 97% of the businesses in the area.

The SE NSW Division of General Practice's office is located in the township of Moruya. The total number of registered GPs in this location is 174. The GP

workload in small rural towns and other rural and remote areas is significantly higher because of increased procedural work.

3.4 Survey Instrument

A questionnaire was designed to determine the factors, barriers, disadvantages of E-commerce adoption. The questionnaire comprised 19 questions, most of which were closed ended questions, grouped as follows:

Table 3.1 Sections of the Questionnaire

Business Profile Questions	Business attributes
	Respondent attributes
	ICT skill levels
	ICT administration, training and support
ICT Adoption Questions	Factors influencing adoption of ICT
	Barriers to ICT adoption
	Benefits of ICT adoption
	Disadvantages of ICT adoption

The Business Profile questions required the respondent to select the descriptor which best suited them or their practice from a list of alternatives, derived from the literature.

The ICT Adoption questions were structured as lists of factors barriers etc to be rated on a 5 point Likert scale, with typical end points being “Not at all important to “Very Important”. Respondents were invited to add any additional factors, barriers etc in an open-ended response.

3.4.1 Business Profile Questions

Business attributes

The business attributes include the business size, the number of patients seen in a week and, implicitly, the business location.

A. Business Size: The organisational structure varies for every business and the business size is an important factor in adopting ICT (see Section 2.6.1). All of the General Practices of Illawarra and SE NSW satisfy the criteria of SMEs. For the purpose of this study, the practice size included 5 categorical values with irregular intervals. The employee size referred to the number of full time equivalent staff working in the practice. Micro sized businesses were included under the interval of 'less than 5 employees' (following ABS classification, 2002). The question on the number of full time employees working in a General Practice had the following categories:

- a. 1-2 employees
- b. 3-5 employees
- c. 6-10 employees
- d. 11-20 employees
- e. >20 employees

B. Number of Patients Seen per week

- a. < 30 patients
- b. 30 - 60 patients
- c. 61 – 90 patients
- d. 91 - 120 patients
- e. 121 – 150 patients
- f. >150 patients

C. Location of the Practice:

Questionnaires were mailed separately to each of the two locations. So it was possible to identify which location any response had come from. This data was coded along with the respondents actual answers.

Respondent Characteristics

Typically, the respondent is the owner of the General Practice, although in some larger practices it may be one of the more senior partners in the

practice. The Respondent's attributes include the age and gender of the GPs and their number of years in Practice.

A. Age of the General Practitioners: The most commonly used age groups were chosen from the literature (see section 2.6, demographics). These intervals are used in many studies especially in studies about SME and E-commerce and hence were included. It is appropriate to find out the influence of age on the dependant variables namely factors, barriers, and disadvantages of ICT adoption.

- a. <30
- b. 31-40
- c. 41-50
- d. 51-60
- e. 61-65
- f. >65

Unfortunately, the question regarding the age of the GP was omitted from one of the batches of questionnaires distributed by the IDGP, so age of GP cannot be included in our analysis of the data.

B. Gender: All the studies of E-commerce and ICT have taken gender into account and have found significant differences in the manner and level of adoption of E-commerce by businesses run by males and females. Gender was also included in this study

- a. male
- b. female

C. Time in Practice: The number of years a GP had practiced in the locations was considered. This was intended to answer questions like whether GPs who practiced in a particular location for a greater number of years perceived the factors, barriers, disadvantages of E-commerce adoption differently to those GPs who had practiced for a lesser number years. As the questionnaires were addressed to the GPs practicing in a particular location (Illawarra or South East NSW division), it was appropriate to know the number of years the GP has practiced in that location. The categories included were

- a. Less than 1 year

- b. 1-5 years
- c. 6-10 years
- d. 11-20 years
- e. Greater than 20 years

ICT skill levels:

Studies by Turner et al (1993) found that the computer literacy of the owners influenced the extent of adoption of E-commerce. If the owners are unaware or do not understand the technologies available, they are unlikely to adopt them into their business (Turner et al, 1993; Thong et al, 1996). Hence it is appropriate to find out the types of ICT skills possessed by the GPs to find out their influence on the adoption of ICT. The respondents are asked to rate their skills from very poor to very good. Checkboxes were provided for the GP's to mark their proficiency against each type of skill. The types of skills included:

- Word processing
- Spreadsheet
- Data entry
- Generating invoices
- Internet – email
- Internet – information retrieval
- Use of software packages (e.g., Medical Director or MD)

The above types of skills are found to be important factors in adoption of E-commerce by SMEs (OECD, 2004; Victoria's E-commerce Advantage Report, 2001). For example use of Internet for email and use of Internet for Information retrieval form the "communication skill" set and might be expected to have a significant impact on ICT adoption. Hence it was appropriate to find out the whether the ICT skills influence the GP's perception of the importance of factors, benefits and disadvantages of ICT adoption. However not all types of ICT skills were tested against all of the dependant variables. For example, it was not logical to test the GPs skill in word processing, spreadsheet etc against 'resistance to usage by staff' which is included as a disadvantage.

ICT administration, and ICT training and support

Two questions were asked specifically about ICT in the practice. The first was about how ICT was administered in the practice. The second was about the importance of ICT training and support in the practice.

The question on ICT administration asked if ICT there was an administrator in the practice and the alternatives were

- a. Yes, within the practice
- b. Yes, but outsourced
- c. No

The question on ICT training and support asked the respondent to rate the importance of ICT training and support on a 5 point Likert scale ranging from “not at all important” to “very important”

3.4.2 ICT adoption questions

These questions focussed on the factors influencing ICT adoption, and the benefits, barriers and disadvantages of ICT adoption. All of these questions presented respondents with a list of choices taken from the literature on SME adoption of ICT and asked respondents to rate their importance on a 5 point Likert scale ranging from “Not at all important” to “Very Important”

Factors influencing ICT adoption

A list of factors was included from literature. Certain factors were adapted to suit the context of General Practice e.g. ‘pressure from customers’ was changed to ‘pressure from patients’.

- Pressure from patients
- Pressure from suppliers
- Pressure from competing GPs
- Pressure from medical authorities
- Improve information storage & retrieval
- Improve communication
- Reduce business costs
- Improve business efficiency

- Improve patient care/contact
- Improve capacity to support a systematic approach to disease management
- Streamlining of billing & accounting functions
- Strengthen relations with business related partners
- Facilitates E-Commerce
- Keeping in touch with medical & other developments
- Generating prescriptions
- Contact with hospitals

Disadvantages incurred through ICT Adoption

A list of disadvantages was included from literature. None of the options needed to be adapted to suit the context of General Practice. The disadvantages were:

- Changes to routines
- Resistance to usage by staff
- Deterioration of relations with business partners
- Higher costs
- On-going technical difficulties
- Software support was inadequate
- Training for use of computers was inadequate
- Reduced flexibility of work
- Duplication of work effort
- Security

ICT contribution to the viability of the practice: Benefits of ICT adoption

A list of benefits was included from literature. Certain benefits were adapted to suit the context of General Practice e.g. 'ordering supplies' was changed to 'ordering drugs'.

- Expanding the patient/ customer base by broadening the area of coverage
- Improvement to business efficiency (time saving/patient care)

- Reduction of the overall workload and increased leisure time
- Enabling more time to be spend on patient care
- Reduction of business operating costs
- Improvement to the way the business is operated
- Allowing the business to expand
- Information storage and retrieval
- Communication with fellow GPs
- Communication with other medical organisations
- Disease management
- Streamlining of billing and accounting functions
- Adding to the skills of the practice
- Communication with hospitals
- Ordering drugs
- Other communication with general practice business suppliers
- Reducing the importance of distance (remoteness) in the provision of high quality medical care

3.5 Procedure

Questionnaires were sent to GPs registered with IDGP and SE NSW DGP. The questionnaires were the same for both locations.

Questionnaires were mailed to the General Practitioners registered under Illawarra Division of General Practice (IDGP) and South East NSW Division of General Practice (SE NSW DGP). Questionnaires were then mailed to the postal address of the General Practices. The respondents were given 8 weeks to return the completed questionnaires. For the questionnaires sent to GPs in the Illawarra region, assistance was sought from the IDGP office situated in Wollongong. A letter of endorsement, signed by the director was included with the questionnaire in addition to a covering letter. IDGP mailed the questionnaires to all of its 238 registered GPs. After 8 weeks, when responses were low, a follow-up letter was sent by IDGP. Questionnaires were mailed to the General Practices of South East NSW with no assistance from the DGP and no follow up was carried out for this location.

3.6 Data Recording

For all the demographic variables with categorical values, the coding of the responses was numbered starting from '1'. i.e '1' was assigned to the first group among the choices and the last category was assigned the highest number. For example for the question on practice size, the following convention was used.

'1' representing practice sizes of 1-2 employees

'2' representing practice size of 3-5 employees

'3' representing practice size of 6-10 employees

'4' representing practice size of 11-20 employees

'5' representing practice size greater than 20

These codes are purely categorical and do not represent intrinsic values e.g. '5' could have been coded as '1' and vice versa.

The coded data was entered in an excel spreadsheet and then exported to SPSS for analysis.

Sample Size:

A formula for sample size was used

$$E = z \alpha/2 \sigma/\sqrt{n}$$

or

$$n = (z \alpha/2 \sigma/E)^2$$

σ was determined to be 2.01

A 99.9% degree of confidence was considered. The margin of error was 1. The minimum sample size was 37 (rounded up). The minimum sample size for 95% degree of confidence was 21 (rounded up).

A series of Levene tests was carried out to determine homogeneity of variance. The Levene's tests provided a significance of <.001 for all

questions being examined, indicating that data was sufficiently robust to apply t-tests, linear regressions and chi-square tests.

Chi-square tests were performed on the data.

3.7 Statistical Analysis

The statistical analysis was carried out in two phases.

In the first phase, descriptive statistics were produced for the Business Profile data. This was the first study of GP's adoption of ICT in the Illawarra or SE NSW, so it was useful to get some idea of the nature of medical practice in those two locations. This phase also involved ranking the various factors, benefits, barriers and disadvantages. The sample included adopters of E-commerce. As non adopters of E-commerce are not focused the sample was not tested for identifying the barriers in adopting E-commerce.

The second phase involved statistical analyses of the various Business Profile attributes (independent variables) against the ICT adoption variables (dependent variables). Chi square tests were conducted to test the association.

The results of both phases are presented in Chapters 4 and 5.

3.8 Conclusion

This chapter has justified the choice of a questionnaire and quantitative statistical analysis as the main methods in this research. It has also presented details of the questionnaire that was developed and the procedure for distributing that questionnaire, coding the responses and analysing that data.

CHAPTER 4

RESULTS FOR THE REGIONAL LOCATION: THE ILLAWARRA

This chapter presents an analysis of the data collected via a survey of GPs in the regional location of Illawarra. As the focus of this chapter is specifically on the regional location the objectives reported on in this chapter have been adapted as follows: The objectives of this research, as stated in Chapters 1 and 2, are:

- 1a. To determine which factors most influence the adoption of ICT by regional GPs
- 2a. To determine which benefits of ICT adoption contribute most to the viability of regional General Practices
- 3a. To determine which disadvantages of ICT adoption are the most significant for regional GPs
- 4a. To determine if the business profile attributes of regional General Practices have any association with the factors, benefits or disadvantages of ICT adoption.

The chapter is divided into 5 sections as follows:

Section 4.1 presents descriptive statistics for the business profile attributes (i.e. business characteristics, respondent characteristics, ICT administration, training and skills, and ICT skill levels) for the General Practices in the Illawarra, namely:

- 4.1.1 Frequency distribution for Number of employees
- 4.1.2 Frequency distribution for Number of patients per week
- 4.1.3 Frequency distribution for Number of years the GPs have practised in the Illawarra
- 4.1.4 Frequency distribution for Gender of the GP
- 4.1.5 Frequency distribution for Employment of an administrator
- 4.1.6 Frequency distribution for ICT training and support
- 4.1.7 Frequency distribution for rating of ICT skills possessed by GPs

Section 4.2 presents the factors influencing ICT adoption and so satisfies objective 1a.

