

**Developing a 'Smart City':
Understanding Information Technology Capacity and
Establishing an Agenda for Change**

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Acronyms

EDEC	Economic Development and Employment Committee
IT	Information Technology is the broad subject concerned with all aspects of managing and processing information involving IT equipment.
IT equipment	IT equipment is defined for the purposes of this report as goods whose function is centrally a matter of programmable information, information processing and/or transferable information storage ability plus the associated devices that realise the functionality of such devices.
IT users	IT users are all employees who use IT to add value to the outputs of the organisation.
IT professionals	IT professionals are defined for the purposes of the LGA analysis as residents that are identified as such in the Australian Standard Classification of Occupations. For the purposes of firm analysis firms listed their IT professionals based on job functions.
IT&T	Information Technology and Telecommunications
LGA	Local Government Area – a geographic area that is identified by specific boundaries (electoral, physical etc.). The area that a local council has responsibility for and the third level of government in Australia.
TAFE	Technical and Further Education
UWS	University of Western Sydney
PCC	Penrith City Council
PCCI	Penrith Chamber of Commerce and Industry
GROW	Growing Regional Opportunities for Work
DEWRSB	Department of Employment, Workplace Relations and Small Business
OECD	Organisation for Economic and Cooperation and Development
LED	Local economic development: a location specific process of economic growth.
R&D	Research and development
LAN	Local Area Network: interconnection of computers and/or communication devices covering a small geographic area.
WAN	Wide Area Network: interconnection of computers and/or communications devices covering a large geographic area.
Intranet	Web/internet for internal use with limited external access.
EDI	Electronic Data Interchange: Electronic Data Interchange is the transfer of data between different companies using networks, such as the Internet. As more and more companies get connected to the Internet, EDI is becoming increasingly important as a mechanism for companies to buy, sell, and trade information (Lycos Tech Glossary)
ERP	Enterprise Resource Planning: enterprise resource planning is a business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing. As the ERP methodology has become more popular, software applications have emerged to help business managers implement ERP (Lycos, Tech Glossary)
SME	Small Medium Enterprise

IP	Intellectual Property
DISR	Department of Industry, Science and Resources
PSS	Postemptive Strike Strategy
CSIRO	Commonwealth, Scientific and Industrial Research Organisation
SMA	Sydney Metropolitan Area
ABS	Australian Bureau of Statistics
ASCO	Australian Standard Classification of Occupations
JTW	Journey to Work
DIMPS	Development and Information Management Planning Services, UWS.
DETYA	Department of Education, Training and Youth Affairs
DCITA	Department of Communications, Information Technology and Arts
OIT	Office of Information Technology
DITM	Department of Information Technology and Management
SPSS	Statistical Package for the Social Sciences
NOIE	National Office for the Information Economy
OGO	Office for Government Online
DPWS	Department of Public Works and Services
DSRD	Department of State and Regional Development
GWS	Greater Western Sydney
GDS	Graduate Destination Survey
GWSEDB	Greater Western Sydney Economic Development Board
CRRI	Centre for Regional Research and Innovation
ACCI	Australian Chamber of Commerce and Industry

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Executive Summary

Project Background

This project was an outcome of the strategic planning processes of the Penrith Economic Development Committee. This group recognised that if Penrith was to achieve its goal of becoming a 'smart city' that it would need to understand more fully its IT capacity. Funding was sought by the Council and the University of Western Sydney through the Growing Regional Opportunities for Work committee (GROW) to undertake such an audit. Funding was provided by the Department of Workplace Relations and Small Business (DEWRSB) in 1999 to the Centre for Regional Research and Innovation to complete the study.

Aims and Objectives of the Project

Particular emphasis in the project has been placed on understanding the Information Technology (IT) capacity of businesses in Penrith local government area (LGA).¹ A conceptual framework was developed that established a number of project objectives and outcomes. This framework is set out below.

- i. Provide a definition of Information Technology, and its components including:
IT occupations; Hardware/Software and IT training.
- ii. Develop descriptions of, and spatial displays in a series of sub-categories: Business with IT capacity; employment and IT investment.
- iii. Determine the IT skills base of staff Review qualifications of staff; and Review IT training conducted as part of employment.
- iv. Assess industry access to employees with skills Analysis of participation of Penrith residents in IT intensive industry; and Analysis of Penrith residents in IT jobs within Penrith
- v. Investigate the production of a skills base in the region and utilisation of available skills:
 - Analysis of training provisions including TAFE, University of Western Sydney, private providers, schools; and.
 - Analysis of where students receiving IT training in Penrith are being employed.
- vi. Examine linkages and sourcing patterns of industry Analysis of where local industry is sourcing its IT requirements
- vii. Examine reasons for location in Penrith: Clusters, Amenities, Infrastructure

The project sought to:

- provide information on Information Technology (IT) capacity within Penrith businesses, IT employment and IT investment;
- identify the IT skills base of staff;
- assess industry access to employees with IT skills;
- investigate the production of an IT skills base in the region and utilisation of available skills;
- examine linkages and IT sourcing patterns of industry;
- develop a strategy to identify and develop IT opportunities and IT action plans within the local government area (LGA) and;
- assess the importance of IT in the context of employment and economic growth.

¹ Penrith LGA: includes suburbs with the postcodes 2745, 2747, 2750, 2748, 2749, 2759, 2757, 2760 and 2765.

The authors believe that if Penrith is to become a centre of excellence in IT its stakeholders must commit to the programs and actions outlined in this report, by developing existing capacity, attracting new business and upgrading regional IT skills and infrastructure.

This is a 'short' version of a much larger report that is available from the authors on request. The report that follows provides a brief review of literature, an analysis of government policies, a description of best practice in Australia and overseas. It also details the procedures used to explore our project question before outlining a summary of the results, conclusions and recommendations.

Research methods

The project was completed in three stages. The first stage included the compilation and analysis of information relating to IT, business competitiveness and local economic development. The second stage of the project involved the collection and analysis of a wide range of new information from industry. These new data provide vital insights on IT capacity of Penrith businesses. The third stage of the project examined the IT skills base being produced in Penrith and served to build on the findings of Stage one and two in developing a framework for evaluating and enhancing Penrith's IT capacity.

Major findings

Our review of the literature, best practice and government policy identified 7 key issues that should concern cities such as Penrith seeking to become IT intensive:

- Information Technology is, primarily, a knowledge intensive industry. Industries in the IT sector create business value through knowledge generation and application (i.e. innovation). Local areas must recognise that developing these factors is in fact one of the principal sources of economic growth.
- Employers across a wide range of industries are demanding IT capable workers to implement the IT they need to be competitive. Skilled people are the most important asset in the development and application of IT. Local areas must develop strategies to develop IT skills in their populations.
- A local area that is able to develop linkages, clusters and interaction within and between firms is well positioned to attract new IT firms and increase the adoption of IT in existing firms.
- Information infrastructure and technological infrastructure are resources that must be developed with a view to enhanced economic well-being and quality of life. Information infrastructure includes cabling that has high speed and capacity, and has a wide distribution; telecommunications; and public access computers/internet and training. Technological infrastructure may include export, training and marketing boards, provided collectively by firms to meet their own needs.
- IT workers are attracted and remain in an area based on competitive remuneration and quality of life considerations. Generating a sense of excitement can attract knowledge workers, as can a shared vision and image of advanced IT within an area.
- Governments have an important part to play in stimulating IT uptake particularly in small and medium enterprises.
- Community based IT projects should focus strongly on community development and avoid becoming too technology centered.

Our research expanded the project aims by collecting a range of new data. This included information on the past and future growth performance of Penrith firms, an analysis of IT management practices, and the provision of specific information on how IT is being used. The report also identified important information on IT skill shortages in Penrith industry and the application areas in which these shortages occur. Additionally, the project presents a detailed discussion on the processes of economic growth and business competitiveness and examined best practice programs for government and local stakeholders to build Penrith's IT capacity.

The report outlines a number of key findings:

- The review of literature identifies new approaches for achieving local economic development. The review highlights the importance of technological change; linkages and networking; innovation and human capital as key factors that have created and sustained economic growth.
- Further, the review of empirical studies demonstrates that IT has allowed business to achieve a number of quantifiable benefits related to economic growth including improved productivity; increased product quality and labour quality. It also shows that IT can also be actively used as an instrument of urban and regional policy.
- Clusters (geographic or virtual concentrations of industry) and networking (interaction and communication within and between firms) are identified as processes that can assist Penrith in promoting innovation; technology take-up and in enhancing the collective capacity of firms.
- Innovation programs, within Penrith, are necessary to accommodate technology intensive firms. This can involve the establishment of an IT network and IT clusters; promotion of IT training and development of information infrastructure.
- Government continues to have a key role in developing IT programs and strategies. This role involves applying IT internally and adopting projects/programs that will promote the take-up and development of IT in the LGA. Penrith Council is involved with a number of initiatives that are consistent with an objective to become a recognised centre of excellence in IT.
- A skilled workforce is vital to the competitiveness of industry. IT skills are requisite within Penrith both for firms to add value through IT and for the growth of the IT industry (section four).
- IT skills are widely diffused throughout Australian industries. Recent studies indicate that there is an increasing demand for IT skills. Promoting awareness and use of existing training opportunities provides an opportunity for enhanced competitiveness in Penrith.
- The types of IT qualifications that are being offered in Penrith are appropriate to most IT positions. Nevertheless, training providers (including Penrith firms) must find methods to respond to quick changes in IT skills.
- Enrolments in a number of IT training areas, in Penrith LGA, are comparatively low. Further, the proportion of Penrith's workforce in IT occupations is also relatively low. This highlights the importance of implementing IT training initiatives and IT action plans (see section six). This may also reflect a situation of Penrith being a relatively late starter in its adoption of IT.
- Penrith's IT capacity can be determined with reference to:
 - IT capital
 - IT applications
 - IT skills and qualifications

The categories above are examined (see section five) together with expenditure and reasons for not using IT to determine and develop the LGA's IT capacity. The points below highlight a number of more specific findings in relation to Penrith from the industry survey of IT capacity.

- There is a high level of adoption of IT equipment and infrastructure (IT capital). Nearly 9 out of 10 Penrith firms have at least one piece of IT equipment. Further, a majority of Penrith firms have high levels of use of IT infrastructure, including Internet connection and use of a Local Area Network, with 70% and 54% respectively.
- Accounting, word processing, spreadsheets and databases are the IT applications with the greatest importance for the majority of Penrith firms.
- Amongst Penrith firms the most frequent uses of the Internet is for communication, advertising and/or obtaining reference information and research data.
- Between one-third and one half of Penrith firms are currently using e-commerce. However, less than one-fifth of businesses are regular users of e-commerce and Penrith firms are found to be less frequent regular users of the Internet for all business applications than national firms. This may reflect a late start-up in IT adoption in Penrith.
- The results of the business survey indicate that new opportunities are available to make greater use of the Internet to network, advertise, conduct training, monitor markets and competition, and participate in e-commerce.
- Penrith firms collectively have a significant number of employees who possess IT skills and qualifications. Overall, 50% of Penrith firms have employees with IT skills obtained through one of ten areas. The main methods of obtaining these skills are through company provided training or learning completely on the job.
- The majority of firms in Penrith have sufficient workers to optimise their IT capacity. However, some 44% of firms currently have a shortage of IT skills. These firms indicate that this is equivalent to over 3,000 positions in nine IT areas.

IT Action Plans and IT Opportunities

The project team believes that Penrith's IT capacity can be enhanced through a number of IT Actions and IT opportunities. These initiatives are drawn from an evaluation of the industry surveys and international best practice projects to further enhance the position of the LGA to become a recognised centre of excellence in Information Technology. There are a number of IT opportunities and strategies that will stimulate IT in Penrith:

- The planned establishment of a High Performance Computing Centre.
- The development of an innovation and incubator precinct in association with the University of Western Sydney.
- The need to develop industry clusters.
- The importance of fast take-up of E-commerce.
- Increased opportunities for involvement in major IT&T events in association with other partners, including the Office of Western Sydney, the Australian Computer Society and the Australian Information Industry Association.
- The development of a skilled IT workforce.
- Opportunities to embrace and support telecommuting and new forms of work organisation supported by IT.
- Adoption of strategies to increase IT spending in the LGA

An IT action plan is proposed that would incorporate the following strategies:

- The development of an IT&T business register, developed and maintained by Penrith Council in association with Penrith City Chamber of Commerce and Industry
- Promotion and development of IT contact networks including:

University–Industry Network for promoting stronger links with research and development organisations.

Business Facility Network to drive and act as a facilitator in the development of joint facilities and promotion of collaborative projects.

Community Networks to promote and support the democratic, social and economic dimensions of IT development.

Business–Business Networks to be further developed for both the IT&T industry and for the promotion of IT in industry and to investigate the opportunities for resource sharing.

Business-Government Networks to promote collaboration and identify new needs in the city and drive IT projects.

- Continued development and promotion of online services such as the Smart City site and further involvement and support for business in the development of on-line products and services.
- The need to develop IT&T promotional material, primarily involving Penrith Council with involvement and support of industry and other key stakeholders.
- Developing a skilled workforce and a learning region, involving UWS and TAFE in partnership with regional companies.
- The continued development of information infrastructure such as high speed low cost cabling, ‘technology smart’ building design and public access to computers, internet and IT training. An Action Plan should also investigate the opportunities to provide technological infrastructure, which are collective resources provided by firms to meet their own needs.
- Continued promotion and support for the adoption and application of IT in firms. This includes making greater use of the Internet to:

Network with other business

Advertise products and services

Conduct training

Monitor markets and competition and

Participate in e-commerce

- Further, an action plan will also need to address a number of other issues including:

Increasing the use of specific software applications including Point of Sale, IT administration and Billing/Quoting software.

Promoting more mature IT management practices in firms, particularly the numbers of firms practicing disaster recovery procedures and conducting assessments of IT use by competitors

Developing programs to overcome barriers to IT, particularly by addressing that IT is not suited to a business or that it is not needed, that it is too costly or that businesses lack knowledge of IT and Targeting or tailoring promotion, awareness and support to industry groups or sectors.

The report also presents four specific action agendas that Penrith’s key stakeholders can become involved in to enhance the existing IT capacity (see Figure 1). This also presents a number of initiatives that can be developed and applied within these to promote the city as a centre of excellence in IT.

Figure 1: Four Action Agenda for Change

<p>Industry Actions</p> <ul style="list-style-type: none"> • Promote the importance of IT. • Increase the regular use of e-commerce and Internet for value adding. • Develop technological infrastructure. • Involvement with initiatives to overcome barriers to IT. • Develop active training programs to overcome IT skill shortages. • Attract new IT professionals. • Develop flexible working practices. • Involvement in industry networks collaboration and other initiatives to support innovation. • Use new IT applications and develop increasingly mature IT practices. 	<p>Government Actions</p> <p>a) Business Development</p> <ul style="list-style-type: none"> • Develop, promote and expand the SmartCity website. • Develop initiatives for industry development strategy – involving increasing the IT capacity of existing firms, promoting new start-ups and attracting new IT companies. • Develop a business register for technology companies • Produce and release IT marketing material • Develop IT infrastructure – particularly through provision of services, zonings and smart building codes <p>b) Community Development</p> <ul style="list-style-type: none"> • Increase numbers of public access computers and Internet connections • Develop public domain for increased community input and increase linkages for dissemination of information • Continue to develop internal IT systems and get appropriate services on-line • Provide funds to support community IT projects
<p>Infrastructure Actions</p> <ul style="list-style-type: none"> • Develop Technological Infrastructure • Development of Information Infrastructure <ul style="list-style-type: none"> i. Telematics ii. Generic Services iii. Networks 	<p>Education and Training Actions</p> <ul style="list-style-type: none"> • Develop IT skills • Produce knowledge workers • Facilitate the development of a learning region • Increase enrolment and improve IT courses in schools • Develop new IT courses or contents within registered training organisations (R.T.O's). • Improve linkages between R.T.Os and industry • Increase training within industry

Community Development

Importantly for Penrith, its stakeholders must ensure that the IT strategy is developed as a community development project not only as a technology project. As Caves and Walshok (1997:30) suggest:

“The technology is certainly a critical element, but finding the most effective applications of that technology to enhance a community’s economic and social circumstances is the key”.

Paul Romer (1999) also argues that to succeed in broader human terms leaders must give people the confidence to compete. They must encourage people to believe that economic change brings real opportunity together with risks that are real, but manageable.

The *Audit of IT capacity in industry: Penrith LGA* shows that Penrith has the resources and the strengths to create local economic development and business growth through IT. Key stakeholders need to continue

to make decisions, commit resources and time to overcome gaps in infrastructure and skills, and implement the strategies that will maximise the local benefits from identified IT opportunities.

Section 1: Review of Literature

This section provides an overview of key literature and details of 'best practice' in IT development that has informed our work.

Local Economic Development and Competitiveness.

As economies become more advanced and increasingly sophisticated new approaches have developed to describe the foundations of economic growth. The economic development literature demonstrates that there is no one model of the internationally competitive firm. Firms of different sizes, structures and corporate strategies have been able to achieve international success in different product markets (Hodgkinson, Iredale, Speak and Vipraio, 1999). Consequently, current development models have progressed to become flexible strategies that focus on the features and characteristics of competitiveness. This review examines the common themes in the economic development approaches and applies these to placing the Information Technology (IT) audit into a wider context of competitiveness and economic change. This review takes a project objective 'to promote the creation of a climate for industry development and success', and examines both a general framework and specific strategies that can be used in Penrith for maximising economic and employment growth.

Approaches to Economic Development

Traditional economic growth theories have placed particular emphasis on the role of increasing inputs of labour and capital in generating economic growth. As the quantity of inputs increased, the contribution to output of additional units of capital and labour was expected to slow. Based on empirical evidence it is now believed that this is only a partial explanation of the economic growth process (OECD, 1998, ACCI, 1999).

The work of new growth theorists has been influential in causing a re-examination of the factors that create and sustain economic growth. This work specifically focusses on four related factors – knowledge, innovation, the application of innovation as new technology and improvements in human capital.

The work of Romer (1990, 1992, 1994) and Grossman and Helpman (1991) highlighted the central importance of technological change, knowledge and innovation in the process of economic growth. Although, this work focussed particularly on modelling the increasing returns to the factors of production; i.e. labour, land, capital and enterprise.

An alternative approach to innovation, discussed by Dodgson and Rothwell (1994), places increased emphasis on both the market and profit-seeking businesses in the innovation process. This leads to a new set of market pull models of innovation, recognising the role played by the market as a source of stimulus for R&D, and subsequently more sophisticated interpretations of the innovative process (Dodgson, 1999).

Based on this evolutionary approach, the most recent models of innovation have placed increased emphasis on linkages within and between firms and other institutions, and the importance of these linkages for innovation. According to Dodgson and Rothwell (1994) and Rothwell (1999) the innovative business is operating in a network of cooperating and competing firms and other institutions, usually including joint ventures and close contacts with customers and suppliers. The firms use the integrated system to draw together information from alliances and its own resources to be continually innovative (Dodgson and Rothwell, 1994). This model also places new attention on the feedback processes operating

between and within firms especially the high level of integration between various elements of the firm in innovation. The characteristics of innovative firms identified by Dodgson (1999) are listed below:

- Process based organization structure
- Creative learning organisation
- Strategic research and development (R&D) units/programs
- Time based strategies (including corporate flexibility and speed of development).
- Knowledge-based competition
- Strategic integration [consisting of links into global markets and partners, strong links with primary suppliers and leading edge customers, R&D collaboration and collaborative grouping (internal and external), and networks]
- Technological integration (comprising of linked systems, Internet, Local Area Networks (LANs), Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP).
- Use of expert systems and simulation modeling in R&D.
- Focus on quality and non-price factors

The discussion on the key determinants of economic growth has progressed to the point where terms including the knowledge-based economy and the information economy have become common in the literature. Part of the premise underlying these terms is the belief that

“the balance between knowledge and resources has shifted so far towards the former that knowledge has become perhaps the most important factor determining the standard of living.”
(OECD, 1997).

OECD evidence indicates that higher knowledge intensive goods and services (such as IT) are the fastest growing in terms of output, employment and wages. This has strong implications for cities like Penrith. Firstly, for Penrith, this means that new technology is and will continue to change the way business is conducted. Secondly, technological change is providing new sources of business growth. Thirdly, part of this technological change is a need, for Penrith, to promote and create knowledge intensive goods and services and to make these types of firms a key target in future industry development strategies.

Penrith firms must embrace innovation including the creation or application of new ideas or processes that add potential value to an organisation. In this context IT is a means that Penrith firms can use for adding value to products and services through knowledge.

In fact Fearey (1997) suggests that IT is a central factor that is changing the rules of wealth creation. IT is a means of adding value to products and services through knowledge. IT has gained this level of importance because it assists in the translation of ideas into innovative new products and processes, which is the key to productivity gains.

Penrith's key stakeholders must examine initiatives to promote and develop innovation in the LGA. In the context of IT this can involve developing IT skills, developing a presence of leading edge IT users, forming collaborations with research institutions, developing advanced IT infrastructure, creating a mechanism to access available venture capital and developing IT clusters and business networks.

A vital generator of knowledge for Penrith is the local labour force. Both Romer (1991, 1994) and Lucas (1988, 1990) emphasise that the characteristics of the labour force (human capital) drive productivity and development. Labour force characteristics identified by Lucas include the level of education and the extent

that the labour force engages in participation or involvement based learning. This emphasis on human capital promotes the view that the technology skills of staff in Penrith can generate a competitive advantage. Consequently, Penrith firms must ensure that staff have a high level of technology skills. Furthermore, local stakeholders such as education and training providers, industry and the Penrith Council must work cooperatively to develop and assist in the implementation of an IT Training Strategy. This may also require the involvement of industry associations such as the Penrith Chamber of Commerce and Industry (PCCI) to promote this strategy and create local ownership.

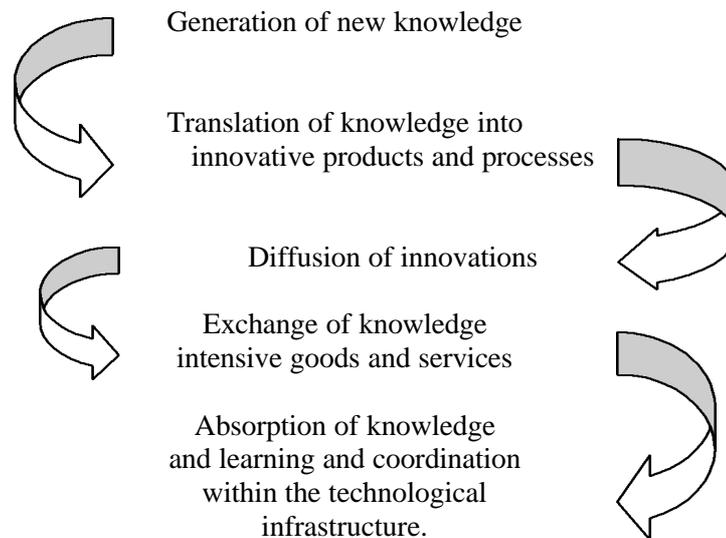
This strategy is important for Penrith because studies show that the skills of the labour force assist regions in promoting 'high value-added' industries that are generally viewed as leading industries (DIST, 1996)

Entrepreneurship and managerial talent are another key characteristic that must be present in the local labour force. In Penrith initiatives including training, mentoring, networking and access to capital can facilitate these talents. Penrith currently has a number of highly successful entrepreneurial firms that highlight the opportunities in the LGA. As such, presenting profiles and/or case studies of successful companies can also be recommended. Additional importance is assigned to these talents with studies showing the importance of entrepreneurs for linking technological opportunity to innovative performance (Temple, 1998). Karpin (1995:32) asserts

“the adaptive capacity of our economy therefore depends on the flexibility of our managers and on adequate investment in management development, which is critical in shaping Australian managers' responsiveness to change.”

A New Focus on Innovation, Applications of Innovation and Human Capital

As discussed above the new growth theories have sought to incorporate innovation and technological change into models of economic growth. In this section further emphasis is placed on understanding the process of innovation and technological change, the development of human capital and the application of innovation as new technology. Temple (1998) highlighted the importance of the interaction between these processes, identifying five sequential factors that must be present in an economy to translate the competitive potential of businesses to actual competitive performance. These factors are shown in the diagram on the next page:



Human Capital and Learning Regions

As the above indicates skilled and knowledgeable workers are vital to innovation. The production of workers for knowledge intensive industries (such as IT) is critical to Penrith's future.

In the late 20th century new forms of knowledge are now becoming necessary and specialised knowledge workers are growing in number. These workers are unlike previous generations of workers, not only in their high levels of education, but because for the first time they own the organisation's means of production – knowledge. For Penrith the question has become: how can these knowledge workers be produced? A strategy that UWS supports involves developing Greater Western Sydney (GWS) as a learning region.

The concept of the learning region has emerged to describe those places that offer an institutional environment that encourages both private and social learning at four different scales: the individual workers, the individual firm, groups or clusters of related firms and government bodies. Consequently, learning regions are less dependent on the individual excellence of their educational institutions as they are on the extent to which their key institutions, organisations and industry are able to trade, support and jointly create knowledge and knowledge networks. The success of key regions around the world has been due in no small measure to social or collective learning processes, in which the role of the region is to animate the formation of 'interaction relationships' between individual firms and between firms and other regional institutions.

Marceau et al (1997) argued that a learning economy is both knowledge and innovation intensive and is usually technology driven. Regions that will make economic progress are those that have rates of innovation and learning greater than those of their competitors do. Temple (1998) identifies the skills and educational attainments of the workforce and the sophistication of the technological infrastructure as the 'knowledge resources' of a society and the competitive assets for an economy.

Penrith currently has a number of high quality education and training providers and importantly a majority of these organisations also provide IT based courses. Through cooperation and collaboration these organisations can facilitate the development of Penrith as part of a learning region.

Application of innovation as new technology

The economic development literature strongly supports the idea that innovation is critical to technology advancement and economic growth.

As the literature highlights it is the application of the innovation and the success of the technology that becomes a major driver for the growth process. The value of technology is as much what it can be connected to as what it can do on its own (Arthur, 1989, 1994, 1996). This highlights the importance for the key stakeholders in Penrith to grasp how technology is used and the context in which it is used. This project provides an opportunity to achieve this for IT.

Important sources of growth have also been linked to the application of information. As Choo (1998) states

“the pursuit of competitiveness has become the pursuit of information- the winning company is the one that is able to obtain the best information in a timely manner and apply it in the creation of its products and services.”

An OECD report (1996:6) on international development found that:

“ the economic performance of most manufacturing and service industries depends on putting technology to work by adopting and using products and ideas developed elsewhere”.