Section 4.3 presents the benefits of ICT adoption and so satisfies objective 2a.

Section 4.4 presents the disadvantages of adoption and so satisfies objective 3a.

Section 4.5 presents an analysis of the influence of business profile variables on the factors, benefits and disadvantages of ICT adoption, and so satisfies objective 4a.

As stated in Chapter 3 (Section 3.6), the minimum sample size for 99.9% degree of confidence was 37 and for 95% degree of confidence was 21. As the sample size of Illawarra was between 21 and 37, 95% degree of confidence is reported. Consequently, all statistically significant results are reported to be 'p' value less than 0.05.

4.1 Descriptive Statistics for Illawarra General Practices

Out of 238 questionnaires, 34 completed questionnaires were returned, a response rate of 14.2 %. Although the response rate is low, it is sufficient enough to represent the region. The GPs might have been busy during that time when the surveys were sent. The previous study (MacGregor et al, 1998) on SMEs of Wollongong had a response rate of 28.39 % with surveys sent to 339 organisations.

A set of frequency distribution were produced using SPSS. As might be expected, some respondents did not answer all the questions. These unanswered responses showed no intrinsic pattern and have been treated in the standard manner for missing results.

4.1.1 Frequency distribution for Number of Employees

Table 4.1 shows the frequency distribution for Number of employees.

Table 4.1 Frequency distribution for Number of employees

Number of Employees	Frequency	Percent	Cumulative Percent
1-2	5	14.7	14.7
3-5	17	50.0	64.7
6-10	6	17.6	82.4
11-20	4	11.8	94.1
>20	2	5.9	100.0
Total	34	100.0	
Mean: 2.44		Std. Deviation:1.078	

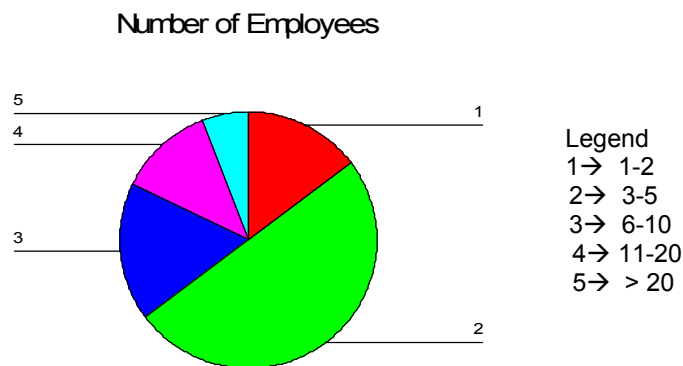


Figure 4.1 Frequency distribution for Number of employees

An examination of Table 4.1 shows that the sample by large consisted of General Practices (50 %) employing between 3 and 5 employees. 17.6% of General Practices have between 6 and 10 employees; 11.8 % of them have between 11 and 20 employees . Only very few (5.9 %) of them are employing more than 20 employees. Illawarra being a regional centre was expected to have more “large” practices (i.e. the number of employees more than 20).

4.1.2 Frequency distribution for Number of patients per week

Table 4.2 shows the frequency distribution for number of patients per week seen by GPs.

Table 4.2 Frequency distribution for Number of patients per week

Number of patients per week	Frequency	Percent	Cumulative Percent
30-60	1	2.9	2.9
61-90	6	17.6	20.6
91-120	6	17.6	38.2
121-150	8	23.5	61.8
>150	13	38.2	100.0
Total	34	100.0	
Mean: 4.76		Std. Deviation: 1.232	

As seen from the Table 4.2, 38.2% of the GPs see more than 150 patients per week and only 2.9 % of the GPs see between 30 and 60 patient per week. This indicates that the client base (patient base) is large for most of the Practices.

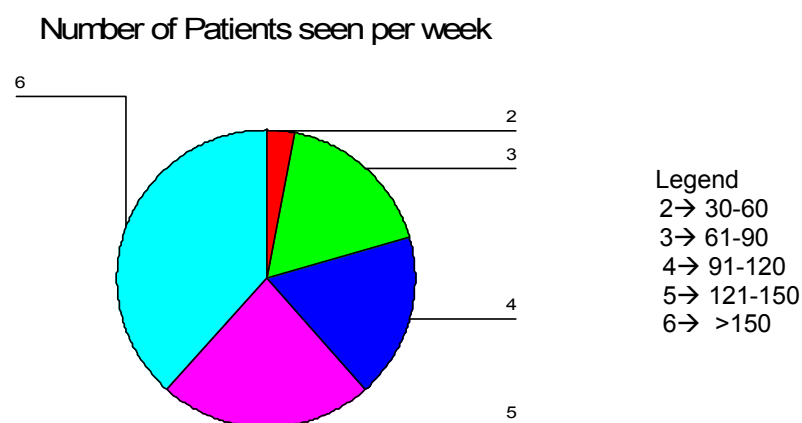


Figure 4.2 Frequency distribution for Number of patients per week

4.1.3 Frequency distribution for numbers of years the GPs have practised in Illawarra.

Table 4.3 provides the frequency distribution of the GP's number of years in Practice in the Illawarra.

Table 4.3 Frequency distribution for GP's Numbers of years of Practice

Numbers of years of Practice	Frequency	Percent	Averaged Percent	Cumulative Percent
< 1 year	0	0	0	0
1-5 years	5	14.7	3.9	14.7
6-10 years	4	11.8	2.9	26.5
11-20 years	12	35.3	3.9	61.8
>20 years	13	38.2		100.0
Total	34	100.0		
Mean: 3.97			Std. Deviation: 1.058	

Table 4.3 shows that 73.5% of the GPs have been practicing in Illawarra region more than 10 years out of which 38.2% have been practicing in Illawarra for more than 20 years.

It should be pointed out that the ranges used in this table are not uniform in size, which might give a false impression. When one sees that 35.3% of respondents have been in practice for 11-20 years, it appears that a significant proportion of GPs have remained in the Illawarra. However, the value of 35.3% represents the GPs who have been in the Illawarra for 11 years, 12 years, 13 years and so on. On the other hand, the 14.7 % of respondents who have been in the Illawarra for between 1 and 5 years represents only 4 age groups i.e. 1, year, 2 year 3 year etc. The column headed "averaged percent shows the group percentage divided by the number of years in the range for that group. We now see a much more uniform spread across the age groups. Note that the 'average percent cannot be calculated for the range >20 years because we do not know the upper bound on that range.

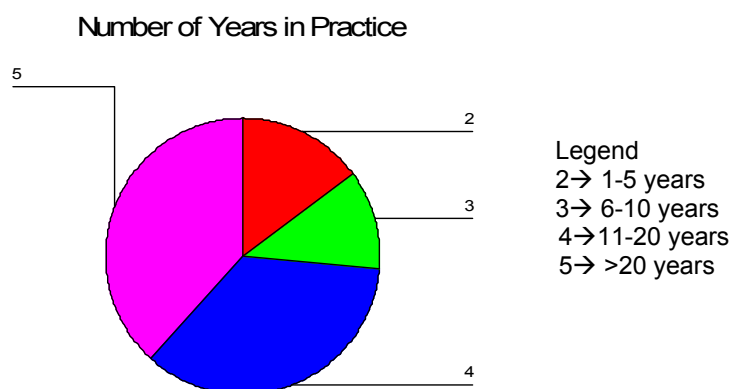


Figure 4.3: Frequency distribution for GP's Numbers of years of Practice

4.1.4 Frequency distribution for Gender of the GP

Table 4.4 shows the frequency distribution for the gender of the GPs

Table 4.4 Frequency distribution for Gender of GPs

Gender	Frequency	Percent	Cumulative Percent
Male	26	76.5	76.5
Female	8	23.5	100.0
Total	34	100.0	

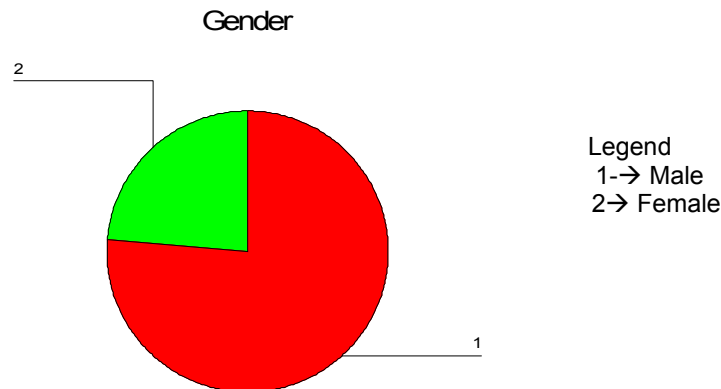


Figure 4.4: Frequency distribution for Gender of GPs

76.5 percent of the responses were from male GPs and 23.5 of the responses were from female GPs. This is a very unusual result given the national and state figures. These show that female GPs made up 31.6% of the Australian GP workforce in 2002 and that proportion was expected to increase as more women joined the profession. Similarly, in NSW female GPs comprised 31.4% of the total GPs in 1997, but had increased to 34.5% by 2002 (AIHW, 2004). So, our results suggest that the Illawarra has far fewer female GPs than the state and national averages. It is possible that our results are skewed by self selection of the respondent i.e. it is possible that more male GPs may have responded to the questionnaire simply because men like doing surveys. A comparison with the figures for SE NSW will shed further light on this.

4.1.5 Frequency distribution for Employment of an administrator

Table 4.5 shows the frequency distribution for employment of an administrator for ICT related issues.

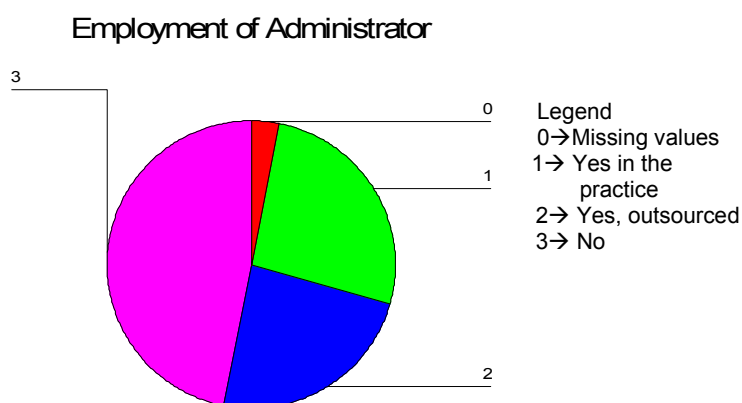


Figure 4.5 Frequency distribution for Employment of an administrator

Table 4.5 Frequency distribution for Employment of an administrator

Employment of an administrator	Frequency	Percent	Cumulative Percent
Missing	1	2.9	2.9
Yes within the practice	9	26.5	29.4
Yes but outsourced	8	23.5	52.9
No	16	47.1	100.0
Total	34	100.0	
Mean 2.15		Std. Deviation: .925	

Table 4.5 shows that 26.5% of the General Practices employed an administrator with specific responsibilities for ICT related issues; 23.5% of them have outsourced whereas 47.1% of them do not employ an administrator for ICT related issues. These Practices might perform administration of ICT related issues informally.

4.1.6 Frequency distribution for the importance of ICT training and support

Table 4.6 shows the frequency distribution for importance of ICT training and support. 70.6% of the General Practitioners in the Illawarra have indicated that ICT training and support is important or very important. The GPs have felt that

they need training to develop ICT skills. They might not have technical knowledge and hence they need ICT training and support.