Previously the significance of having knowledge intensive firms in Penrith was highlighted. The next form of firm promotion should be directed to those that are not intensively involved in the creation of knowledge and highlights the importance of both: the internal development of goods and services and of finding creative applications for externally developed technology. For Penrith initiatives such as facilitating technology networks² could assist in the application of IT to more business functions.

Clusters and Linkages

Based on the evidence above it is clear that key stakeholders in Penrith must promote innovation and the application of IT in business. Examining centres of IT excellence around the world (for example Silicon Valley) highlights the importance of industry concentration. For Penrith this calls for increased attention to the development of industry clusters and networks to support high technology growth. Localised strategies are required that bring together networks of like companies allow knowledge structures to develop, exchange of technology to take place, and enhanced collective capacity to be developed by SMEs working in related and at times unrelated industries. Groups of this type in Penrith would also provide a means to develop, track and test innovations and to provide a critical mass of knowledge workers and structures.

Industry clusters are reported to promote economic development in a number of ways. Firstly, firms can act as suppliers and clients for each other. A second, more elaborate, version of the firm concentration model is the industrial district approach. In these regions clusters of firms have developed a symbiotic growth relationship involving utilising the products, production processes and expertise of neighbouring

² Current initiatives include the Technology Awareness Program co-ordinated by Linkwest at UWS, other opportunities include providing on-going IT training and promoting technology awareness

firms rather than their own internal capacities.³ Lorenz (1992) identifies cooperation and competition amongst firms as key features of an industrial district. Cooperation involves the provision of collective goods, for example education and training and research and development.

The resulting innovation in a regional system generates growth based on interactions or networks between local firms. However, rather than these being solely the result of market transactions, it also arises from firms acting as models of development for others in the local area and from sharing of knowledge regarding appropriate ways to improve market share and organisational structures. The 'milieu'⁴ on which firms' growth is based includes the labour skills and training; technical, market and organisational knowledge; public assistance programs; infrastructure and communication networks developed in the region. Based on these factors the entrepreneur can draw additional knowledge inputs that feed into their business processes (Marceau, et.al, 1998).

For Penrith businesses developing clusters would potentially assist each firm in achieving competitiveness as a cluster provides access to additional factors that ensure commercial success. These include high level management skills, well developed marketing and distribution channels, manufacturing facilities and customer support capabilities. These factors determine whether the original innovator or imitators win from innovation.

Lawson (1997) and Swain (1998) have found that clustering is particularly strong in the case of high-tech information intensive sectors, sectors that one might anticipate, given the development and proliferation of new information technologies, to be the least sensitive to the need for geographic proximity. Furthermore, the process of developing linkages, both within and between firms, is supported as a mechanism to facilitate and significantly influence both the willingness and ability of firms to undertake and successfully exploit innovative activity (Marceau et.al, 1997).

Information Infrastructure

The discussion above of shared facilities between firms (raised in DCITA, 1999) essentially involves promoting and building on the information and technological infrastructure of Penrith.

Technological infrastructure has a crucial role in promoting an economy's knowledge distribution capacity (Teubal et.al, 1996). Technological infrastructure encompasses a broad range of infrastructure categories, including

“the set of specific industry-relevant capabilities which have been supplied collectively and which are intended for several applications in two or more firms or user organisations” (Teubal et.al., 1996: 10).

Examples may include industry training and marketing boards. A primary characteristic of technological infrastructure is that it is provided collectively, as the industry gets what it needs and collectively has some responsibility for its design and implementation. Technological infrastructure is important to economic development for two main reasons. Firstly, as it absorbs and diffuses externally developed knowledge, services and innovations. Secondly, it involves the:

³ (For examples see Pyke and Sengenberger, 1992; Piore and Sabel, 1984; Lawson, 1997; Scott, 1993 and Storper, 1993).

⁴ Lawson, 1997; Marceau, 1998; Storper, 1993; Swain et.al 1998).

“development of generic cutting-edge technologies through the cooperate efforts of business firms, often in collaboration with public sector institutions.” (Teubal et.al., 1996, xi).

For Penrith the development of technological infrastructure will require the coordination of the individual efforts of firms. Although this may be undertaken by groups of firms in the private sector, government action and public sector support often initiates this collaboration.

Penrith currently has a number of important components of a quality information infrastructure. Outlined below is a list of a number of key examples.

- high quality and high speed connections (including local ISP provider and fibre optic cabling in some businesses),
- responsive governments (for example Penrith Council's "Smart Cities" project) that can save business money through areas such as by having services on-line which potentially reduces transaction and search costs, allowing improved efficiency in approval processes, providing business information, providing updated zoning and planning information. Relevant Penrith City sites are located at the following addresses <http://www.penrithcity.nsw.gov.au>, <http://www.smart-city.com.au> and <http://www.penrithcity.com.au>, <http://www.penrithvalley.com.au>.
- access to technical education programs and advanced school and higher education programs preparing students for the new economy (TAFE and UWS programs)
- quality of life - ability to work from home, convenient access to public services and community organisations, high level of livability and attractive environmental assets. For example Penrith Council has initiated programs to brand itself by emphasising the quality of its environment with the 'Rivers, Mountains, Lakes' program.
- telecommunications infrastructure - dual provider telecommunications cable rollout, access to metropolitan phone charges in a number of suburbs.
- leadership - in the high number of successful businesses, active involvement of fast-growing University, active and well patronised Chamber of Commerce, and pro-active Council.

Current Approaches to Competitiveness and the Importance of Information Technology: The Local Area Level

Information technology is now recognised as a fundamental source of growth, productivity, employment and competitiveness (Williams, 1988 and DCITA, 1999). Successful economic development experience shows IT can be actively used as an instrument of urban and regional policy (Stough, 1996 and Amirahmadi and Wallace, 1995). IT can play a catalytic role in economic development and can function as a major stimulus for creating better cities (Caves and Walshok, 1997). Information Technology's role in creating and advancing competitive advantage creates an imperative for the development, utilisation and application of IT products and processes in local firms.

This means that Penrith's key stakeholders need to develop innovation programs specifically to accommodate technology intensive firms and design policies that achieve a match with the industrial objective of competitive advantage. This will involve the establishment of an intelligent IT network and IT clusters, high-quality labour training in IT and, the promotion of the desirable physical environment and the support of productivity strategies. This will also involve supporting and/or attracting high tech and

information technology intensive firms. Firms that are based on the exploitation of new scientific knowledge. As such, a high-tech development strategy requires a pre-existing knowledge base consisting of public and private research institutions (e.g. UWS and CSIRO) from which intellectual property is generated, technically proficient sub-contractors and entrepreneurs willing to engage these new market opportunities. This type of information could be provided through an IT industry directory and parts of this information are already hosted on Penrith's Smart City site.⁵

Competitiveness and Information Technology: A firm level perspective

IT has a critical role in business. The competitive role for IT turns on its contribution to the overall success of the business through factors including an effective integration of business strategies, IT capacity and human resources.

The role of information technology in business innovation can be viewed in two ways: information technology provides new products, new services, and innovative ways of doing business; and information technology supports and speeds up the innovation of other new products and services (Yuan, 1993).

Penrith businesses must continue to plan their use of IT. This will mean becoming more involved in putting IT to work as a tool to be applied in a wider human and organisational context. Barnatt (1996) argues that IT only comes to play a useful role when applied by individuals and/or within organisations to enable the realisation and completion of business processes that will further the goals of the organisation. For this reason Penrith businesses (and registered training organisations: RTOs) must be encouraged to undertake staff training and prepare IT plans that includes a policy to align human resources, IT plans and business plans. Through these programs that can be implemented in Penrith firms it must be impressed that strategically using and applying IT within a firm is associated with a number of quantifiable benefits. These benefits have been studied and proven using case studies and large-scale surveys at the firm level (Mahmood and Mann, 1993, for a review of studies see Brynjolfsson and Yang, 1996, DCITA (1999)). Benefits include, the ability to:

connect distant places	speed up the production process
engage in reverse engineering	assist to diffuse new ideas or innovations
facilitate new organizational and spatial production arrangements	produce linkages in the production process
drive faster decision making	create improvements in quality
stimulate the maximisation of agglomeration economies	drive improved customer service
enable increased variety	improve timeliness
allow for customisation	increased capacity utilisation
improved inventory tracking and a reduced need for inventories	new product introduction (time to market)

(adapted from Brynjolfsson and Yang, 1996 and Berndt and Morrison, 1995).

A review of empirical research, conducted by Brynjolfsson and Yang (1996) found that IT is associated not only with improvement in productivity, but also intermediate measures, consumer surplus and

⁵ www.penrithvalley.com.au

economic growth. Siegel (1994) found IT investment is positively correlated with both product quality and labour quality, a result that is consistent with other studies (for example Brynjolfsson, 1996).

The section above highlights the positive impacts of IT. Nevertheless, Penrith's key stakeholders must recognise that for a certain number of people (business) change, partly driven by IT is uncertain and uncomfortable. In fact two central features of IT products and processes are change and transformation, with Boar (1998) describing the 'information age' as characterised by continual upheaval. There are two important points that arise here. Both of these are important for Penrith. The first relates to taking new opportunities. Alston (1998) suggests

“that those businesses which capitalise on new opportunities are more likely to be internationally competitive in the 21st century, while those who ‘wait and see what happens’ are likely to take a back seat in the information economy and may not even survive”

The second important factor is the need for education training and support. Alston argues that education and training needs to be available and programs need to be developed that will make the changes manageable and overwhelmingly beneficial.

The above discussion indicates that if Penrith stakeholders decide to pursue a vision to become a centre of excellence in IT they must also commit to the programs and actions that will achieve this outcome, by developing existing capacity and attracting new business. This will require co-ordinated and concerted action by all major regional stakeholders.

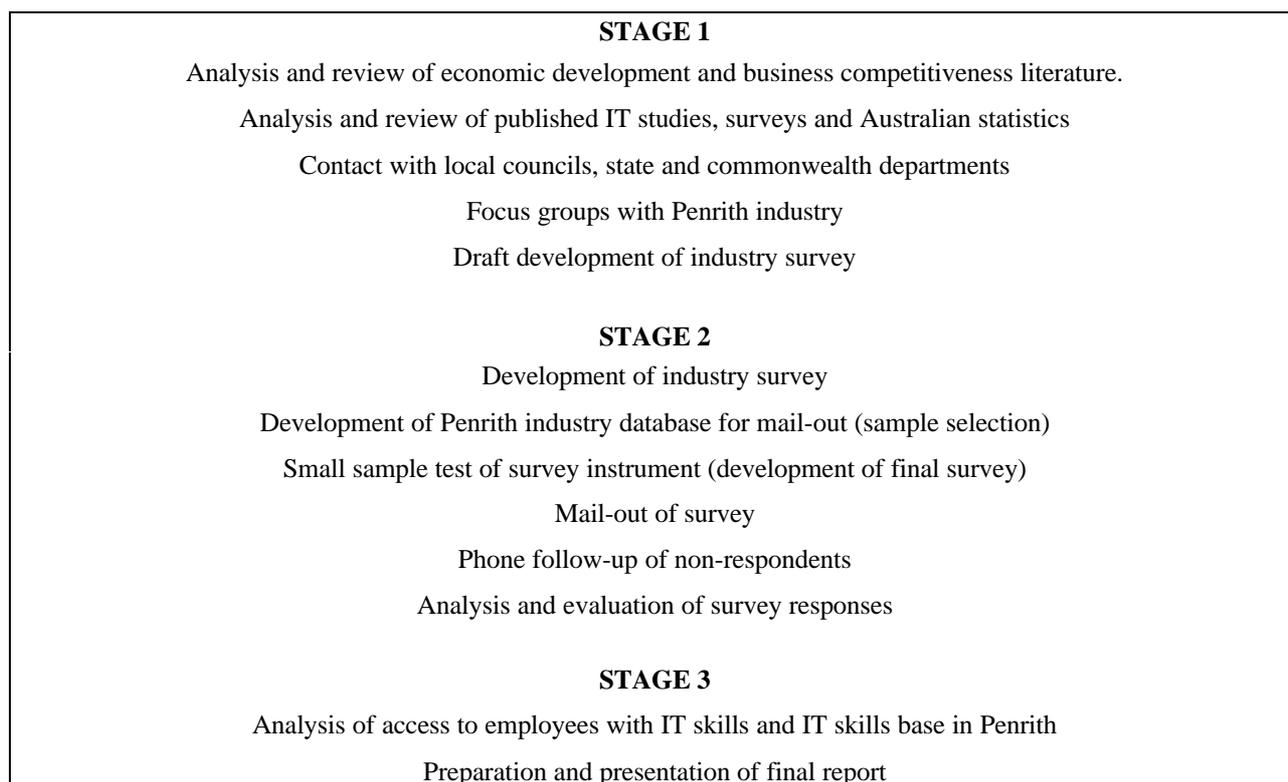
Section 2: Methodology

This study employed survey and focus group methods to obtain inputs into the IT capacity of Penrith firms. The study also collected and analysed existing, published and unpublished, data relevant to assessing the IT capability of the population.

The project was completed in three main stages. The flow diagram below sets out the procedures employed for the project.

The first stage included compiling and analysing: published literature and surveys relating to IT, business competitiveness and local economic development. The second stage of the project primarily involved the collection of a wide range of new information from industry in the LGA. This stage involved developing and conducting a large mail-out of a questionnaire on IT capacity, and the follow-up of these questionnaires. In the third stage of the project the research team used the material collected from stages one and two to formulate the project outcomes and develop an action plan for Penrith.