Table 4.6 Frequency distribution for importance of ICT training and support

ICT training and support	Frequency	Percent	Cumulative Percent
Missing	3	8.8	8.8
Not at all important	2	5.9	14.7
Unimportant	2	5.9	20.6
Neither important nor unimportant	3	8.8	29.4
Important	11	32.4	61.8
Very Important	13	38.2	100.0
Total	34	100.0	
Mean: 3.65		Std .Deviation: 1.612	

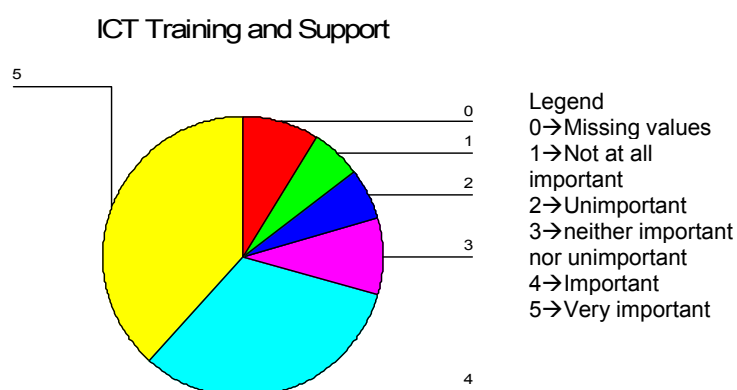


Figure 4.6 Frequency distribution for importance of ICT training and support

4.1.7 Frequency distribution for rating of ICT skills possessed by GPs

The frequency distributions for different types of skills are given in Table 4.7.

Table 4.7 Frequency distribution for ICT skills

ICT SKILLS	Very poor	Poor	Neither Good nor Poor	Good	Very Good
Word processing	3 (8.8%)	3 (8.8%)	14 (41.2%)	9 (26.5%)	4 (11.8%)
Spreadsheet	10 (29.4%)	7 (20.6%)	10 (29.4%)	5 (14.7%)	2 (5.9%)
Data entry	5 (14.7%)	5 (14.7%)	7 (20.6%)	11 (32.4%)	6 (17.6%)
Generating invoices	12 (35.3%)	6 (17.6%)	6 (17.6%)	6 (17.6%)	4 (11.8%)
Internet – email	1 (2.9%)	4 (11.8%)	6 (17.6%)	14 (41.2%)	9 (26.5%)
Internet – Information retrieval	1 (2.9%)	2 (5.9%)	9 (26.5%)	12 (35.3%)	9 (26.5%)
Software packages (e.g. Medical Director or MD)	2 (5.9%)	3 (8.8%)	14 (41.2%)	12 (35.3%)	1 (2.9%)

An examination of Table 4.7 reveals that most GPs in the Illawarra do not consider themselves to be highly skilled in using ICT. The only skills which are rated as good or very good by more than 50% of respondents are retrieving information on the Internet and using Internet for email purposes. Conversely, skill in using software packages, like Medical Director, was only rated as good or very good by 38% of GPs. This is very surprising as one would expect a medical practitioner to make more use of and hence be more proficient with medical software. Even relatively simple skills such as word processing were rated as good or very good by only 38%.

Gender and number of patient visits per week

It was of interest to know whether there was an association among some or all of the demographic variables. Chi Square test was conducted to find out the association. It was interesting to note that there is a significant difference in

the number of patients seen by male and female GPs (as seen from Table 4.8).

Table 4.8 Gender and Number of patients seen per week

		Gender	
		Male	Female
Number of Patients seen per week	30-60	0	1
	61-90	2	4
	91-120	5	1
	121-150	7	1
	>150	12	1

$p < 0.05$

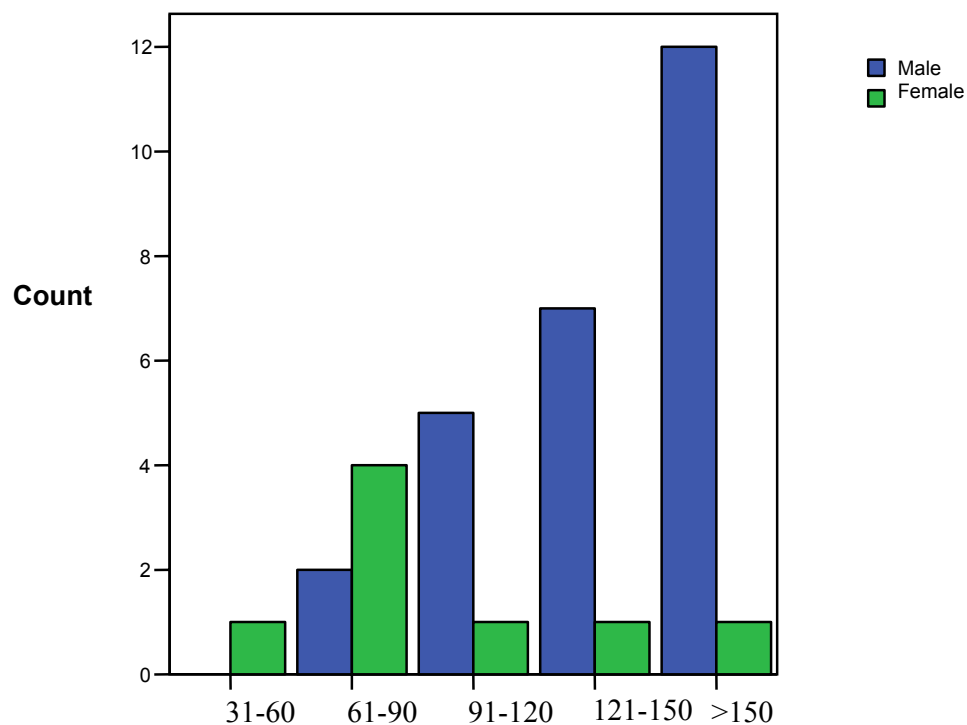


Figure 4.7 Gender and Number of Patients per week

From Figure 4.1 it is seen that female GPs see fewer patients per week than their male colleagues. 50% of female GPs see only 61-90 patients per week. Male GPs (73 %) see more than 121 patients per week where as only 25% of

female GPs see more than 121 patients per week. However the quantitative time spent with each patient by male or female GPs is not known.

In summary, the analysis presented in Section 4.1 has shown that:

- Most of the Practices are medium sized employing between 3 and 5 employees.
- 73.5 % GP have practised in the location for more than 10 years.
- Very few Practices employ an administrator for ICT related issues within their practice.
- ICT training and support is considered to be important.
- GPs are good at ICT skills like using Internet for emails and information retrieval.

4.2 Factors influencing ICT adoption

Objective 1a of the study is to determine which factors most influence ICT adoption in regional General Practices. Table 4.9 shows the distribution of the ratings of importance of each of the factors influencing ICT adoption. The ranking is calculated using weighted average of the responses i.e. Unimportant is given a weight of 1, while Very important is given a weight of 5.

Table 4.9 shows that Improve information storage and retrieval, Improve communication, Generating prescriptions, Improve patient care/contact and Improve capacity to support a systematic approach to disease management were the most important factors.

As stated in literature, GPs use computers more for information retrieval. Hence as expected, Improving communication and Improving information storage and retrieval were expected to be rated as important factors and they were. GPs need to share and retrieve information regarding patients, medical records; treatments etc in a more efficient way and use of ICT can facilitate this, so the high ranking for this is also to be expected.

Table 4.9 Ratings of the importance of Factors influencing ICT adoption

Rank	Factors	1	2	3	4	5
1	Improve information storage & retrieval	1	0	6	7	20
1	Improve communication	1	2	3	7	21
1	Generating prescriptions	2	1	4	4	23
2	Improve patient care/contact	1	3	3	6	21
3	Improve capacity to support a systematic approach to disease management	1	2	4	8	19
4	Streamlining of billing & accounting functions	4	0	2	13	15
5	Improve business efficiency	3	0	6	8	17
6	Contact with hospitals	2	2	5	14	10
7	Reduce business costs	4	2	6	13	9
8	Keeping in touch with medical & other developments	5	3	6	14	6
9	Strengthen relations with business related partners	7	5	11	6	5
9	Pressure from medical authorities	7	2	11	10	3
10	Facilitates E-commerce	15	3	12	1	3
11	Pressure from competing GPs	18	2	7	7	0
12	Pressure from patients	19	2	7	5	1
13	Pressure from suppliers	22	4	6	2	0

LEGEND: 1 Unimportant, 2 Somewhat unimportant, 3 Neither unimportant nor important, 4 Somewhat important, 5 Very important

ICT can facilitate effective communication with other Practices, medical organisations, suppliers etc. GPs have perceived ICT to improve communication both external as well as internal. Use of ICT can improve internal communication especially in Practices with more employees.

It is seen that GPs have perceived the importance of ICT in improving patient care/ contact and generating prescriptions. Use of ICT can generate online prescriptions thus saving time and reducing paperwork. ICT also helps improve patient contact. Also seen from table is that pressure from customers (patients) and suppliers and pressure from GPs were rated as the least important factors. These findings support the findings of MacGregor's study

(2004) about regional SMEs who found that pressure or demand from customers and suppliers are not important criteria in adopting E-commerce.

It is significant to note that ‘adoption of ICT facilitates E-commerce’ was considered to be one of the least important factors. General Practices have not adopted E-commerce on a large scale. GPs of regional areas seem not to encourage adoption of E-commerce. However they have adopted ICT for effective communication and information sharing purposes.

4.3 Benefits of ICT adoption

Objective 2a of the study is to determine which benefits of ICT adoption contribute most to the viability of regional General Practices. Table 4.10 shows the distribution of the ratings of importance of each of the potential benefits of ICT adoption. The ranking is calculated using weighted average.

It is seen that ICT has contributed significantly to the functioning of the Practices mainly in Streamlining of billing and accounting functions, Information storage and retrieval, Disease management and Improvement to business efficiency. The most important benefits of ICT adoption in regional General Practices support the findings that GPs mainly use computers for information sharing and administrative purposes (GP Red tape taskforce, 2003). Streamlining of billing and accounting functions has been rated as an important benefit. It can be implied that automation of certain functions like billing, accounting etc would save time and possibly reduce the human errors involved in these repetitive functions.

The benefits that are least applicable to regional General Practices are:

- Other Communication with General Practice business suppliers
- Expanding the patient base by broadening the area of coverage
- Reducing the importance of distance (remoteness) in the provision of high quality medical care.
- Ordering drugs

Table 4.10 Ratings of importance of benefits of ICT adoption

Rank	Benefits	1	2	3	4	5
1	Information storage and retrieval	2	0	5	12	14
2	Streamlining of billing and accounting functions	3	0	3	16	11
3	Disease Management	3	1	7	14	8
3	Improvement to business efficiency (time saving/patient care)	2	2	9	11	9
4	Improvement to the way the business is operated	2	3	5	17	6
5	Adding to the Skills of the practice	3	1	8	15	6
6	Communication with hospitals	2	2	10	15	3
7	Communication with other medical organisations	3	3	12	10	5
8	Allowing the business to expand	4	6	8	11	4
8	Communication with fellow GPs	5	4	10	9	5
9	Enabling more time to be spend on patient care	2	6	13	5	6
10	Reduction of business operating costs	6	4	8	12	1
11	Reduction of the overall workload and increased leisure time	3	5	13	7	2
12	Ordering drugs	10	4	10	4	5
13	Reducing the importance of distance (remoteness) in the provision of high quality medical care	12	4	10	4	3
14	Expanding the patient/ customer base by broadening the area of coverage	9	7	10	5	1
15	Other communication with general practice business suppliers	10	6	14	2	1

LEGEND: 1 Not at all important, 2 Unimportant, 3 Neither important nor unimportant, 4 Important, 5 Very important

The regional GPs have rated the benefit Other Communication with General Practice business suppliers as the least important one. As expected, the GPs are not keen in expanding their client or patient base by broadening the area of coverage. The chances of ordering drugs online might be high if the suppliers to these Practices insist on placing orders online. But we saw from section 4.2 that Pressure from suppliers was not perceived to be an important factor in adopting ICT. Hence it is implied that GPs have rated ordering drugs as one of the least benefits of ICT adoption.

4.4 Disadvantages of ICT adoption

Objective (3a) of the study is to find out the disadvantages of ICT adoption in regional General Practices. Table 4.11 shows the distribution of the ratings of importance of each of the disadvantages of ICT adoption. The ranking is, once again, calculated using a weighted average of the responses.

Table 4.11 Ratings of the importance of Disadvantages in adopting ICT

Rank	Disadvantages	1	2	3	4	5
1	Software support was inadequate	3	3	4	13	9
2	On-going technical difficulties	2	2	7	11	9
3	Higher costs	2	4	8	12	6
4	Training for use of computers was inadequate	3	4	9	8	8
5	Changes to routines	2	6	8	13	3
6	Resistance to usage by staff	1	8	13	5	5
7	Security	3	6	10	10	3
8	Duplication of work effort	5	6	9	9	3
9	Reduced flexibility of work	5	10	9	6	2
10	Deterioration of relations with business partners	5	13	12	2	0

LEGEND: 1 Not at all important, 2 Unimportant, 3 Neither important nor unimportant, 4 Important, 5 Very important

Software support was inadequate, on-going technical difficulties and higher costs have been rated as the most important disadvantages incurred through the introduction of ICT by the General Practices. GPs and staff might lack technical knowledge; lack software knowledge. Practices could have incurred higher costs including consultation, implementation and maintenance costs.

These findings are similar to those of MacGregor's study (2004), which found that higher costs and computer maintenance were among the major disadvantages rated by regional SMEs.

It is seen that the technical issues like lack of software support and other technical difficulties related to ICT have been rated as important disadvantages by the GPs of regional Practices. ICT training and support could be the solution to overcome these disadvantages.

4.5 Influence of Business Profile attributes on adoption of ICT

As discussed in Chapter 2, many studies have found that business profile attributes i.e. business characteristics, owner characteristics etc. influence the importance of the factors, benefits, disadvantages of E-commerce adoption. Chi square tests were conducted to test for any association between the Business Profiles variables and the factors, benefits and disadvantages of ICT adoption by General Practices of Illawarra. These findings satisfy objective (4a) of our study.

4.5.1 Association of Business Profile Attributes with Factors influencing ICT adoption

A list of factors was compared against the Business Profile attributes. The statistically significant results are presented below.

Number of employees

Number of employees was found to be associated with a number of factors influencing ICT adoption namely Improve information storage and retrieval, Improve communication, Improve business efficiency, Improve patient care and Generating prescriptions.

Number of employees and Improve information storage and retrieval

Table 4.12 Association of number of employees and Improve information storage and retrieval

		Improve information storage and retrieval				
		Un-important	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important
Number of Employees	1-2	1	0	2	2	0
	3-5	0	0	4	2	11
	6-10	0	0	0	0	6
	11-20	0	0	0	1	3
	>20	0	0	0	2	0

p<0.05

Table 4.12 shows the association between number of employees and Improve information storage and retrieval. The trend seen here is a positive association. In case of Practices with 1 or 2 employee(s), accessing information is much easier. Hence these functions were not considered to be very important by these Practices in adopting ICT. It is likely that the Practices with more employees need more efficient information storage and retrieval.

Number of employees and Improve communication

Table 4.13 Association of Number of employees with Improve communication

		Improve communication				
		Un- important	Somewhat un- important	Neither unimportant nor important	Somewhat important	Very important
Number of employees	1-2	1	0	3	1	0
	3-5	0	1	0	4	12
	6-10	0	0	0	0	6
	11-20	0	1	0	0	3
	>20	0	0	0	2	0

p<0.05

Table 4.13 shows the association between the number of employees and Improve communication. A positive trend is seen, with large practices rating Improve communication to be more important. It is likely that as the number of employees increases, efficient communication becomes vital. Communication could be informal in Practices with 1 or 2 employees. The larger Practices (having more than 20 employees) would like to improve both internal as well as external communication.

Number of employees and Improve business efficiency

Table 4.14 shows the association between Number of employees and Improve business efficiency. The trend seen here is positive. Practices employing more employees have given more importance to this factor. Large Practices would like to improve their business efficiency by adopting ICT. However Practices with 1 or 2 employee(s) were equivocal.

Table 4.14 Association of Number of employees and Improve business efficiency

		Improve business efficiency				
		Un- important	Somewhat un- important	Neither unimportant nor important	Somewhat important	Very important
Number of employees	1-2	2	0	3	0	0
	3-5	0	0	3	3	11
	6-10	0	0	0	1	5
	11-20	1	0	0	2	1
	>20	0	0	0	2	0

p<0.05

Number of employees and Improve patient care/contact**Table 4.15 Association of Number of employees with Improve patient care/contact**

		Improve patient care/contact				
		Unimportant	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important
Number of employees	1-2	1	1	3	0	0
	3-5	0	2	0	4	11
	6-10	0	0	0	0	6
	11-20	0	0	0	1	3
	>20	0	0	0	1	1

p<0.05

Table 4.15 shows that there is a positive association between the number of employees and Improve Patient care/contact. It is obvious that that as the number of employees increases, the Practice would have multiple doctors and a patient might be seen by more than one GP, contacting patients becomes difficult. Use of ICT has been perceived to improve patient contact. Practices with 1 or 2 employee(s) have rated this factor as neither important nor unimportant in adopting ICT. It is likely that these practices with one or two employee(s) would not find difficult contacting their patients.

Number of employees and Generating prescriptions

Table 4.16 shows that there is a positive association of Number of employees with Generating prescriptions. Practices with more employees would have multiple doctors and consequently more patient visits per week. Hence these

Practices would need efficient way of generating prescriptions. ICT can facilitate online prescriptions thus saving time and reducing paperwork.

Table 4.16 Association of Number of employees with Generating prescriptions

		Generating prescriptions				
		Unimportant	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important
Number of Employees	1-2	2	0	3	0	0
	3-5	0	1	1	3	12
	6-10	0	0	0	0	6
	11-20	0	0	0	0	4
	>20	0	0	0	1	1

p<0.05

Practices having 1 or 2 employees have felt that this factor was not influential in adopting ICT. It is possible that these Practices might have fewer patients per week and hence generating prescriptions was not considered as an important factor influencing their adoption of ICT.

Number of patients seen per week by the GPs and Reduction of business costs

Table 4.17 Association of Number of patients seen per week with Reduction of business costs

		Reduction of business costs				
		Unimportant	Somewhat unimportant	Neither important nor un-important	Somewhat important	Very important
Number of Patients per week	30-60	0	1	0	0	0
	61-90	1	1	1	2	1
	91-120	1	0	0	3	2
	121-150	1	0	4	0	3
	>150	1	0	1	8	3

p<0.05

Table 4.17 shows the association of Number of patients seen per week with Reduction of business costs. The trend is positive. It is possible that the business costs (administration costs) would be higher for Practices with more employees than compared to Practices with fewer employees. Hence large Practices would want to reduce the business costs by adopting ICT and have rated reduce business costs as somewhat important and very important factors.

4.5.2 Association of Business Profile Attributes with Benefits of ICT adoption

The importance of benefits of ICT was tested for any association with the business profile attributes and the statistically significant result is discussed here.

Number of years in Practice and Reducing the importance of distance (remoteness) in the provision of high quality medical care

Table 4.18 Association of number of years in Practice and Reducing the importance of distance (remoteness) the provision of high quality medical care and number of years in Practice

		Reducing the importance of distance (remoteness) in the provision of high quality medical care				
		Un-important	Somewhat Unimportant	Neither Un-important nor important	Somewhat Important	Very Important
Number of years of Practice in Illawarra	1-5	1	0	1	3	0
	6-10	2	0	0	0	2
	11-20	4	3	4	0	1
	>20	5	1	5	1	0

p<0.05

1 missing

Table 4.18 shows the association between the Number of years in Practice with Reducing the importance of distance (remoteness) in the provision of high quality medical care. A negative trend is seen. This suggests that GPs who have been practising in the regional Illawarra for more than 10 years would have established networks with other medical Practices and organisations and hence did not perceive reducing the importance of distance to be a benefit.

4.5.3 Association of Business Profile Attributes with Disadvantages of ICT adoption.

Only one result was significant and it is discussed.

Number of patients seen per week and Resistance to usage by staff

Table 4.19 Association of Number of patients seen per week with Resistance to usage by staff

		Resistance to usage by staff				
		Not at all important	Un-important	Neither Unimportant nor important	Important	Very Important
Number of Patients per week	30-60	0	0	0	1	0
	61-90	0	3	0	0	3
	91-120	0	3	0	2	1
	121-150	0	0	6	1	0
	>150	1	2	7	1	1

p<0.05

2 missing

Table 4.19 shows the association of Number of patients seen per week and the disadvantage Resistance to usage by staff. The trend is negative; General practices with more patients per week have not given importance to this disadvantage. It is possible that employees working in a Practice with more patients have more workload and they have perceived ICT to reduce their workload. Hence the Practices with more patients per week had little or no resistance from staff.

4.6 CONCLUSION

This chapter discussed the findings of Illawarra study. Some of the findings were as expected. For example, GPs did not perceive expanding the patient/customer base as an important benefit of ICT adoption. Some of the findings were more specific to GP sector. For example, the external factors namely the pressure from suppliers, customers (patients) or pressure from competitors did not influence the adoption of ICT in regional General Practices. These factors were found to be important by the most of the studies conducted in other industries. GPs are good or very good at using certain ICT skills like using Internet for emails and information retrieval. GPs of regional Practices perceive improve communication and information sharing to be most important factors.

CHAPTER 5:

RESULTS FOR THE RURAL LOCATION: SE NSW

This chapter presents an analysis of the data collected via a survey of GPs in the rural location of SE NSW. As the focus of this chapter is specifically on that rural locations the objectives reported on in this chapter have been adapted as follows: The objectives of this research, as stated in Chapters 1 and 2, are:

- 1b. To determine which factors most influence the adoption of ICT by rural GPs
- 2b. To determine which benefits of ICT adoption contribute most to the viability of rural General Practices
- 3b. To determine which disadvantages of ICT adoption are the most significant for rural GPs
- 4b. To determine if the business profile attributes of rural General Practices have any association with the factors, benefits or disadvantages of ICT adoption.

Chapter is divided into 5 sections as follows:

Section 5.1 presents descriptive statistics for the business profile attributes (i.e. business characteristics, respondent characteristics, ICT administration, training and skills, and ICT skill levels) for the General Practices in SE NSW, namely:

- 5.1.1 Frequency distribution for Number of employees
- 5.1.2 Frequency distribution for Number of patients per week
- 5.1.3 Frequency distribution for Number of years the GPs
have practised in SE NSW
- 5.1.4 Frequency distribution for Gender of the GP
- 5.1.5 Frequency distribution for Employment of an administrator
- 5.1.6 Frequency distribution for importance of ICT training and
support.
- 5.1.7 Frequency distribution for rating of ICT skills possessed by GPs

Section 5.2 presents the factors influencing ICT adoption and so satisfies objective 1b.

Section 5.3 presents the benefits of ICT adoption and so satisfies objective 2b.

Section 5.4 presents the disadvantages of adoption and so satisfies objective 3b.

Section 5.5 presents an analysis of the influence of business profile Attributes on the factors, benefits and disadvantages of ICT adoption, and so satisfies objective 4b.

5.1 Descriptive Statistics for SE NSW General Practice

From a population of 174 GPs in SE NSW, 45 completed questionnaires were received. The response rate was 25.86%. The sample size was sufficient to be considered representative of the location (See section 3.6). A set of frequency distribution were produced using SPSS. As might be expected, some respondents did not answer all the questions. These unanswered responses showed no intrinsic pattern and have been treated in the standard manner for missing results.