Figure 2.1 Cycle of Analysis



Stage 1

Stage one had two complementary purposes. To review literature and examine applications to development in IT and business competitiveness and to review and develop a survey of industry IT capacity.

- Stage one involved a review of current approaches in local economic development and research on the application of IT in business. This was intended to position the IT audit within a broader framework of industry and economic competitiveness. The review assisted in outlining how Penrith can create a climate for industry development and success, particularly through IT. The focus on IT also examined how these products and processes can be used to achieve competitive advantage in business.
- As part of the research for the *Audit* the CRRI contacted 20 local councils around Australia to locate/obtain relevant industry capacity studies. A phone follow up of these letters was conducted.
- The project team contacted a number of Commonwealth and State Government agencies to provide additional information regarding the current definitions of IT, surveys of IT utilisation and recently published IT reports and papers. These reports and papers provided information about trends, current research, policy directions and initiatives that may shape or direct decisions in Penrith.
- A review of IT surveys was also conducted. This involved the collection and review of IT surveys and questionnaires that have recently been conducted both domestically and internationally. Information from a number published surveys are used throughout the report as benchmarks to gauge Penrith's current IT position.
- The CRRI organised three focus group meetings with Penrith business people to discuss IT in Penrith and particularly the development of the questionnaire. A focus in these meetings was determining the current applications of IT and to discuss IT in Penrith businesses.

Stage 2

Stage two involved the conduct and analysis of the survey on IT capacity of industry. This stage was focused on the administration of the survey to over 5,000 businesses and the analysis of data.

- The first task in stage two involved the CRRI collating and reviewing the information from stage one and applying it to the development of an industry survey. The development of the survey involved input from a number of business people from Penrith, industry organisations and individuals in the IT industry.
- The CRRI tested the draft survey with 25 businesses. Based on these activities the CRRI developed the final industry survey.
- In conjunction with Linkwest, UWS Nepean CRRI developed a database of businesses in Penrith LGA. This process combined the databases of a number of organisations to develop one of the most comprehensive databases for businesses in Penrith. The database is based on Yellow Pages (Marketing Pro), Kompass and those developed by Penrith Chamber of Commerce and Industry (PCCI) databases and Penrith City Council.
- The CRRI organised and administered a comprehensive survey that was mailed out to 5,518 businesses Penrith LGA. To maximise the survey response rate the CRRI used existing industry groups and business associations to promote awareness and encourage participation. For example, members of the project team attended and presented short speeches at Penrith Chamber meetings.

Further, the CRRI placed reminder articles and project updates in the PCCI newsletter and a newsletter *Penrith in Focus* sent out by Penrith City Council. This survey mail-out resulted in 712 returned surveys.

- The CRRI administered and supervised a phone-follow up of Penrith businesses in selected suburbs from the initial database list. This was conducted by the Results Group. Targeted businesses for the follow up were located in North Penrith, South Penrith, Emu Plains, Dunheved Estate, North St. Marys Estate, Penrith Commercial District and St. Marys Commercial District.
- Surveys were sent to the 630 businesses that requested the survey be resent. This phone follow-up and resend of surveys resulted in 327 additional returned questionnaires.
- In these selected suburbs the project team identified 3,331 operating businesses indicating that the response rate, based on the number of enterprises was 31.1% (1,037 surveys / 3,331 enterprises). Based on the employment size of these enterprises, it also indicates that these firms employed 42% of the total LGA workforce.
- The final task in stage 2 involved entering and analysing 1,013 survey responses.

Stage 3

The two important analyses that were performed in this stage were access to employees with IT skills and the extent of the IT skills base in Penrith. This stage was also used to provide a spatial display of a number of survey findings on IT capacity in Penrith.

The CRRI used the Journey to Work data from the Transport Data Centre, based on the Australian Bureau of Statistics 1996 Census to determine the participation of Penrith residents in IT&T industry.⁶

The CRRI requested student enrolment and destination data from the University of Western Sydney (UWS) Nepean Community College and from TAFE NSW. The CRRI obtained the UWS data from Development and Information Management Planning Services (DIMPS). CRRI also obtained enrolment information from TAFE NSW. however graduate destination data was not available.

Nepean Community College was not prepared to provide student enrolment numbers in its IT courses, however the CRRI obtained some general data from the NSW Board of Adult and Community Education⁷.

⁶ The definition of IT& T occupations was based on the classification found in "Skill Shortages in Australia's IT&T Industries", pg 5 (<http://www.noie.gov.au/reports/skills.html>)

⁷ The CRRI used (and recommends) a number of sources to locate IT&T training providers in the Penrith area including the IGNITE web site (<http://www.ignite.net.au>); the National Training Information Service (<http://www.anta.gov.au/ntis>) and the Yellow Pages local directory.

Section 3: Recent Government IT Programs and Initiatives

Although much of the Information Technology industry is being driven by global economic pressures and business imperatives, governments have an important part to play in stimulating IT uptake particularly in small and medium enterprises. Gibbs and Tanner (1997) suggest that government and governance remains essential in the information age.

According to a feature edition of the Journal of State Government (1999), information technology is an essential part of government operations and will continue to be vitally important to administration, decision making and direct service delivery. It is also critical in the evolving relationships between government and other kinds of organisations, and between governments and citizens. American Vice President Al Gore (Gore, 1997) suggested that new technology, including high technology and IT, are forcing major changes in government and policy worldwide.

Many governments are actively promoting the adoption and utilisation of IT. Finland provides one notable example of government policy success. Finland is one of the most networked nations in the world (Lyytinen and Goodman, 1999). Noted IT&T statistics from Finland include:

- a larger proportion of Finns (50%) have mobile phones than in any other country
- it was the first country where income from wireless communication exceeded income from land lines
- the number of Internet hosts per capita is the world's highest
- the per capita volume of Internet use is the world's highest
- 10% of Finns use the Internet every week to buy bills or buy services.
- Finland and Ireland are the only two European countries with positive trade balances for IT products and services.

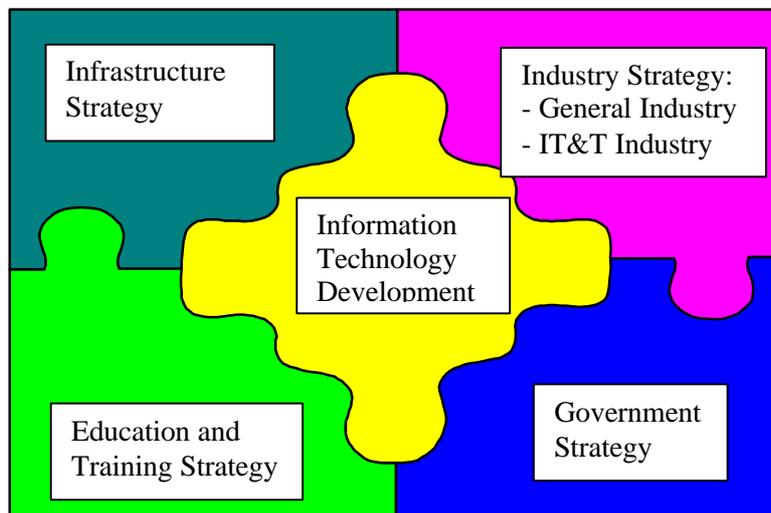
(Lyytinen and Goodman, 1999).

Although a combination of factors assisted Finland to achieve these outcomes, the role of government policy was particularly important in the process. Examples of Finnish government policy included:

- Strong educational policies and funding in computing and networking
- Active promotion of IT skills in the Finnish education system (all schools have Internet access)
- All libraries linked to the Net providing free access and assistance in Internet use
- Development of the "IT driver's License", a publicly developed and maintained national test to evaluate IT skills amongst the workforce
- Transformation of the National Science and Technology Council into a top-level policy making body chaired by the Prime Minister. According to the EC (1998) the council was central in developing long-range plans and maintaining growth in R&D.
- In 1983 Finland established the Technology Development Centre (TEKES) to foster industry-oriented R&D. From its current annual budget of \$US 400 million approximately \$160 million is allocated to IT. This is believed to have helped develop a critical technology base for the growing IT industry in many areas.

(Source: Lyytinen and Goodman, 1999)

The way that government initiatives/strategies may operate and interact in this framework is presented in the following diagram:



This diagram highlights the lead role government must play in developing and applying IT internally and in examining how projects or programs will promote the take-up and development of Information Technology and Telecommunications in the LGA. These policies also need to be complementary with other policies in the LGA and may also share common themes.

The local economic environment is shaped and driven in numerous ways by external as well as internal factors. The IT strategies, policies and programs of both State and Commonwealth governments serve as a factor that can influence the success of an area, as identified in the work of Michael Porter⁸.

At the Commonwealth level there are a number of departments and offices that are directly responsible for IT. The main three are the Department of Communication, Information Technology and the Arts (DCITA); the National Office for the Information Economy (NOIE also part of DCITA) and the Office for Government Online (OGO which is part of DCITA).

The full report of this research contains a comprehensive examination of the programs of Australia's various levels of government. This includes a discussion of the merits of major programs and a table that provides a summary of initiatives. All three levels of Australian government have produced strategies, allocated funding, provided support and in a number of cases developed specific regulatory approaches that impact on IT&T.

While many of the funding initiatives are planned at the state and federal levels, local government is a key driver of regional development and must continue to respond to a changing economic environment and new business imperatives, brought about in part through IT. This will particularly be the case in relation to areas such as service delivery, internal procedures and economic development. In regional cities like Penrith local government must continue to develop and implement new IT projects and facilitate collaborations that will achieve the vision of IT excellence.

⁸ See Michael Porter, 1990, Competitive Advantage of Nations.

Section 4: Results and Analysis

This section presents a summary of the results and analysis of the industry survey that was administered by the project team. The survey results present a comprehensive picture of the IT capacity of 1,013 organisations, a representative sample of businesses, in targeted areas in Penrith LGA. The survey provides a comprehensive insight into Information Technology in Penrith LGA. This information not only provides much needed information on the current IT capacity of respondent firms it will allow benchmarking to assess future IT development and as the basis for a number of conclusions and recommendations. Further, it is possible to use techniques employed by the Australian Bureau of Statistics (ABS) to use the survey results to estimate/project figures for the entire population, although this process is outside the scope of this project.

In total 1,037 surveys were returned, however 24 of these responses were incomplete or unusable. The majority of respondents to the questionnaire were business owners (68.5%) or business managers (24.0%). This is an indication that the responses to the questions reflect the current IT capacity of Penrith business, as these respondents are generally the most likely to have a clear understanding of business operations, business equipment and staff details.

Growth Orientation

The general pattern for surveyed businesses presents evidence of growth in the LGA, particularly highlighting growth in sales and employment over the past 2 years. For the next 5 years there is a strong expectation of continued growth. This indicates positive business conditions over the past 2 years in the LGA and suggests a sense of business confidence in existing firms, particularly with regard to employing additional staff.

Almost 45% of responding businesses experienced slow sales growth over the past two years, while 33% had fast or very fast growth. There had been no change in the sales growth rate for 19% of businesses and 5% had experienced a fall in sales growth.

A high percentage of businesses (46%) had experienced no change in employment over the same period, while 33% had slow growth. In comparison to the sales figures, a smaller percentage (13.4%) of business had experienced fast or very fast employment growth and a higher proportion of businesses (8%) had experienced a fall in employment. This suggests that sales growth may provide business with opportunities to employ additional staff. However, it also suggests that there may be a lag between increased sales and increased employment, with firms perhaps having excess capacity or perhaps responding by increasing the amount of overtime worked.

Businesses were also asked to give their estimates of employment growth and sales growth in their businesses over the next five years. Long-term (5-year) estimates by business show 47% of business anticipate slow sales growth. Importantly, 43% of businesses stated that their company goal was to achieve fast or very fast sales growth. The remaining 10 % expected no change in sales in the next 5 years.

The majority of businesses (50.9%) stated the 5-year employment goal of the company was for slow growth, while 31% expected no change. 16% of companies predicted fast growth. A small number (1%) of companies predicted very fast or falling employment growth in the long term.

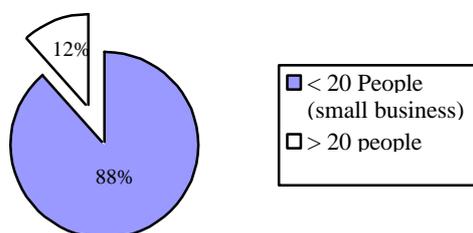
These employment and projected sales figures represent positive indicators for Penrith. For example, if each company with a slow employment growth projection creates an additional position 460 additional jobs would exist in the LGA. Further, if the companies with a fast employment growth create 3 to 5 new positions there will be between 420 and 700 new positions in the LGA.

Employees

In 1997 94% of all Penrith firms had less than 20 employees and were classified as small businesses. Overall, the vast majority of survey respondents (89%) are also small businesses, employing full-time workers.

Most survey respondents (52%) had less than 5 full-time employees, with a further 21% of businesses having more than five less than 10 employees. An additional 16% of respondents more than ten and less than 20 employees. This shows that a significant majority (89%) of survey respondents were small businesses,⁹ similar to data in Australian Bureau of Statistics (ABS, 1997) Business Register that records 94% of businesses in the LGA as small businesses.

Employment size of sample firms



The 1,013 businesses that responded to the questionnaire employ 13,808 full-time and 4,811 part-time workers, while 67 employees are engaged in telecommuting.

The median employment size of the sample population is 15.4 full-time employees and 7.7 part-time employees.