5.1.1 Frequency distribution for Number of Employees

Table 5.1 shows that the sample largely consisted of Practices with Number of employees between 3 and 5 (40%). 6.7% of the General Practices have more than 20 employees. This is somewhat counter intuitive as Rural General Practices are normally expected to be either solo Practices or employ less than 10 employees.

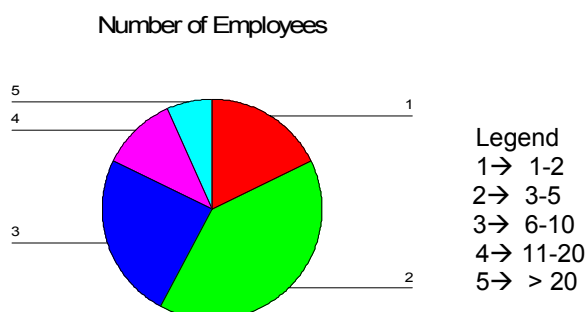


Figure 5.1 Frequency distribution for Number of employees

Table 5.1 Frequency distribution for Number of employees

Number of Employees	Frequency	Percent	Cumulative Percent
1-2	8	17.8	17.8
3-5	18	40.0	57.8
6-10	11	24.4	82.2
11-20	5	11.1	93.3
>20	3	6.7	100.0
Total	45	100.0	
Mean	2.49	Std Deviation	1.121

5.1.2 Frequency distribution for Number of patients per week

Table 5.2 shows that 26.7% of GPs see more than 150 patients per week and a significant proportion, (24.4%) see between 91 and 120 patients per week. This is somewhat surprising, given that all the practices are in relatively small country towns. It is even more surprising when one takes into consideration the number of GPs actually practising in SE NSW (174). While there are a number of practices seeing less than 60 patients a week, these only account for 22.3 of practices in our sample.

Table 5.2 Frequency distribution for Number of patients per week

Number of patients per week	Frequency	Percent	Cumulative Percent
<30	3	6.7	6.7
30-60	7	15.6	22.2
61-90	7	15.6	37.8
91-120	11	24.4	62.2
121-150	5	11.1	73.3
>150	12	26.7	100.0
Total	45	100.0	
Mean: 3.98	Std. Deviation: 1.617		

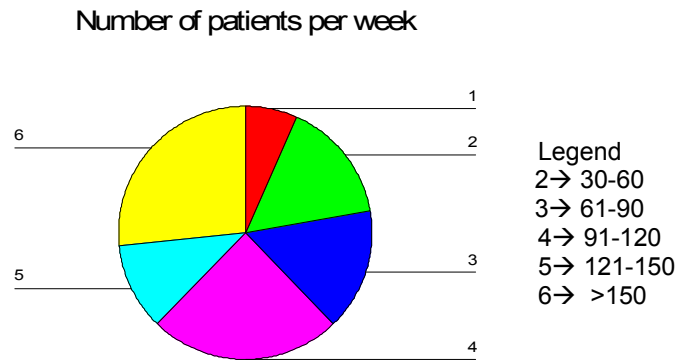


Figure 5.2 Frequency distribution for Number of patients per week

5.1.3 Frequency distribution for Number of years the GPs have practised in SE NSW

Table 5.3 shows that a significant number of GPs have been practising in the SE NSW for more number of years. Given the limitations of the locations and unavailability of some services, it is interesting to note that 17.8 % of GPs have practised in this location for more than 20 years.

Table 5.3 Frequency distribution for Number of years in practice

Number of years in Practice	Frequency	Percent	Averaged percent	Cumulative Percent
<1 year	3	6.7	6.7	6.7
1-5 years	12	26.7	6.7	33.3
6-10 years	8	17.8	4.5	51.1
11-20 years	14	31.1	3.5	82.2
>20 years	8	17.8		100.0
Total	45	100.0		
Mean: 3.27			Std .Deviation : 1.232	



Figure 5.3 Frequency distribution for Number of years in practice

It should be pointed out that the ranges used in this table are not uniform in size, which might give a false impression. When one sees that 31.1% of respondents have been in practice for 11-20 years, it appears that a significant proportion of GPs have remained in SE NSW. However, the value of 31.1% represents the GPs who have been in SE NSW for 11 years, 12 years, 13 years and so on. On the other hand, the 6.7 % of respondents who have been in SE NSW for less than one year represents only a single year group. The column headed “averaged percent, shows the group percentage divided by the number of years in the range for that group. Somewhat surprisingly, we now see that there are a few higher proportion of GPs in SE NSW in the early stages of their careers. Note that the ‘average percent cannot be calculated for the range >20 years because we do not know the upper bound on that range.

5.1.4 Frequency distribution for Gender of the GP

Table 5.4 provides the frequency distribution of the gender of the GPs

Table 5.4 Frequency distribution for Gender

Gender	Frequency	Percent	Cumulative Percent
Male	29	64.4	64.4
Female	16	35.6	100.0
Total	45	100.0	

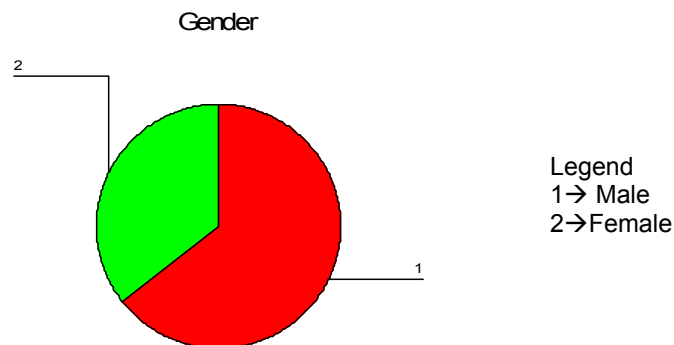


Figure 5.4 Frequency distribution for Gender

64.4% of the responses were from male GPs and 35.6% of the responses were from female GPs. Our results are consistent national figures and trends, which show that female GPs made up 31.6% of the Australian GP workforce in 2002 and that proportion was expected to increase as more women joined the profession. Similarly, in NSW female GPs comprised 31.4% of the total GPs in 1997, but had increased to 34.5% by 2002.

It should be recalled that this was not the trend observed in the Illawarra, see Section 4.1.4, where the number of female GPs was far lower than the state and national averages.

It was suggested in Section 4.1.4 that the reason for the lower proportion of female GPs might be self selection of the respondent i.e. more male GPs may have chosen to respond, thereby skewing the results. The results for SE NSW would suggest that self selection is not the answer. So why then are there so few female doctors in the Illawarra? It would be very useful to examine this trend in other regional locations.

5.1.5 Frequency distribution for Employment of an administrator

Table 5.5 provides the frequency distribution of the responses to the employment of administrator with specific responsibilities for ICT related issues.

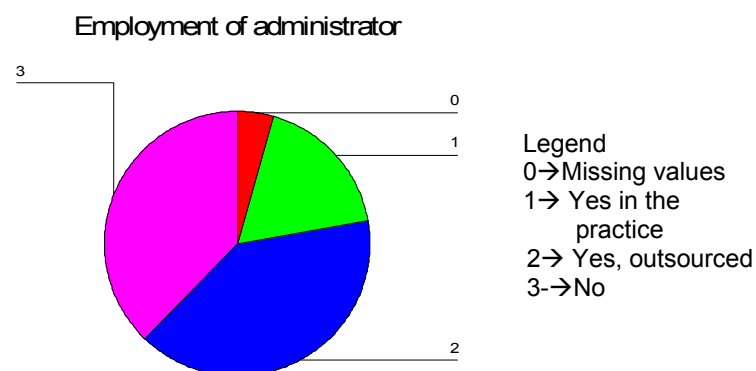


Figure 5.5 Frequency Distribution for Employment of an administrator

Table 5.5 Frequency Distribution for Employment of an administrator

Employment of an administrator			
	Frequency	Percent	Cumulative Percent
Missing	2	4.4	4.4
Yes in the practice	8	17.8	22.2
Yes outsourced	18	40.0	62.2
No	17	37.8	100.0
Total	45	100.0	
Mean : 2.11		Std. Deviation: .859	

As seen from the Table 5.5, 17.8% of General Practices have employed an administrator within their practice while 40 % of them have outsourced an administrator. It is surprising that 37.8 % of General Practitioners do not employ any administrator at all, which suggests that administration of ICT related issues is done either informally or not at all.

It is also worth noting that the proportion of practices not employing an administrator is far lower than in the Illawarra (see section 4.1.6). One possible answer might be that practices in the Illawarra are smaller and so do not need an administrator. However, if we examine the distributions for Number of Employees (Sections 4.1.1 and 5.1.1), the Illawarra does not, as a general rule, have larger practices. So, our possible explanation is not likely.

Another reason might be that GPs in the Illawarra have higher ICT skills and so do not believe they require the services of an administrator. However, as shown in Section 5.1.7, GPs in the Illawarra rated themselves as far less skilled than GPs in SE NSW for all ICT skill surveyed except in generating invoices. So this explanation also fails.

5.1.6 Frequency distribution for the importance of ICT training and support

Table 5.6 provides the frequency distribution for the importance of ICT training and support.

Table 5.6 Frequency distribution for the importance of ICT training and support

ICT Training and support	Frequency	Percent
Not at all important	1	2.2
Unimportant	0	0
Neither important nor unimportant	4	8.9
Important	14	31.1
Very Important	26	57.8
Total	45	100.0
Mean : 4.42	Std. deviation: .839	

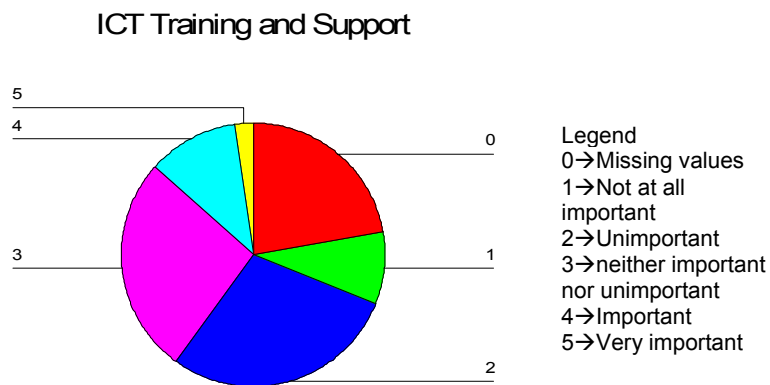


Figure 5.6 Frequency distribution for the importance of ICT training and support

89.9% of the General Practices have perceived ICT training and support to be important or very important. This implies that more GPs would like to become ICT skilled and are willing to spend on ICT training and support. It is possible that employees in rural General Practices may not be ICT skilled.

5.1.7 Frequency distribution for rating of ICT skills possessed by GPs

The frequencies of the responses to different types of ICT skills are given in the Table 5.7. The frequency distribution with cumulative percentages of responses of each skill is included separately in the appendix B.

Table 5.7 Frequency distribution for rating of ICT skills

	Very Poor	Poor	Neither Good nor Poor	Good	Very Good
Word processing	1 (2.2%)	2 (4.4%)	11 (24.4%)	23 (51%)	7 (15.6%)
Spreadsheet	5 (11.1%)	1 (28.9%)	4 (8.9%)	20 (44.3%)	2 (4.4%)
Data entry	4 (8.9%)	6 (13.3%)	13 (28.9%)	15 (33.3%)	6 (13.3%)
Generating invoices	6 (13.3%)	16 (35.6%)	6 (13.3%)	9 (20%)	4 (8.9%)
Internet – email	1 (2.2%)	0 (0%)	7 (15.6%)	21 (46.7%)	15 (33.3%)
Internet- information retrieval	1 (2.2%)	2 (4.4%)	5 (11.1%)	21 (46.7%)	16 (35.6%)
Software packages (e.g. Medical Director or MD)	2 (4.4%)	2 (4.4%)	8 (17.8%)	15 (33.3%)	17 (37.8%)

An examination of Table 5.7 reveals some interesting patterns in rating of ICT skills. Many GPs have rated themselves as good or very good at some ICT skills. These include:

- Use of software packages: rated as good or very good by 72% of GPs,
- Use of word processing: rated as good or very good by 66% of GPs
- Use of email: rated as good or very good by 70 % of GPs
- Use of Internet to retrieve information: rated as good or very good by 72%

Only 50% of the GPs rate themselves good at using spreadsheet or data entry. Only about 28.9% are good or very good at generating invoices. More importantly, 48.9% rate themselves as poor or very poor in generating invoices. This is a far higher frequency of poor and very poor than for every other ICT skill except for spreadsheet, which is still 40%. This suggests that GPs don't do their books or accounting functions and they are more familiar with entry level skills like word processing and use of the Internet.

Overall, we see that rural GPs are reasonably good at using technology and we would expect a reasonably positive attitude to ICT from them. Word processing and use of software packages are entry level skills and most rural GPs are familiar with them.

However, it is interesting to note that this was not the case in the Illawarra. For the following applications, the percentage of GPs who rated themselves as good or very good were:

- Use of software packages: 38%, compared to 72% in SE NSW,
- Use of word processing: 37.4%, compared to 66% in SE NSW
- Use of Internet to retrieve information: 62%, compared to 72% in SE NSW

The only skill that is even remotely comparable is Use of Internet to retrieve information.

GPs of both locations rated themselves poor at generating invoices (Illawarra: 53%, SE NSW: 48.9%)

5.2 Factors influencing ICT adoption

Objective (1b) of the study is to find out the factors influencing ICT adoption in rural Practices. Table 5.8 shows the distribution of the ratings of importance of each of the factors influencing ICT adoption. The ranking is calculated using weighted average of the responses i.e. Unimportant is given a weight of 1, while Very important is given a weight of 5.

Table 5.8 Ratings of the importance of Factors influencing ICT adoption

Rank	Factors	1	2	3	4	5
1	Generating prescriptions	2	0	1	12	30
2	Improve information storage & retrieval	1	0	4	17	23
3	Streamlining of billing & accounting functions	1	0	4	20	20
3	Improve communication	1	0	4	20	20
4	Improve patient care/contact	2	1	5	12	25
5	Improve business efficiency	1	1	5	16	21
6	Improve capacity to support a systematic approach to disease management	2	2	6	14	19
7	Keeping in touch with medical & other developments	2	2	6	25	10
8	Contact with hospitals	3	1	10	16	13
9	Strengthen relations with business related partners	8	8	11	11	7
10	Pressure from medical authorities	12	7	5	19	2
11	Facilitates E-commerce	15	8	12	6	3
12	Pressure from patients	22	6	10	6	1
13	Pressure from competing GPs	23	6	8	8	0
14	Pressure from suppliers	25	5	14	1	0

LEGEND: 1 Unimportant, 2 Somewhat unimportant, 3 Neither unimportant nor important, 4 Somewhat important, 5 Very important

Table 5.8 shows that certain factors were considered to be very important in influencing the adoption of ICT. Generating prescriptions was rated as a very important factor by 93.4% of the General Practices. The importance given to this factor is not unexpected as it is directly related to the work of GPs. We have also noted that these rural Practices have a large number of patient visits per week. Hence, the ability to provide prescriptions online would be a real asset.

Improving information storage and retrieval and Improving communication were rated as the next most important factors. GPs need to share and retrieve information regarding patients, treatments, surgeries etc in a more efficient

way and ICT adoption is envisaged to facilitate this. It is also seen that rural Practices perceived the factor Improve business efficiency as being important. Improve Patient care/contact was rated as an important factor. It appears that GPs have perceived ICT as a means to improve the health care services to patients. For example, GPs can access patient records easily, monitor and assist treatments through video conferencing, generate online prescriptions, communicate with patients through emails etc. This factor is quite similar to the factor namely 'Improving customer service' which is identified as very important factor of E-commerce adoption by many studies (European Commission, 2005; Caskey et al, 2000; Parker and Papendrea, 2002).

From the data in Table 5.8, we can calculate that only 62.2 % of respondents considered pressure from patients (customers) to be either very important or important and only 66.7% of respondents rated pressure from suppliers as either very important or important. These findings support the findings of MacGregor's study about regional SMEs who found that pressure or demand from customers and suppliers are not the important criteria in adopting E-commerce.

These findings are quite different from the findings of many studies which have found that the external factors namely pressure from customers and suppliers (Poon and Swatman, 1997; Al Qirim, 2006; OECD, 2004) are influencing factors in adopting E-commerce. This study found that external pressure is not as important a factor in influencing the adoption of ICT by rural General Practices.

5.3 Benefits of ICT adoption

Objective 2b of the study is to determine the relative importance of the benefits of ICT adoption in rural General Practices. Table 5.9 below shows the distribution of the ratings of importance of each of the potential benefits of ICT adoption. They have been ranked, once again, using a weighted average of the responses.

Table 5.9 shows that ICT has contributed significantly to the functioning of the Practices mainly in information storage and retrieval, streamlining of billing

and accounting functions, disease management and improvement to the way the business is operated. A closer examination of the Table reveals that 88.9% of GPs have rated Information storage and retrieval as an important or very important benefit. General Practices maintain a huge number of patient records. ICT facilitates efficient retrieval of information.

Table 5.9 Rating of Benefits of ICT adoption

Rank	Benefits	1	2	3	4	5
1	Information storage and retrieval	1	1	3	19	21
2	Streamlining of billing and accounting functions	1	2	4	18	19
3	Adding to the Skills of the Practice	2	3	9	20	11
4	Disease Management	4	2	5	20	13
5	Improvement to business efficiency (time saving/patient care)	4	4	3	24	9
6	Communication with other medical organisations	3	4	10	20	8
7	Improvement to the way the business is operated	5	2	4	28	5
8	Communication with fellow GPs	6	4	6	20	9
9	Enabling more time to be spend on patient care	8	2	12	18	5
10	Allowing the business to expand	6	5	12	18	4
11	Communication with hospitals	7	6	7	18	6
12	Reducing the importance of distance in the provision of high quality medical care	7	3	11	13	8
13	Reducing business operating costs	8	5	12	16	3
14	Ordering drugs	9	7	14	12	3
15	Other Communication with General Practice business suppliers	10	8	14	11	2
15	Reducing the overall workload and increased leisure time	9	5	15	12	2
16	Expanding the patient base by broadening the area of coverage	19	2	15	8	1

LEGEND: 1 Not at all important, 2 Unimportant, 3 Neither important nor unimportant, 4 Important, 5 Very important

Section 5.1.3 showed that the client base (patient base) is high for most of the Practices. Searching through a huge number of patient records is time consuming and is a tedious task. Accounting and billing functions are also time consuming. Using ICT these functions can be performed in a more effective way. Hence the GPs have perceived that adoption of ICT would streamline billing and accounting functions.

These results support the findings from previous studies which found that General Practitioners use computers mainly for retrieving information and accessing patient records. (GP Red tape taskforce, 2003; AIHW, 2004).

For rural General Practices in SE NSW, the benefits that are least important are:

- Other Communication with General Practice business suppliers
- Ordering drugs
- Reducing the overall workload and increased leisure time
- Expanding the patient/ customer base by broadening the area of coverage

As expected, given the number of patients seen by many GPs, they are not keen to expand their patient base. The GPs do not see the Ordering [of] drugs as an important benefit of ICT adoption. This is only to be expected as the role of the GP in providing drugs is to prescribe drugs, not to supply them. Moreover, the importance of ordering drugs online might be higher if the suppliers (pharmaceutical companies) insisted on the Practices placing orders online. But we saw from section 5.5.1 that Pressure from suppliers was not perceived to be an important factor in adopting ICT. This may also explain why GPs have rated ordering drugs as one of the least important benefits of ICT adoption.

It is, however, quite surprising that GPs ranked Reduction of workload and increase leisure time very low. This does not mean that GPs do not want to reduce their workload, rather it suggests that GPs do not expect ICT adoption

to have actually reduce their workload. Since a GP's workload is directly proportional to the number of patients seen, the only way to reduce real workload is to reduce the number of patients. Instead, GPs are looking to improve the efficiency of work that is done in the Practice by non-medical staff, such as streamlining billing or information storage. These sorts of efficiencies would only be expected to have a minimal impact on the GP's workload but they may help reduce a cost, which was also seen as an important benefit of ICT adoption.

5.4 Disadvantages of ICT adoption

Objective 3b of the study is to determine the importance of various disadvantages of adopting ICT in rural General Practices. Table 5.10 shows the distribution of the ratings of importance of each of the disadvantages of ICT adoption. The ranking is, once again, calculated as a weighted average.

Table 5.10 Rating of Disadvantages of ICT adoption

Rank	Disadvantages	1	2	3	4	5
1	On-going technical difficulties	3	2	5	20	15
2	Higher costs	4	3	5	24	9
3	Training for use of computers was inadequate	3	7	9	16	10
4	Software support was inadequate	4	5	10	13	12
5	Changes to routines	3	5	12	19	6
6	Security	4	6	7	18	9
7	Resistance to usage by staff	7	3	14	15	6
8	Duplication of work effort	9	6	11	13	5
9	Reduced flexibility of work	8	8	16	7	4
10	Deterioration of relations with business partners	15	9	16	4	1

LEGEND: 1 Not at all important, 2 Unimportant, 3 Neither important nor Unimportant, 4 Important, 5 Very important

An examination of Table 5.10 reveals that On-going technical difficulties and Higher costs have been rated as the most important disadvantages incurred through the introduction of ICT by the General Practices. GPs and staff might lack technical knowledge and Practices could have incurred higher costs

including consultation, implementation and maintenance costs. Other important disadvantages are Training for use of computers was inadequate and Software support was inadequate. It is seen that the technical issues related to ICT were rated as important disadvantages by the GPs. ICT training and support could be the solution to overcome these disadvantages. Changes to routines was one of the important disadvantages.

Resistance from employees has been shown in many previous studies to be a very important disadvantage (OECD, 2002; SEAMATE, 2004). This is not evident in the case of rural GPs where it is ranked only seventh in importance. Similarly, Security which is of more concern in product oriented sectors and other service sectors was not rated as one of the more important disadvantages by GPs. In industries involving online buying and selling of products and services, security is perceived as a major disadvantage. But it is obvious that as GPs do not seem to encourage electronic transactions, security has not been rated as an important disadvantage.

It is interesting to note that some of the disadvantages which are least applicable to rural General Practices are

- Deterioration of relations with business partners
- Duplication of work effort
- Reduced flexibility of work

General Practices do perceive ICT adoption leading to deterioration of relations with business partners. Long term established networks with business partners are not affected by adopting ICT. GPs may not have flexibility in their work shifts. Hence reduced flexibility of work as a disadvantage is not applicable to rural GPs.

5.5 The influence of Business profile attributes on ICT adoption

As discussed in Chapter 2, Business profile attributes, which include the business characteristics, the respondent characteristics, ICT administration, training and support, and ICT skill levels, have been found to influence the adoption criteria. Objective 4b of our study is to determine if the business

profile attributes of rural GPs have any association with the factors, benefits and disadvantages of ICT adoption. The following sections explain the significant results obtained from chi-square tests.

5.5.1 Association of Business Profile Attributes with Factors influencing ICT adoption

All the factors influencing adoption were tested for association with Business Profile Attributes. Number of employees in a Practice was found to be associated with certain factors influencing adoption.

Number of employees and Information storage and retrieval

Table 5.11 shows the association of Number of employees with Improve information storage and retrieval. An examination of the table reveals that as the Number of employees in a Practice increases, the importance of Information storage and retrieval also increases.