Figures from Journey to Work (JTW) 1996 show that 43,884 people were working in Penrith LGA. The firms that are represented in the survey collectively employ 18,619 people in the LGA, which represents 42% of the JTW figure.

⁹ The definition of a small business adopted for this report is consistent with the Australian Bureau of Statistics that classifies companies (except manufacturing) with less than 20 employees as small, companies in the manufacturing industry with less than 100 employees are classified as small.

Industry

Construction, Retail Trade, Health and Community Services and Manufacturing are the dominant industry groups in Penrith LGA. The survey received a similar sample with most returns from Retail Trade, Health and Community Services, Manufacturing and Construction.

Businesses from Retail Trade, Manufacturing and Health and Community Services industries were most strongly represented in the number of surveys returned. Construction was next, followed by Personal and other services and Property and Business Services. Interestingly, almost 4.0% of businesses nominated themselves as specifically in the Information Technology industry.

Overall the percentages of respondents in each industry is broadly consistent with the ABS Business Register.

Information Technology Equipment and Infrastructure

Nearly 9 out of 10 Penrith firms had at least one piece of IT equipment, which for most was a personal computer. This indicates that there is a high level of adoption of IT. The percentage of Penrith firms that had IT equipment is similar to national percentages.

As Table 5.1 shows 88% of survey respondents had at least one workstation. In total the survey indicated 5,596 workstations are used in these firms. Further, 28% of firms surveyed had at least one laptop/notebook computer. These proportions are consistent with figures in a recent Yellow Pages survey (Yellow Pages, May 1999) that found 82% of small businesses use desktop computers and 99% of medium sized business use desktop computers. Further, the Yellow Pages study revealed that 22% of all businesses own at least one laptop computer. The Australian Bureau of Statistics (June 1998) reported that 63% of employing businesses use personal computers.

A small number of respondents also listed other specialised computers that are part of their company's IT capacity. These included: computer engraving machine, automate TCD, machine controllers, engine computer analysis and registers/Point of Sales machines

Table 5.1: IT equipment owned by responding Penrith businesses

	Survey respondents (%)	Total units	Average units per company	Standard Deviation
Workstations	88	5596	6.5	27.2
Laptops	28	462	1.7	2.0
Mainframes	6	73	1.0	0.7
Servers	30	457	1.5	1.5

Approximately 6% of survey respondents owned at least 1 mainframe computer, indicating that these businesses own over 70 mainframe computers.¹⁰ This suggests that a strong potential for a cluster in the LGA of businesses using high-end and advanced computer applications.

Around 30% of respondents were using servers. A server is typically used to provide the overall network management function and to host common files and services. This suggests a certain prevalence of networked systems, multiple-users and machines within organisations.

The survey results were also analysed to determine the ownership of workstations based on the size of businesses. This showed that 83% of small businesses had at least one workstation and 98% of medium sized businesses had at least one workstation (see Table 5.1).

Internet and LAN are the most common types of IT infrastructure in Penrith firms. Penrith firms have comparatively high levels of adoption of IT infrastructure (see Table 5.2).

Table 5.2 IT Infrastructure of respondent businesses

	Survey respondents (%)	Number of firms
Telecommunications Network	34	335
Local Area Network	54	531
Wide Area Network	15	147
Intranet	25	246
Internet	70	689

Questions relating to IT infrastructure of firms produced the following responses¹¹.

- 70% of all firms with a PC were connected to the Internet this is the most common IT infrastructure. This figure is much higher than the comparable Yellow Pages (Yellow Pages, 1999) finding of 48% connection amongst small business and 82% connection in medium business.
- Next most prolific was a Local Area Network (LAN) connection, with 54% of businesses maintaining a LAN system.
- Telecommunications networks and Intranet were available in 34% and 25% of firms respectively
- Wide area network systems were utilised by 15% of Penrith firms.

The ABS (1998) reported that 20% of all national business use a LAN/WAN connection and almost 50% of employing businesses with PCs have Internet access. A national study by IDC (1999) found that 42% of computers are connected to the Internet however that figure is predicted to rise to more than 61% by the end of 1999, highlighting the rapid adoption of the technology.

A small number of firms also recorded other forms of IT infrastructure which included:- dial in networking, modems and specialised servers.

¹⁰ The project team used a follow-up call to check the accuracy of a number of these responses. In some cases it is believed that there may have been a misunderstanding of the term, however less than 5% proved inaccurate.

¹¹ Response rate for this question was 87%.

Nearly 200 firms listed “Other IT equipment supporting key business functions.” This specialised hardware included: printers, scanners, film processing machines, plotters, facsimile, EFTPOS, digital photocopiers (and photocopiers), Epsom photoex, CD burners, barcoders, modems, digital cameras, mobile phones (and phones), pinchange, and high density concentrated call termination equipment.

Internet Applications

Penrith firms’ most frequent uses of the Internet are for communication (e-mail), advertising and/or for obtaining reference information and research data (see Figure 5.2 on next page). The key to understanding the value of these high levels of Internet connection lies in analysing the uses of the technology. Businesses connected to the Internet were asked to indicate for which of 14 specific activities they used the Internet. The choice of responses are scaled based on the frequency of use from daily use to never.

Communication via e-mail is the most frequent type of Internet usage, being used by 64% of those connected on a daily basis. The next most frequent daily use is for advertising purposes with 23%, while 19% of connected businesses obtained reference information and research data.

Examining the use of the Internet for e-commerce indicates that between one third and one half of Penrith firms use e-commerce.

An important potential growth area for using the Internet is electronic commerce (e-commerce). Electronic commerce is any type of business transaction or interaction in which the participants operate or transact business or conduct their trade electronically. E-commerce, using the Internet, is a new way of advertising, buying, selling and in some cases, delivering goods and services. Four of the Internet usage categories, relate to the e-commerce activities of buying goods and services over the Internet:

- Half of those connected to the Internet *regularly*¹² use the Internet to “look for information or products and services” they may wish to buy.
- 14% of those connected use the Internet to *regularly* “place orders for products or services”. Overall, 43% of connected businesses use the Internet for this purpose with monthly or half yearly the most common usage rates.
- 11% of those connected *regularly* “pay for products and services” through the Internet. Overall, 31% of connected businesses use the Internet for this purpose.
- 17% of those connected *regularly* “take orders for products for goods and services over the Internet. Overall, 27% of those connected use the Internet to take orders.
- The potential for increased e-commerce utilisation is highlighted by the figures from the survey. From those connected “taking orders for products and services”, “paying for products and services” and “Training” are the functions where the Internet is least used.

¹² “Regularly” is defined as the sum of the connected businesses that use the application on a daily or weekly basis.

Figure 5.2 Regular Internet Uses, National and Penrith Comparisons

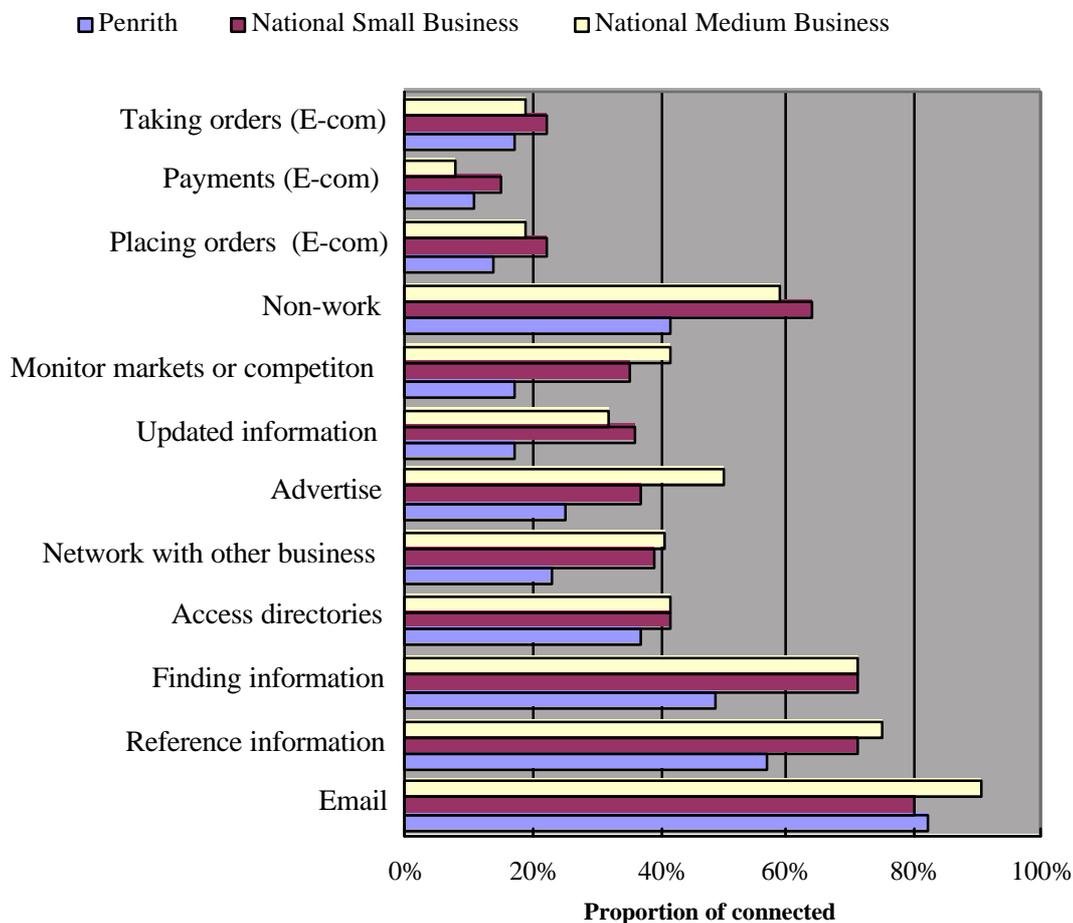


Table 5.3 shows that email is the most common form of national Internet usage and that other frequently used functions of the Internet included obtaining reference or research information; looking for information about products or services; and browsing or ‘surfing’ for fun. Additionally, the survey finds over one-third of national businesses that are connected use the Internet to advertise. Around one-fifth of national businesses that are connected, use the Internet to transact business orders or to pay for products or services.

Survey data indicate that Penrith firms may use the Internet comparatively less, than the national sample, for the 12 specific activities. A national survey conducted by the ABS (1998) finds that email is used by 92% of businesses with access to the Internet. Other reported uses for the Internet included marketing and promotional activities (23%), placing orders (16%) and receiving sales orders (10%). Payments are made via the Internet by 8% of businesses with Internet access.

Based on the figures presented there is the particular potential for firms to make greater use of the Internet to:

- Network with other business;

- Advertise products and services;
- Conduct training;
- Monitor markets and competition; and
- Increase business through e-commerce.

Table 5.3: Business use of specific Internet applications. Number of companies using these applications and proportion (%) doing so

	Daily	Weekly	Monthly	½ Yearly
Email	442 (64%)	123 (18%)	32 (5%)	3 (0.4%)
Reference information or research data	130 (19%)	263 (38%)	120 (17%)	39 (6%)
Find information about products and services	87 (13%)	252 (37%)	153 (22%)	53 (8%)
Access Directories	82 (12%)	174 (25%)	144 (21%)	47 (7%)
Training	25 (4%)	44 (6%)	84 (12%)	108 (16%)
Network with other business	87 (12%)	72 (11%)	83 (12%)	58 (8%)
Advertise products and services	155 (22%)	16 (2%)	66 (10%)	57 (8%)
Get updated information timetables, weather etc.	48 (7%)	71 (10%)	106 (15%)	68 (10%)
Monitor markets or competition	43 (6%)	75 (11%)	103 (15%)	87 (13%)
Professional reading	50 (7%)	116 (17%)	144 (21%)	50 (7%)
Non-work	72 (10%)	218 (32%)	87 (13%)	43 (6%)
E-commerce				
Place orders for products and	39 (6%)	58 (8%)	115 (17%)	86 (13%)
Paying for products and services	27 (4%)	49 (7%)	91 (13%)	50 (7%)
Take orders for products and services	58 (8%)	62 (9%)	46 (7%)	20 (3%)

These conclusions, in relation to the five specific activities outlined above, hold even without comparison to the national sample. As the overall current levels of usage are low, there is an opportunity for Penrith business to use these Internet functions more regularly.

There are a number of other feasible explanations for the lower levels of Internet use within Penrith. Positively, first it can be seen that Penrith has a high proportion of firms that have computers. Additionally, a high proportion of Penrith businesses are connected to the Internet and the proportion of firms using e-mail is 87%. These findings and data may suggest that Penrith is a late starter in its IT development.