Table 5.11 Association of Number of employees with Improve information storage and retrieval

		Improve information storage and retrieval				
		Unimportant	Somewhat Unimportant	Neither un-important nor important	Somewhat important	Very Important
Number of Employees	1-2	0	0	0	6	2
	3-5	0	0	3	5	10
	6-10	0	0	1	5	5
	11-20	0	0	0	0	5
	>20	1	0	0	1	1

p=.011

It is surprising that Practices of more than 20 employees are equivocal in their response. Conventional wisdom suggests that Practices with more employees would require more efficient information storage and retrieval but however in this case they have deviated from the trend for reasons not known.

Number of employees and Improve Communication

Table 5.12 Association of Number of employees with Improve communication

		Improve communication				
		Unimportant	Somewhat Unimportant	Neither unimportant nor important	Somewhat important	Very Important
Number of Employees	1-2	0	0	0	6	2
	3-5	0	0	2	7	9
	6-10	0	0	2	6	3
	11-20	0	0	0	0	5
	>20	1	0	0	1	1

p=0.011

Table 5.12 shows the association of Number of employees with Improve communication. A closer examination of the table reveals a positive trend between them i.e. in general, as the number of employees in a Practice increases, the importance given to Improve communication also increases.

Communication could be informal in Practices with less than 5 employees. These Practices have perceived the importance of improve communication because ICT facilitates efficient external communication with GPs, patients, suppliers. Practices having between 5 and 20 employees may have perceived improved communication for both internal and external purposes.

Number of employees and Streamlining of billing and administrative functions

Table 5.13 Association of Number of employees with Streamlining of billing and accounting functions

		Streamlining of billing and accounting functions				
		Unimportant	Somewhat Unimportant	Neither unimportant nor important	Somewhat important	Very Important
Number of Employees	1-2	0	0	1	6	1
	3-5	0	0	0	10	8
	6-10	0	0	2	4	5
	11-20	0	0	0	0	5
	>20	1	0	1	0	1

p=.002

Table 5.13 shows the association of Number of employees with Streamlining of billing and accounting functions. The trend seen in the table is positive i.e. as the Number of employees in a Practice increases the importance of this factor also increases. Practices having 5 or less than 5 employees have considered this factor to be somewhat important or important. Conventional wisdom suggest that large Practices might have more of billing and accounting functions as they have multiple GPs and they would have responded positive in rating of this factor compared to smaller sized Practices. Large Practices are equivocal in their rating of this factor.

Number of employees and Strengthen relations with business partners.

An examination of the Table 5.14 shows that there is a positive relation between the Number of employees and Strengthen relation with business partners. Most Practices with 1 or 2 employee(s) have rated this factor as unimportant. The reasons could be that those Practices may not have relations with more business partners and hence this factor may not be applicable to them

Table 5.14 Association of Number of employees with Strengthen relations with business partners.

		Strengthen the relation with business partners				
		Unimportant	Somewhat Unimportant	Neither unimportant nor important	Somewhat important	Very Important
Number of employees	1-2	5	1	1	1	0
	3-5	1	1	8	6	2
	6-10	0	4	2	4	1
	11-20	1	1	0	0	3
	>20	1	1	0	0	1

p=0.04

For Practices of 3 or more employees, strengthening relation with business partners is an important factor in adopting ICT. It seems logical for Practices with more employees to have business ties with many and hence they have perceived that ICT can strengthen the relations with the business partners and have given greater importance to this factor.

Summarising Section 5.5.1,

- Practices with 5 or less than 5 employees have considered certain factors to be more important, namely, information storage and retrieval, use of computers for administrative and streamlining of billing functions in influencing the adoption of ICT.
- Practices with more than 20 employees were equivocal in their responses. They were expected to follow the trend instead they deviated from them. The reasons are not known.

5.5.2 Association of Business Profile Attributes with Benefits of ICT adoption

A list of benefits of ICT (see Table 5.9) contributing to the viability of running the General Practices was tested against the Business Profile Attributes of the Practices. The statistically significant results are discussed.

Number of employees and Improvement to business efficiency

Table 5.15 shows the association of Number of employees with Improvement to business efficiency.

Table 5.15 Association of Number of employees with Improvement to business efficiency

		Improvement to business efficiency				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of employees	1-2	3	0	0	3	2
	3-5	0	2	1	12	3
	6-10	0	1	2	6	2
	11-20	0	1	0	2	2
	>20	1	0	0	1	0

p=0.022 1 missing

General Practices with 1 or 2 employees are equivocal in their responses with 62.5 % considering this benefit as important and 37.5 % of them considering it to be not at all important. 90% of General Practices with employees between 11 and 20 have considered this benefit as important. A closer examination of the table reveals that there is positive association between the Number of

employees and Improvement to business efficiency i.e. practices with more employees have given more importance to this factor.

Number of employees and Reduction of the overall workload and increased leisure time

Table 5.16 shows the association of Number of employees with Reduction of the overall workload and increased leisure time. A positive trend is seen i.e. the greater the Number of employees in a Practice, the more importance is given to this factor. Smaller Practices, even after adopting ICT, need time to do the data entry and hence reduction of workload is not applicable to these Practices.

Table 5.16 Association of Number of employees with Reduction of the overall workload and increased leisure time

		Reduction of the overall workload and increased leisure time				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of employees	1-2	5	1	0	0	2
	3-5	2	2	7	6	0
	6-10	0	2	6	3	0
	11-20	1	0	2	2	0
	>20	1	0	0	1	0

p=0.015 2 missing

Number of employees and Communication with other medical organisations

Table 5.17 Association of Number of employees with Communication with other medical organisations

		Communication with other medical organisations				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of Employees	1-2	3	2	1	2	0
	3-5	0	2	2	8	6
	6-10	0	0	4	6	1
	11-20	0	0	1	3	1
	>20	0	0	2	1	0

p=0.023

Table 5.17 shows the association of Number of employees with Communication with other medical organisations. There exists a positive trend implying that the greater the Number of employees in a Practice, the more importance is given to this benefit. As the Number of employees increases in a Practice, chances of the Practices having multiple doctors are high and GPs want to improve communication with other medical organisations.

However Practices with more than 20 employees deviate from the above trend, and they have perceived this benefit to be neither important nor unimportant.

Number of employees and Reducing the importance of the distance (remoteness) in the provision of high quality medical care.

Table 5.18 Association of Number of employees and Reducing the importance of the distance (remoteness) in the provision of high quality medical care

		Reducing the importance of the distance (remoteness) in the provision of high quality medical care				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of employees	1-2	5	2	1	0	0
	3-5	2	3	9	3	1
	6-10	0	3	2	5	1
	11-20	2	0	0	3	0
	>20	1	0	2	0	0

p=0.034

Table 5.18 shows the association of Number of employees with Reducing the importance of the distance (remoteness) in the provision of high quality medical care. A positive trend is seen between the two. Practices with fewer employees have rated this benefit as not at all important whereas Practices with more employees have considered it to be somewhat important. Large Practices may have a large network of other medical organisations with which they communicate. If these organisations are in other locations, as would be expected in a rural Practice, there may be a real problem maintaining the network at a distance. Hence, larger Practices see a greater benefit in reducing remoteness by adopting ICT.

Number of years of Practice and Streamlining of billing and accounting functions

Table 5.19 Association of Number of years of Practice with Streamlining of billing and accounting functions

		Streamlining of billing and accounting functions				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of years in Practice	<1	0	1	1	1	0
	1-5	0	0	1	9	2
	6-10	0	0	1	3	4
	11-20	0	0	1	3	10
	>20	1	1	0	2	3

p=0.044 1 missing

Table 5.19 shows that there is an association of Number of years in Practice by the GPs with Streamlining of billing and accounting functions. It is seen that the association between them is positive i.e. the greater the number of years the GPs have practised in SE NSW, the more importance they perceive in Streamlining of billing and accounting functions.

It is possible that Practices which have been in a region for a long time have are more mature in their business practices and so may already have integrated ICT into those work practices. On the other hand, newer practices may be preoccupied with the day to day running of the practice and so ICT has a lower profile. If this were the case, then older practices may not see further streamlining as an advantage, while newer practices would.

Summarising the findings of Section 5.5.2,

- There exists an association between the Number of employees and a number of benefits of ICT namely reduction of the overall workload and increased leisure time, improve communication with other medical organisations and reducing the importance of distance (remoteness).
- GP's number of years in the Practice is positively associated with Streamlining of billing and accounting functions.

5.5.3 Association of Business Profile Attributes with Disadvantages of ICT adoption

All the disadvantages (see Table 5.10) were tested against Business Profile Attributes. The following are the statistically significant results.

Number of Patients seen per week and Duplication of work effort.

An examination of the Table 5.20 shows the association of Number of patients per week with Duplication of work effort. A negative association is seen between them i.e. as the Number of patients seen by GPs in a week increases, the less this disadvantage is seen as important. It is possible that Practices with more patients per week have integrated ICT into their work practices, thereby reducing duplication of work such as keeping handwritten patient records, records on MD.

Table 5.20 Association of Number of patients per week with Duplication of work effort

		Duplication of work effort				
		Not at all important	Unimportant	Neither important nor unimportant	Somewhat important	Very Important
Number of patients per week	<30	0	0	0	3	0
	30-60	2	0	1	2	2
	61-90	2	1	0	3	1
	91-120	1	4	2	3	1
	121-150	0	0	5	0	0
	>150	4	1	3	2	1

p=0.041 1 missing

Number of years in Practice and Deterioration of relations with business partners

Table 5.21 shows that there is an association of GP's number of years in Practice with Deterioration of relations with business partners. Practitioners who are new to a Practice may not have established networks with business partners and hence this disadvantage is not applicable to them. For Practitioners who have been practising in the same location for many years, ICT does not appear to affect the old established relationships in a rural medical environment. This is interesting because deterioration of relations

with business partners is often perceived as disadvantages of ICT adoption in many studies (Raymond, 2001; Stauber, 2000)

Table 5.21 Association of Number of years in Practice with Deterioration of relations with business partners

		Deterioration of relations with business partners				
		Not at all important	Unimportant	Neither unimportant nor important	Somewhat important	Very Important
GP's Number of years in Practice	<1	0	1	2	0	0
	1-5	0	5	3	4	0
	6-10	5	0	3	0	0
	11-20	4	2	7	0	1
	>20	6	1	1	0	0

p=0.008

5.6 CONCLUSION

This chapter analysed the findings of the data from the rural location, SE NSW.

Regarding objective 1b of our study, we have seen that certain factors were considered not to be important in affecting the adoption of ICT by the General Practices. Pressure from customers (patients), competing GPs and suppliers were rated as unimportant factors respectively.

Regarding objective 2b of our study, we observed that not all the benefits of ICT adoption were perceived important by the GPs. It differed significantly from the findings of studies conducted in other SME sectors. Information storage and retrieval was rated as important or very important benefit of ICT adoption by most of the General Practices (88.9%).

Regarding objective 3b of our study, it was noted that certain disadvantages were rated more as being important by the General Practices namely ongoing technical difficulties. Higher costs was rated as the next most important disadvantage.

Regarding objective 4b of our study, we saw that the business profile Attributes. such as business and respondent characteristics do have some influence on the factors, benefits and disadvantages in adopting ICT. Some of the findings are summarised here.

- There exists an association between the Number of employees and a number of benefits of ICT namely reduction of the overall workload and increased leisure time, Improve communication with other medical organisations and reducing the importance of distance (remoteness). While large Practices having more than 20 employees are equivocal in their perception the factors, the medium and micro sized Practices have considered most of the factors as important.
- GP's number of years in the Practice significantly affected the perceptions of certain benefits namely streamlining of billing and accounting functions.

CHAPTER 6

CONCLUSIONS

6.1 Introduction

Chapters 4 and 5 presented the results of the study addressing the objectives. This chapter summarises the important findings and the conclusions drawn from those findings. Finally the significance of the study, limitations of this research and future directions of this research are suggested.

6.2 Conclusions

The study aimed to determine which factors, benefits and disadvantages most influence the adoption of ICT by rural and regional SMEs in the service sector, particularly GPs. It also aimed to determine if any business profile attributes are associated with those factors, benefits and disadvantages. The analysis of data of from regional locations, the Illawarra, and a rural location, SE NSW, showed that the importance placed on some of the factors and benefits by GPs were similar to those found in other studies conducted in manufacturing and retail industries. There were, however, striking differences in the rating of importance of certain factors and benefits by GPs.

In their ranking of the **factors influencing ICT adoption**, both the rural and regional GPs were less influenced by “external factors”, like pressure from suppliers” than SMEs in other studies had been. It is unclear at this stage whether this is because the General Practices that responded a) are in the service industry b) are located in rural or regional locations or c) are simply different to other service –oriented SMEs because they are medical practices. It would be useful to carry out similar studies of other service-oriented SMEs that were not in a “caring profession” to try to decide which of these possible explanations is most likely.

It was also observed that the GPs were more influenced by internal factors, like information storage and retrieval, generating prescriptions than SMEs in previous studies. This may be because service industries tend to be more self-contained than, say, retail or manufacturing industries and are therefore

less influenced by suppliers' and customers' demands to operate online. Indeed, while there may be some patient support for telemedicine in emergency situations, most patients prefer a face- to-face interaction with their GP. Both these observations support the idea that the emphasis on internal rather than external factors is probably due to a combination of both the service-orientation of General Practice and its being a caring profession. One might expect very similar results from, say, dentists, veterinaries or physiotherapists.

In their ranking of the **benefits of ICT adoption**, both the rural and regional GPs responded in a similar way to SMEs in previous studies. One very noticeable difference, however, was that GPs did not perceive an expansion of their client base (patient base) as particularly desirable, rating it as the least important benefit realised by adopting ICT. This is not surprising given that many GPs who participated in this study were seeing in excess of 150 patients a week. If these consultations were on average fifteen minutes long, the consultations alone would occupy about 40 hours a week. Add to these house calls, hospital visits and necessary paperwork and our GPs may be facing a daunting workload.

While other SMEs in, for example, the retail, manufacturing or transport industries, may have spare capacity, or can easily increase their capacity by hiring additional unskilled or semi-skilled staff, increasing capacity in a General Practice is far more difficult, so it is not surprising that GPs do not want a greater workload. Once again, it is unclear whether this is true for other service industries or whether it is an aspect of being in a caring profession

In their ranking of the **disadvantages of ICT adoption**, both the rural and regional GPs responded in a very similar fashion to SMEs in previous studies. This is not unexpected as the disadvantages found in the literature are of a general nature and would appear to apply to any industry sector, including the service sector. Moreover, the disadvantages do not appear to be dependent on location. Since the differentiating factors of this study are industry sector

and location, it is not surprising that the disadvantages all appear to be applicable.

In analysing the associations between business profile attributes, and the factors, benefits and disadvantages of ICT adoption, only a few associations were found to be statistically significant. .

For the Illawarra study, there were associations between both the Business size, and the Number of years in practice, and the perception of importance of certain factors and disadvantages.

For the SE NSW study, there was an association between the Business size and the perception of importance of certain factors and a number of benefits

6.3 Significance of this study

The results of the study are significant to a number of groups.

1. Medical organisations, such as Australian Medical Association (AMA) and Australian Institute of Health and Welfare (AIHW). These organisations have formulated strategies to promote the adoption of ICT in General Practices. The results from the two locations, Illawarra and SE NSW, could provide them the details for their future strategic plans
2. E-commerce providers in rural and regional locations would benefit from a deeper understanding of the disadvantages that are experienced by SMEs, particularly GPs in those locations. This study may help them to identify weaknesses in their service provision or in the strategies adopted by GPs when adopting ICT and E-Commerce.
3. Government policy makers on ICT. The Australian Federal Government, amongst many others, has been encouraging the adoption of E-commerce across various industries. From the findings of this study, issues involved in ICT adoption by rural and regional General Practices could be understood. For example the study found that GPs do not perceive the importance of E-commerce adoption. If Government policy makers were aware of the reasons why ICT and E-

Commerce are not appropriate for some groups of SMEs, they might take that into account in their policies.

4. Researchers in the field of ICT and E-Commerce adoption will find the study significant because it provides an initial benchmark for studies on service oriented SMEs, and for studies on SMEs in rural and regional locations
5. General Practices of Illawarra and SE NSW. The results are of significance to GPs of these locations who would consider adopting E-commerce in future. They can know about the trend of ICT adoption and are aware of the factors, benefits and disadvantages perceived by other GPs in their location (Illawarra or SE NSW).

6.4 Limitations of the study

This study aimed to broaden our understanding of the adoption of ICT and E-Commerce by SMEs in the service sector in rural and regional locations.

Because the study is a pilot study in a larger Australia-wide study, it was decided to focus only on GPs as a specific group of SMEs in the service industry. Consequently, the findings of this study may not be applicable to other service industry SMEs. Indeed, the conclusions above suggest that there may be significant differences between service-oriented SMEs which are part of the caring professions and those that are not. Our results are inconclusive.

The literature has confirmed that there are differences in the way ICT and E-Commerce are adopted by rural and regional SMES and by metropolitan SMEs. However, this study did not identify any obvious differences between rural and regional SMEs themselves. Moreover, because the study has examined only one rural General Practice and one regional General Practice, it is impossible to generalise our conclusions to other rural or regional GPs, let alone to other rural and regional service-oriented SMEs. There is however, great scope for additional research, and this study provides a useful survey instrument and a set of initial benchmarks.

6.5 Future research

The study focussed on rural and regional General Practices of Australia. A comparison study between the two locations can be done.

A comparison study of ICT adoption by metropolitan and regional, rural and remote locations can be conducted. ICT adoption in other regional and rural locations of Australia can be conducted. A national survey of ICT adoption by regional and rural General Practices could be conducted. It is hoped that more studies in this research domain be conducted with greater breadth in the future.

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APPENDIX

A1 QUESTIONNAIRE

1. How many equivalent full-time people work in your practice?
☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-20 ☐ >20
2. How many clients/patients do you see on average in a week?
☐ <30 ☐ 30-60 ☐ 61-90 ☐ 91-120 ☐ 121-150 ☐ >150
3. How long have you practised in the Illawarra* area?
☐ < 1 year ☐ 1-5 years ☐ 6-10 years ☐ 11-20 years ☐ >20 years
4. What is your gender?
☐ Male ☐ Female
5. What is your age in years? **

<input type="checkbox"/> <30	<input type="checkbox"/> 31-40	<input type="checkbox"/> 41-50	<input type="checkbox"/> 51-60	<input type="checkbox"/> 61-65	<input type="checkbox"/> >65
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Please note: In this survey, Information and Communications Technology (ICT) *is the technology (computers and software) required to convert, store, protect, transmit, and retrieve information.*

6. Rate your ICT skills in the following areas:

Type of ICT skill	Very Poor	Poor	Neither Good nor Poor	Good	Very Good
Word processing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spreadsheet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generating invoices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet – email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet – information retrieval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of software packages (e.g., Medical Director or MD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Does your practice employ an administrator with specific responsibilities for ICT related issues?
☐ Yes, in the practice ☐ Yes, the person is outsourced ☐ No

* SE NSW specified in SE NSW questionnaire

** Age not included in some questionnaires

8. How would you rate the importance of the following factors in influencing your adoption of ICT?

Factors	Un- important	Somewhat un- important	Neither Un- important nor Important	Somewhat Important	Very Important
Pressure from patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure from suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure from competing GPs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure from medical authorities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve information storage & retrieval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduce business costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve business efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve patient care/contact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve capacity to support a systematic approach to disease management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streamlining of billing & accounting functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strengthen relations with business related partners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facilitates e-Commerce*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keeping in touch with medical & other developments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generating prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contact with hospitals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*E-commerce consists primarily of the distribution, buying, selling, [marketing](#), and servicing of [products](#) or [services](#) over electronic systems such as the Internet and other [computer networks](#).

9. Rate the following barriers in introducing ICT in your general practice.

Barriers	Very Minor	Minor	Was not a barrier	Major	Very Major
Access to skilled ICT staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Financial resources and initial costs (hardware/software)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost of consulting services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No time to keep up with ICT changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Privacy & security concerns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of your practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resistance from employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. In what ways has ICT contributed to the functioning/viability of your general practice?
- | Contribution | Not at all important | Unimportant | Neither important nor unimportant | Important | Very important |
|--|--------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|
| Expanding the patient/ customer base by broadening the area of coverage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Improvement to business efficiency (time saving/patient care) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduction of the overall workload and increased leisure time | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Enabling more time to be spend on patient care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduction of business operating costs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Improvement to the way the business is operated | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Allowing the business to expand | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Information storage and retrieval | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Communication with fellow GPs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Communication with other medical organisations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Disease Management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Streamlining of billing and accounting functions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Adding to the Skills of the practice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Communication with hospitals | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Ordering drugs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other communication with general practice business suppliers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reducing the importance of distance (remoteness) in the provision of high quality medical care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other (please specify): | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
-
11. What were the disadvantages incurred through the introduction of ICT?
- | Disadvantage | Not at all important | Unimportant | Neither important nor unimportant | Important | Very important |
|---|--------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|
| Changes to routines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Resistance to usage by staff | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Deterioration of relations with business partners | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Higher costs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| On-going technical difficulties | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Software support was inadequate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Training for use of computers was inadequate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduced flexibility of work | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Duplication of work effort | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Security | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other (please specify): | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
-
12. How important is ICT training and support for your practice?
- ☐ Not at all important ☐ Unimportant ☐ Neither important nor unimportant
- ☐ Important ☐ Very important
13. As a proportion of the total costs of operating your practice, what contribution would be made by ICT costs?
- ☐ 0-5% ☐ 5-10% ☐ 10-15% ☐ 15-20% ☐ >20% ☐ >150

14. In terms of the following ICTs, identify which of these you envisage as becoming more important in the operation of your practice in the future.

Type of ICT	Will become un-important	Will become less important	Its importance will not change	Will become somewhat more important	Will become much more important
Telephone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fax	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet – email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet – information retrieval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet – billing HIC online	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E-commerce*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Video-conferencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*E-commerce consists primarily of the distribution, buying, selling, [marketing](#), and servicing of [products](#) or [services](#) over electronic systems such as the Internet and other [computer networks](#).

15. Do you believe that advances in adoption of ICT by GPs can facilitate improvements in health care provision?

☐ Yes

Please go to Q19

☐ No

Please go to Q20

16. In what ways can ICT adoption/usage facilitate better health care?

Reason	Not at all important	Un-important	Neither important nor un-important	Important	Very important
Improve access to patient records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improve networking in the care of patients (with specialists)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medication prescriptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. Please indicate your agreement or disagreement with the following statements about the use of ICT in your practice and in the provision of health care generally.

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
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ICT cannot replace face-to-face contact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICT is valuable in enhancing access to information I require in my practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICT is valuable in enhancing the ability to keep up with developments in health care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The technology is not sufficiently advanced to meet health care needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of ICT significantly eases the burden of repetitive administrative tasks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of ICT frees up the GP's time to concentrate on patient care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICT enables more efficient functioning of the practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICT undermines the quality of the doctor-patient relationship by depersonalizing the patient					
My practice is not making full use of the potential of ICT in enhancing patient care					
Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please add any comments in the box provided below relating to issues that you believe are important but that have not been included in this survey. Any additional comments that will facilitate further improvement in the survey are also welcome.

THANK YOU FOR COMPLETING THIS SURVEY. YOUR RESPONSES WILL BE TREATED IN THE STRICTEST CONFIDENCE.