Table 5.4: Comparison of the activities where the Internet is used ‘regularly’

	Penrith	National Small Business¹³	National Medium Business¹⁴
Email	82 %	80 %	91%
Reference information or research data	57 %	71 %	75 %
Find information about products and services	49 %	71 %	71 %
Access Directories	37 %	42 %	42 %
Training	10 %	N/A	N/A
Network with other business	23 %	39%	41 %
Advertise products and services	25 %	37%	50 %
Get updated info. timetables, weather etc.	17 %	36 %	32 %
Monitor markets or competition	17%	35 %	42 %
Professional reading	24 %	N/A	N/A
Non-work	42 %	64 %	59%
E-commerce			
Place orders for products and	14 %	22 %	19 %
Paying for products and services	11 %	15 %	8 %
Take orders for products and services	17 %	22 %	19 %

Information technology applications

Businesses were presented with a range of core business activities that could use the organisation’s IT capacity. Respondents were asked to indicate the importance of these applications (see Figure 5.3), on a range that included “not used”; “little importance”; “important”; “very important”; and “key importance”. The responses to this question highlighted four dominant IT applications that were used in a majority of businesses. This emphasised the importance of business analysis and clerical and administration applications in most businesses:

- Accounting, which was ranked as very important or having a key importance by 67% of firms,
- Word Processing, which was ranked as very important or having a key importance by 64% of firms and
- Spreadsheets, which were classified as very important or having a key importance by 54% of firms and
- Databases, which were classified as very important or having a key importance by 53% of firms

A number of other IT applications were also in use by over 1/3 rd of the sampled firms, these included:

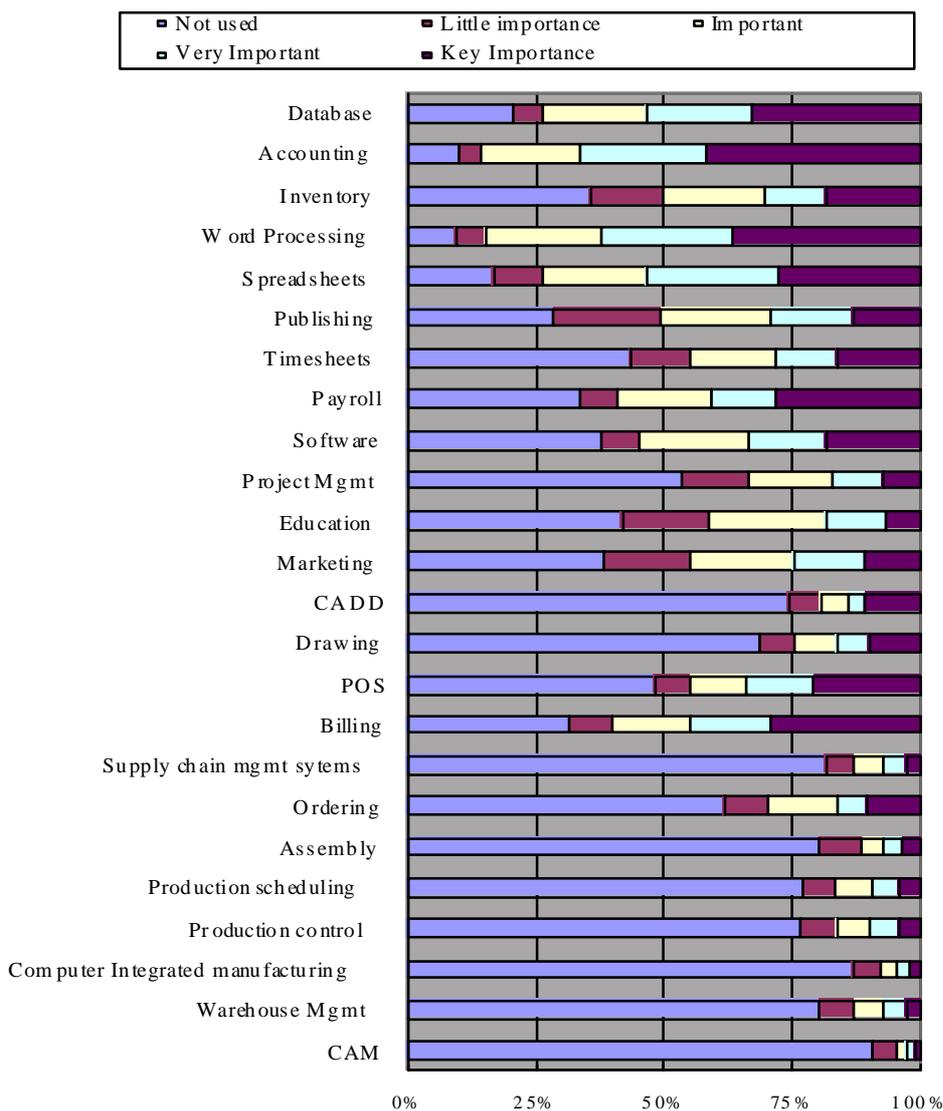
- Billing/Quoting, with 44% of businesses indicating that this was very important or had a key importance.
- IT Admin Software, which was ranked as very important or as having key importance by 31% of firms and,

¹³ Yellow Pages, 1999, Small Business Index.

¹⁴ Ibid.

- Point of Sale, which was seen as very important or as having a key importance for 32% of firms.

Figure 5.3: Importance to Business of Specific Software Applications



IT Expenditure

IT Expenditure of Penrith firms in the past two years was allocated to IT acquisition, IT internal costs and/or Software Licensing.

Importantly, there are a number of Penrith firms that have spent at least \$500,000 on one area of IT in the past 2 years.

Companies were asked to indicate the amount of IT expenditure that they have outlaid in the past two years. The responses show that the majority of firms spent up to \$10,000 on IT acquisition (58%)¹⁵, IT internal costs (59%)¹⁶ and software licensing (58%)¹⁷.

Approximately 50% of companies had no expenditure on IT training and skill development or IT costs for systems maintenance.¹⁸ However, 50% had spent up to \$10,000 in these areas.

A majority of companies had no expenditure in the last two years on external services or systems development¹⁹, with 58% and 63% of companies respectively.

Over 250 firms also indicated that they had IT expenditure on “Other” areas of IT in the past two years. Over 90% of these respondents spent up to \$10,000 on these purchases. Unfortunately, few specified what this money is spent on.

Importantly, 6% of businesses had acquisition expenditure of \$50,000 to \$100,000 and 3% of respondents had expenditure of over \$500,000 in at least one of the seven nominated areas. This indicates that a number of businesses have spent relatively large amounts on IT acquisition. Secondly, these figures show that over 20 businesses have been identified that have spent over \$500,000 on IT in the past two years, meaning that together these companies have made outlays worth a minimum of \$10 million.

Planned Change in IT Spending

Penrith firms were asked to indicate whether they were planning changes in their IT spending in the next two years, and the direction of this change. Table 5.6 presents the results from this question. The table shows that from the firms that responded to this question the majority planned no change in their levels of IT expenditure in each category. Nevertheless, in a number of categories a high percentage of firms indicated that they planned to increase their IT spending in the next 2 years. For example, 42% of respondents planned to increase acquisition expenditure, 37% planned to increase expenditure on IT training and development and 32% indicated that they planned to increase expenditure on IT internal costs (for example operations, help desk, upgrades and installations).

¹⁵ Sample size (n=797)

¹⁶ Sample size (n=742)

¹⁷ Sample size (n=746)

¹⁸ Sample size: Training (n=748); Systems Maintenance (n=742)

¹⁹ Sample size External services (n=743), Systems Development (n= 745)

Table 5.6: Planned change for Penrith firms in IT spending in the next 2 years.²⁰

	Planned Increase	No change Planned	Planned Decrease
Acquisition	42%	37%	20%
IT internal costs	32%	57%	11%
Software Licensing	27%	63%	10%
Training and Skills Development	37%	57%	7%
IT costs for systems development	27%	68%	5%
IT costs for systems maintenance	31%	63%	7%
External Services	29%	61%	10%

Areas Receiving the IT Expenditure of Penrith firms

Penrith firms were found to be directing significant levels of IT expenditure to other firms in the LGA or to firms in the Sydney Metropolitan Area.

An important consideration in promoting local economic development involves understanding the amount of local spending in an area. This process is often referred to as the ‘multiplier’ as a person or organisation receiving expenditure then spends a proportion creating further economic activity. This is equally important in analyzing where Penrith businesses are deciding to allocate IT expenditure.

Questionnaire respondents were asked to nominate the geographic location(s) in which they allocated 4 types of IT expenditure.

- 50 % of companies²¹ indicated that they had purchased some IT hardware in Penrith, such that the LGA emerged as the most common location for expenditure on IT hardware. On average, 85% of those businesses total IT hardware expenditure occurred within the LGA.
- The majority of IT software was sourced from either Penrith or the Sydney Metropolitan Area (SMA), with 40% and 33% of firms²² respectively indicated that they obtained some software in each area. When these purchases occurred in Penrith and the SMA, these locations were used almost exclusively to obtain all of their companies IT software, suggesting that firms obtaining software in SMA are unlikely to also purchase software in Penrith and visa versa. 14% of firms indicated that they obtained some of their firm’s software in “the Rest of Australia”
- Expenditure on IT training by Penrith organisations was more often spent in other areas of the SMA rather than in the Penrith LGA. Analysis found that 42% of firms²³ spent some money on IT Training in the SMA, while 31% spent some money within the LGA. This highlights the potential for strategies that increase the utilisation of IT Training within Penrith. These may include: improved awareness of providers, improved communication between suppliers and industry and/or changes to the content and/or delivery of courses within the LGA.
- A larger proportion of expenditure on IT services was also being directed to firms in Penrith and the SMA, with 39% and 34% of firms²⁴ respectively spending some money in these locations. 16% of

²⁰ Sample size ranges (n between 328 and 423).

²¹ Sample size (n=920)

²² Sample size (n=947)

²³ Sample size (n=561)

²⁴ Sample size (n=634)

businesses also spent some money on IT services in Greater Western Sydney, which indicates that additional money is remaining in the region.

Information Technology Management Practices

Current research (Khandelwal and Ferguson, 1999; Nolan and Koot, 1992) highlights the importance of determining the maturity of IT in organisations. This work demonstrates that to manage effectively in an environment where IT is increasingly critical the people responsible for the firm's IT needs to continue to advance the level of IT maturity. This ensures that IT provides real business value to their enterprises.

Approximately 30% of business respondents indicated that they 'sometimes' undertake four of the IT practices listed, with the "Review of business IT needs", "Review of IT to meet customer needs", "IT plans and Strategies" and "IT Security" obtaining most responses in this category. Furthermore, approximately 40% of remaining respondents engaged in these activities 'never' or 'rarely' and 1/3 rd engaged in these activities 'often' or 'very often'. These figures indicate that a significant number of firms have developed a high level of IT maturity for this practice. However, equally a significant number of firms need to undertake these practices more frequently.

In the sample, 28% and 37% of firms respectively perform This indicates that the majority of firms have recognised the importance of this practice and have developed mature practices. There remains scope for improving the frequency of information back-ups in the 22% of firms that back-up never or rarely.

The majority of firms "never" or "rarely" practice disaster recovery procedures or assessments of IT use by competitors. According to the survey data 32% of respondents never conduct disaster recovery procedures and 51% of respondents never conduct an assessment of IT use by competitors. This indicates that their IT management practices, in these areas, have not developed to a mature stage. Another concerning figure is the lack of regularity that firms have displayed in monitoring the use of IT by competitors. Less than 10% of respondent firms monitored the use of IT by competitors often or very often.

IT Qualifications and IT Skills

Penrith firms have a significant number of employees that possess IT skills and qualifications. The main method of obtaining these skills is "company provided training".

The sample showed that 50% of firms indicated that they have employees with IT skills that were obtained through one of ten areas. Over 6,100 employees have received IT training from the company at which they are employed. This is clearly the form of IT training that has been undertaken by most workers. This translates to 344 firms that have provided some form of IT Training.

IT skills learnt completely on the job describes the method of obtaining IT skills utilised by the second highest number of workers, with almost 2,400 employees learning in this manner. A majority of companies also used the learning on the job approach, with 516 firms having some employees that have learnt IT skills completely on the job.

Over 1,200 participants obtained their IT skills through education and/or training provided by consultants. Almost 250 firms have had in-house IT training provided and delivered by consultants. Importantly, the firms surveyed also employed a significant number of employees with university and TAFE level IT qualifications. Just over 270 people were identified as having a University level qualification, while 820 people held TAFE level qualifications. Additionally, a further 540 workers possessed an IT industry certificate. The responses also indicate that 240 firms employ at least one person with university level qualifications and 290 firms employ at least one person with TAFE level qualifications.

A small number of companies also indicated that employees have obtained IT skills or qualifications through other sources including:- conferences, seminars and business study.

Table 5.7: Number of Penrith employees and firms with IT Qualifications

	Number of employees	Number of firms	% of total employment within firms with staff qualified at this level	% of total firm employment
a. University				
Higher Degree	128	102	23%	0.7%
Degree	145.5	139	25%	0.8%
b. TAFE				
Diploma	279	164	28%	1.5%
Certificate	541	220	33%	
c. Private Company				
Industry Certificate	542	167	37%	2.9%
d. In-house Training				
Company provided	6115	344	58%	32.8%
Provided by Consultants	1226	249	51%	6.6%
e. Skills learnt totally on the job	2393	516	54%	12.9%
f. Self-study	547	241	55%	2.9%

IT Training By IT Skill Set

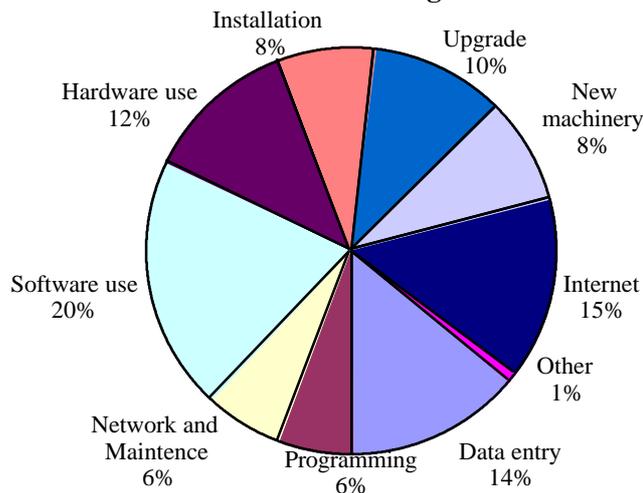
A large number of employees in Penrith firms have undertaken IT Training in the past two years. This indicates that these firms are active in training new employees and/or up-skilling their current workforce.

A primary answer to the question of what types of IT training are employees receiving at their workplaces is provided by examining the types of IT Training that company workers have undertaken in the past two years. Companies were required to select, from a list of 9, the types of IT training that their employees have received. Companies also had the opportunity to record other forms of training that weren't included on this list. The responses show that over 200 firms have employees that have received IT training in at least one of the four areas listed below:

- Software Use (378 firms)
- Internet (271 firms)

- Data entry (256 firms)
- Hardware Use (221 firms)

Figure 5.4 :IT Training in the past 2 years in Penrith firms - the most common areas of training



Each of the nine types of IT training was selected, by over 100 firms, and represents the training of at least one employee in the past 2 years.

These results indicate that a significant number of Penrith firms have been actively involved in upgrading their IT skills. This pro-active approach is to be both commended and encouraged.

Around 20 companies indicated that their employees have participated in ‘other’ areas of IT Training in areas including:- personal programming, management, equipment, applications, ISO 9000 and design.

Data on planned IT Training in Penrith firms was similar to current training priorities (see Table 5.8) and was being directed toward the same four areas as the training that was previously conducted. This means Planned IT training will focus on four main areas:

- Software Use (268 firms)
- Hardware Use (266 firms)
- Internet (188 firms) and
- Data Entry (146 firms)

The figures presented on past and planned IT training provide the basis for both optimism and concern. Firstly, there is evidence of a continuing pro-active approach to IT Training among a number of Penrith firms. Further, firms have targeted core IT areas such as hardware and software use and the increasingly important Internet. Concern arises in considering that at least 50% of firms have not participated in any IT training and have not indicated a plan to undertake any IT training.

Table 5.8: Participation of Penrith firms in IT Training

	Trained in the past 2 years (no.)	Plans for training in the next 2 years (no.)
Data entry	256	146
Programming/Systems Analysis	110	104
Network/Computer Maintenance	118	124
Software Use	378	268
Hardware Use	221	266
Installation	146	109
Upgrades	194	143
New Machinery	158	105
Internet	271	188
Other	13	10

IT Professionals

Penrith firms provide employment for IT professionals that represent a number of occupations. Just over 11% of responding firms employed at least one IT professional.

IT Professionals are particularly important to the development of an IT Industry in an LGA. According to the Australian Computer Society²⁵ most IT professional work can be classified into three broad areas:

- Information Systems
- Computer System Engineering and
- Computer Science.

IT professionals have a crucial part to play in the effective application of computers and computing technology to achieve effective outcomes for an organisation. As such, this project attempted to identify the IT professionals that are working in industry and the occupations of those people. This information could also identify a number of occupations that may not be included in the ABS classifications.

The results of the survey show that 116 firms indicated that they employed at least one IT professional. This translates to 249.5 (full-time equivalent) IT professionals employed in the responding firms. The survey also revealed that contract staff comprise approximately 4% of an average firms IT staff. The occupations that are listed in the survey included:

Programmer	Systems (Analyst, Administrator, Setup)
Help Desk Officer	Network (Engineer, Administrator)
Web Master	Engineer (Networks, Electronic, Electrical, Computer)
Business Analyst	Technicians
Software Developer	PC Hardware
(CAD, Graphic, Technical Drawing, Construction Plans, Draftsman)	Retail Sales
IT Support	Teacher
Programme Developer.	IT Manager

²⁵ See <http://www.act.acs.org.au> details on accreditation

These results highlight the range of occupations that IT professionals hold in the LGA and also emphasizes the numbers that are currently employed.

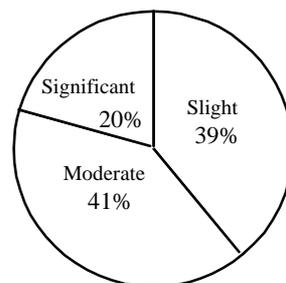
Combining these data with the levels of IT qualifications suggests that there are also a number of employees with IT qualifications that are not employed as IT Professionals. Examining the IT qualifications shows that over 1,600 people have IT qualifications at an industry certificate level or higher. This highlights that there are a significant number of people employed in Penrith firms that have qualifications applicable to performing the tasks of an IT professional and/or IT paraprofessional. The data also show that people with accredited IT qualifications are concentrated in around 35% of the firms. In other words this means that approximately²⁶ 650 firms (65%), that responded to the questionnaire do not have, any employees with accredited IT qualifications.

IT Skill Shortages

One of the major current issues in the IT sector is the problem of skill shortages. A recent government report states “shortages ... are increasingly being seen as a key constraint to the growth and competitiveness of industry in Australia, and to the emerging information economy.”

In Penrith, the majority of respondent firms (56%) were not currently experiencing a shortage of IT skills. However, 44% of firms currently did have a shortage of IT skills amounting to over 3000 positions. The project team also asked a question to gauge the magnitude of these shortages. These results are presented graphically in Figure 5.5.

Figure 5.5: Magnitude of IT Skill Shortages in respondent firms



This shows that the majority of firms that have identified themselves as having an IT skill shortage have moderate or significant IT skill shortages. This situation **must** be addressed in Penrith. The following analysis specifies the precise IT skill areas where these shortages exist and also the number of potential positions that exist.

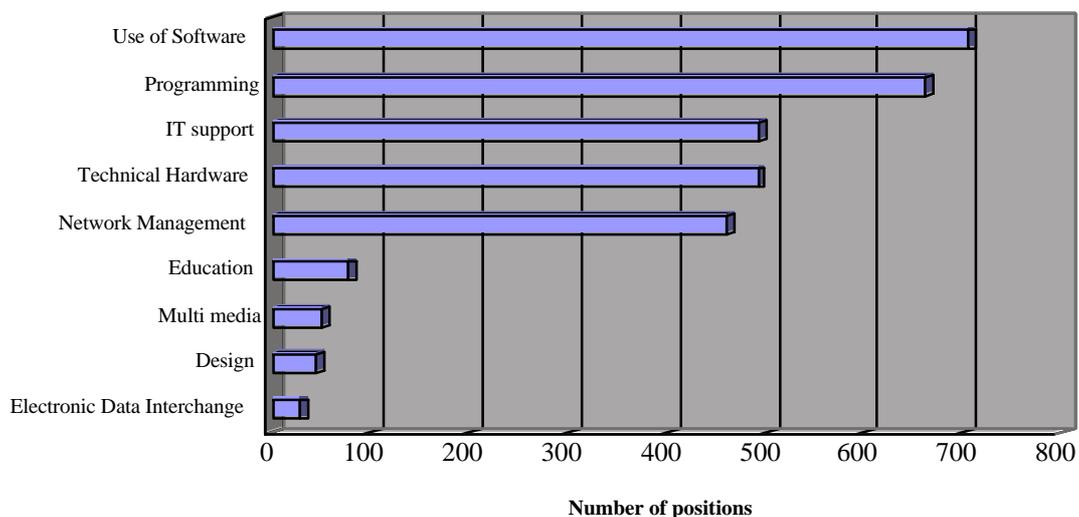
²⁶ This figure may be an overestimate as it assumes all respondents answered this question.

Examining the list provided to respondents there is found to be:

- 195 firms that have indicated that they have a skill shortage in IT support, these firms indicated that this translated to 494 positions
- 128 firms have a skill shortage in multimedia, these firms indicated that this translated to 53 positions.
- 122 firms have a skill shortage in Design, these firms indicated that this translated to 48 positions
- 125 firms have a skill shortage in Network Management, these firms indicated that this translates to 462 positions.
- 148 firms have a skill shortage in Technical Hardware, these firms indicated that this translates to 493 positions.
- 122 firms have a skill shortage in Programming and Systems Analysis, these firms indicated that this translates into 663 positions
- 176 firms have a skill shortage in Software and Applications, these firms indicated that this translates to 709 positions.
- 139 firms have a skill shortage in Education and Training, these firms indicated that this translates to 80 positions and
- 103 firms have a skill shortage in Electronic Data Interchange (EDI), these firms indicated that this translates to 30 positions.

The above figures indicate that the businesses surveyed indicate a skill shortage equivalent to 3012 full-time positions.

Figure 5.6: IT skills shortages in Penrith firms



The results of this study suggest that there is an IT skill shortage in a number of Penrith firms. However, Penrith is certainly not alone in this regard. DEWRSB's Skills Shortage Assessment Program has recently identified shortages in a number of IT skills at the State level. DEWRSB reports

“the labour market for computing professionals in New South Wales is reported to be in shortage. Shortages exist in a range of areas including programming, networking design and management, and data warehousing. Programming languages currently in shortage include Java, Java Script, C

++, Delphi, Visual Basic and Cobol; and enterprise packages facing shortages include SAP and PeopleSoft.”

Internationally the situation is increasingly chronic with Virginia Tech indicating that 346,000 IT positions are vacant in the USA in three core IT occupations (programmers, systems analysts and computer scientists/engineers).

The responses from Penrith firms indicates that there is a shortage equivalent to 3,029 positions in 9 IT areas. This highlights the significant opportunity for positive employment growth in Penrith. These positions exist within firms that are already established in the LGA meaning they are building on existing capacity. There is a pressing need to investigate how to address these shortages, to identify individuals to fill these positions and to identify firms that can commit to filling these shortages. Depending on the circumstances it may also be necessary to encourage, discuss and/or assist firms in creating new job opportunities and in creating a full time or part time position where a skill shortage currently exists.

Reasons for not using Information Technology

Penrith firms indicated that there are a number of reasons for not using IT.²⁷ The top five reasons for Penrith firms not using IT are:

- Not suited to business (60% of those not using)
- Lack of Knowledge (59% of those not using)
- Cost (51% of those not using)
- Don't need it (51% of those not using) and
- Time (50% of those not using).

Taking a pro-active approach to developing Penrith's IT capacity will involve understanding these problems and developing strategies to minimise them. To the greatest extent possible Penrith firms must make decisions that the reasons to use IT outweigh the reasons not to use IT. Evidently, a significant number of firms continue to believe that there is at least one specific factor that means this is not the case for all areas of the firm's operations.

Summary

The analysis of data collected from this study in Penrith reveals that there is a high level of adoption of IT equipment and infrastructure (IT capital). Nearly 9 out of 10 Penrith firms have at least one piece of IT equipment. Further, a majority of Penrith firms have high levels of use of IT infrastructure, including Internet connection and use of a Local Area Network, with 70% and 54% respectively. This level of adoption is well above national averages.

Between one-third and one half of Penrith firms are currently using e-commerce. However, few businesses are regular users and Penrith firms are found to be less frequent regular users of the Internet for all business

²⁷ Based on the number of response received it is believed that a number of companies that were using IT also answered this question. As such, it may be appropriate to view this question as why business do not use IT in a specific area and not why do they not use IT at all

applications than national firms. The results of the business survey indicate the new opportunities are available to make greater use of the Internet to network; advertise; conduct training; monitor markets and competition; and finally, participate in e-commerce.

Penrith firms collectively have a significant number of employees that possess IT skills and qualifications. The main methods of obtaining these skills is through company provided training or learning completely on the job. However, while the majority of firms in Penrith have sufficient workers to optimise their IT capacity, some 44% of the firms surveyed currently have a shortage of skills. These firms indicate that this is equivalent to over 3000 positions in 9 IT areas. Enrolments in a number of IT training areas, in Penrith LGA, are comparatively low. Furthermore, the proportion of Penrith's workforce in IT occupations is also relatively low. This highlights the importance of implementing IT training initiatives and IT action plans for all levels of education (school, TAFE and university).

Section 5: IT Actions and IT Opportunities in Penrith LGA

This final section specifically identifies key areas and programs that can be used to promote and develop Penrith as a centre of excellence in IT. It draws on the proceeding sections to identify gaps in IT, nominate potential solutions and to highlight initiatives that can be used to enhance Penrith's IT capacity.

The project team has identified a number of key opportunities for Penrith. These are outlined below before summarising a series of actions that need to be taken by key stakeholders within the region.

Opportunities

IT&T Opportunity 1: High Performance Computing Centre

A high performance computing facility is being established at the Australian Technology Park (ATP) under the direction of a board that represents the two stakeholders (NSW universities and the State Government). The facility is called the Australian Advanced Computing and Communication Centre (AC³). Its purpose is to provide high performance computing facilities and training with two related purposes – research and industry development. To assist the latter, AC³ has decided to establish a network of distributed intelligent nodes to enable industry access to the computing power available.

The creation of a Penrith High Performance Computer Centre (HPCC) would present an outstanding and exciting opportunity for advances in IT&T within Penrith. Penrith LGA is the potential site for an intelligent node of a high performance computing facility linked to the Australian Technology Park (ATP). The Penrith node would ultimately consist of a 3 to 4 gigaflop machine linked by 1 Gb fibre optic cable to the central facility at the ATP.

The continued involvement of Penrith Council, industry, local organisations and the University of Western Sydney will be vital to the achievement of optimal outcomes from any HPCC development. The development of an industry strategy and the implementation of effective technology diffusion strategies and training will be central to the success of the project. The Centre for Regional Research and Innovation (CRRI) has recently been awarded funding, from the Department of Employment, Workplace Relations and Small Business (DEWRSB) through the GROW Employment Council, to develop a High Performance Computer Strategy for Penrith. This project commenced in May 2000.

The project seeks to implement an effective set of industry strategies that will lead to the relocation of companies to the Outer West. It will also target existing companies with potential high performance computing application. The project will greatly enhance employment opportunities in technology based industries and will facilitate additional training options in this area through TAFE and UWS.

The HPCC and a well-developed industry strategy are estimated to have the capacity to create 75-100 new high technology jobs within 3 years. Penrith must ensure that a strategy is developed for the HPCC and that the facility is used to its full potential. It is strongly suggested that the strategy identify opportunities and organisations to use the HPC node and develop a package to attract organisations to Penrith to take advantage of the High Performance Computer Node. An education and training package is also a key

program that is necessary to ensure the success of the High Performance Computer. The UWS has taken a lead in developing training in High Performance Computing.

The current project identified evidence of a strong core of Penrith firms that believe they could make use of high performance computing. This suggests there is potential for strong industry development should this facility be established.

Companies that responded to the survey were asked “If access to a high performance-computing centre of world standard was available in this region could your company make use of it?” The results from this question are that 350 firms suggested they could make use of it and 505 firms indicated they couldn’t make use of it. A number of firms also recorded their uncertainty about whether or not they could use the HPC (with these responses left blank for the purpose of analysis) writing responses including:

“depends”, “don’t know”, “more info”, “possibly” etc.

These results indicate that there are a large number of firms (350) in Penrith LGA that have identified themselves as organisations that could use advanced computing.

IT&T Opportunity 2: Innovation and Incubator Precinct

The site selected for the HPCC is also a potential location for an innovation and incubator precinct. The innovation precinct would focus on attracting new businesses to Penrith and on fostering the growth of existing companies.

Focus groups and industry representatives have suggested that there is a net outflow of IT&T workers from Penrith and GWS. The development of an innovation precinct provides a clear opportunity to attract GWS residents to work in the LGA. Trends from Sydney Metropolitan Area support the tendency of IT&T firms to be geographically concentrated.

The Penrith Campus (Werrington North) of the University of Western Sydney has been identified as one potential location for the HPCC. UWS has also identified the site as a suitable location for an innovation and incubator precinct. The international evidence suggests that high-tech precincts have been successfully developed around HPCCs. The Maui High Performance Computing Centre has 1,200 users and has established a strong industry cluster at the site. Experience from the international centres suggests that a successful innovation precinct could generate 500-1000 high technology jobs, within 5 years. The site could also be developed as a venue for technology conferences and industry meetings. To successfully drive the development of a precinct Penrith requires external funding. Potential sources of this funding are set out in Appendix 1. For firms located within this precinct there must also be a strong education program that identifies funding sources²⁸ and potential collaborators.

²⁸ The IT engine room found that in general existing State and Federal Government programs are under-utilised by IT&T SMEs. 233 SMEs were surveyed and across 21 Government schemes the average proportion of companies that used each scheme was 9.6%.

IT Opportunity 3: Industry Clusters

The literature presented in the first section of this report highlights the importance of industry and IT clusters. Well functioning clusters allow knowledge structures to develop; exchange of technology to take place and enhanced collective capacity to be developed. The cluster can facilitate/provide for interaction, networks and a set of facilities that can be drawn as inputs into business processes. Two potential clusters are proposed.

1. SME cluster: In addition to a large innovation precinct there is discussion and research being conducted on the feasibility of an IT&T SME incubator in Penrith. This project was proposed as a program to develop Home Based Businesses (HBB's) to grow and establish together in an incubator environment.

Nationally, in the IT&T services and application areas the potential for the expansion of Home Based Business and the creation of SMEs is very substantial. This type of employment creation can be facilitated by:

- development/promotion of a well-educated and appropriately skilled workforce;
- providing and developing materials and expertise in local organisations;
- providing appropriate infrastructure and access to technology (high speed and low cost);
- promoting the take-up of new technology in households and schools;
- examining the feasibility of developing building codes that facilitate current and/or future access to high-speed connection and smart building design;
- examining procedures and codes that exist at the Council level for approving HBBs;
- encouraging and/or creating and facilitating networks for HBBs and new IT&T companies;
- facilitating access to capital.

The creation of a cluster for IT&T SME firms is an IT opportunity that has important merit. The current feasibility study will provide more details on a number of features of IT HBBs in the LGA.

The choice of whether and how strongly to pursue the HBB/SME concept is a choice to be made at the LGA level. Importantly, these businesses are a potentially significant source of employment generation. However, the negative side may include a sense of isolation for HBBs and the possibility of business failure. Important consideration needs to be given to these impacts and the value to quality of life in the community that could be gained.

2. Knowledge Intensive Industry Cluster:

In the first section of this report the importance and strong worldwide growth of knowledge intensive industry (such as IT, biotechnology, advanced manufacturing) was highlighted. For Penrith it is recommended that initiatives are developed to promote and create knowledge intensive goods and services and to make these types of firms a target in future development strategies. The choice of this specialist cluster would depend on further assessment of Penrith's existing strengths and opportunities. A knowledge intensive industry cluster can comprise different types of organisations. At one level are major exporting enterprises such as software, aeronautical, and electronic instrument manufacturers. The next level provides the exporting layer with specialised tools and services. The third layer provides general support services.

IT Opportunity 4: E-Commerce

Electronic Commerce (E-Commerce) is any type of business transaction or interaction in which the participants operate or transact business or conduct their trade electronically. E-commerce, using the Internet, is a new way of advertising, buying, selling and in some cases, delivering goods and services. It is already clear that e-commerce will bring significant changes to business, consumers, government and the economy.

Importantly, between one third and one half of Penrith firms are using e-commerce as a value-adding application of the Internet. However, it appears that few businesses are regular users of e-commerce and that Penrith is behind national averages for this application.

The less regular use of e-commerce, within Penrith firms, constrains business from participating in a new form of doing business. This can also have financial consequences. For instance, a pilot study on e-commerce (NOIE, 1999) estimates that widespread national adoption of e-commerce could have a national net impact that could increase output by 2.7% and enhance consumption by \$10 billion.

The patterns reported in national surveys (ABS, 1998, 1999, IDC, 1999, Yellow Pages, 1999) indicate that computer use and Internet access in business and households is increasing significantly and although e-commerce is at relatively low levels, the number of businesses using this application is also growing rapidly.

IT&T Opportunity 5: Telecommuting

Findings in this study suggest that there remains a strong potential to develop telecommuting within Penrith. Currently, from the firms surveyed that employ 18,686 people only 67 workers are engaged in telecommuting. This potential, for increased teleworking, is most likely to be first realised in certain roles and occupations such as IT professionals and office/clerical workers, and within industries such as finance, banking, communication services, IT, government and wholesale trade due to the ability to more easily conduct remote business transactions and job functions.

A number of initiatives and programs have been developed internationally, particularly in America, to promote and develop telecommuting. The promotion and development of telecommuting has the potential to grow employment opportunities, particularly with the increasing use of computers and more people becoming aware of flexible work options.

In the a study on teleworking in the United States found the business benefits included employees indicating an increase in work performance and managers supporting this and estimating that there had been a 10% increase in the productivity in their telecommuting employees.

IT&T Opportunity 6: Increase the use of specific software applications

The results of the survey of Penrith industry highlight the significant potential for firms to make greater use of the Internet to:

- network with other business;
- advertise products and services;

- conduct training;
- monitor markets and competition;
- increase business through e-commerce.

These Internet applications were the least used by Penrith firms, therefore they present the potential areas where there can be the greatest actual increase and areas that are viable and appropriate for Internet use.

The IT survey found there is potential for more Penrith firms to use Point of Sale, IT Administration and Billing/Quoting computing applications. These applications were found to be used by a relatively low number of firms, however the firms that are using these applications ranked them as being very important or having a key importance. This may suggest that a number of other companies could also benefit by using these applications.

IT&T Opportunity 7: Increase IT spending in Penrith

According to survey responses no more than one half of Penrith firms spend at least some money on IT in the LGA. This also means that at least half have IT expenditure over the past 2 years that is directed outside the LGA.

Specifically, IT training, IT software and IT services can be targeted as areas where an opportunity exists to get local firms to spend locally. For instance, IT training presents an expenditure area where 69% of Penrith firms spend money outside the LGA. Furthermore, it is found that the majority of firms typically spend at least 80% of their total expenditure in one geographic location, meaning that typically a firm purchasing IT equipment outside the LGA will spend a large majority of their budget outside the LGA.

IT&T Opportunity 8: Developing a Skilled Workforce for the Future and the Learning region

Penrith can create an IT opportunity by encouraging greater participation in IT education and training. This means taking a medium term focus and advocating that a highly skilled workforce would be a significant incentive for companies with IT skill shortages to locate in Penrith. The second issue is to ensure that these workers have the right skills when qualified and that skills can be quickly upgraded. To ensure this discussion and collaboration between local industry and local providers will be vital to develop programs that are relevant to industry. Additionally, new programs will be vital for producing skills for emerging knowledge intensive industries such as photonics, high performance computing and e-commerce.

The Australian Computer Society has released a number of documents (see <http://www.acs.org.au>) outlining core skills for IT professionals, which can provide an appropriate guide for many providers. Michael Hedley (1999) from the Australian Information Industry Association believes that business need both a level of the technical expertise and also 'soft skills' including team skills, good communication, and an understanding of business. Further, Hedley points out that the supply of IT places must match the demand that is generated in a LGA. All Registered Training Organisations have a significant role to develop programs and work with industry to assist in developing IT skills in the LGA. Industry must also actively participate and/or conduct IT training.

Local residents and local schools need to be made aware of opportunities in IT, both in the local area, through placements and through sites such as Ignite (<http://www.ignite.net.au>) and the National Training Information Service (<http://www.anta.gov.au/ntis>).

The main findings in this report highlight the importance both of increasing local enrolments in school, TAFE and university level IT courses and increasing the amount of IT training conducted by business. This strategy can also assist in the development of a learning region that is based on social or collective learning processes. This would also focus on increased training and awareness in the wider community and in developing programs to achieve these outcomes.

In 1996 Penrith had a small number of IT professionals working in the LGA compared with other LGAs in Western Sydney. Part of becoming a recognised centre of excellence in IT will involve developing and attracting IT professionals.

Strategies to achieve this may include:

- Targeting IT graduates from local organisations such as TAFE and UWS
- Developing marketing material to be used in employment packages.
- Encouraging UWS and TAFE to incorporate modules in programs that deal with small business start-up strategies for graduating students.
- Targeting IT professionals that are residents of GWS.
- Attracting higher female participation in IT courses

Action Plan

In the preceding section a range of IT opportunities are outlined. In the following section further detail is provided in Action Plans to support and develop these opportunities.

IT&T Actions Plan 1: Development of an IT&T Business Register/Database

Currently, a general business register for each LGA is researched and compiled by the Australian Bureau of Statistics. A number of councils have also undertaken their own research to compile detailed registers for LGAs and/or sub-regions.²⁹ An IT&T register/database for Penrith would be designed to help individuals, companies or government organisations:

- identify local sources of supply for specific IT goods
- identify local IT supply capabilities
- identify potential clients
- identify potential partners for joint ventures.

The register may be financed partly by government, by industry associations and also through advertising space.

²⁹ An example of a well-produced Register is provided in the *Geelong and Surf Coast Manufacturing and Processing Register*. This profiles 455 companies, and represents approximately 90% of the total number of this type of company in Geelong.

Penrith could use a register of this type that will provide IT business information to existing and potential firms and this information can be added to Penrith City web-site(s). This would allow Penrith to provide additional information on IT&T to companies that are increasingly being exposed to type of publication.³⁰

Information that is collected through the completion of a Register, of IT&T businesses, will build on and add to the information obtained through this IT Audit. The information presented will also assist in attracting new IT investment to Penrith and in promoting increased local spending by local firms and households. The information obtained in the Register could also be able to be used by the Networks Coordinator recently employed by Penrith Council. Networking agents are able to work with Australia's major IT&T users to identify innovative business and technology solutions that give them competitive advantage implemented by SMEs in the LGA.³¹

IT&T Actions Plan 2: Development of IT Contact Networks

Penrith has a number of well-developed contact networks and initiatives that can support and develop the city's IT capacity.

Examining the programs used in regions that have become recognised centres of excellence in IT proves that all have a strong contact network theme. For Penrith a number of networks are highlighted that can be developed further.

University-Industry Network for promoting stronger links with the R&D organisations (RDOs).

The IT engine room: SMEs in Australia's IT&T Industry found 78% of firms surveyed never visit RDOs. However, RDOs are often undertaking cutting-edge research and also have a strong potential to create spin-off companies.

The opportunity also exists in Penrith to cluster SMEs with common technology interests around a RDO as a 'virtual incubator'

Within Penrith the University of Western Sydney has an important role to continue to develop and strengthen links with IT&T firms, particularly SMEs. The University has developed a number of innovative programs to link local business, UWS students and researchers. Within the University further opportunities would emerge as the result of programs to promote and fund IT&T and SME business development.

Industry associations and industry within Penrith will also need to continue to take a pro-active role in advocating partnerships, promoting awareness and collaborations with research organisations particularly UWS, and others including CSIRO and other universities if applicable..

Business Facility Network to drive and act as stakeholders in the development of joint facilities and promotion of collaborative projects.

³⁰ Councils include Gold Coast City Council that is currently administering and producing a similar register of IT&T companies in the Gold Coast. Wollongong City Council has also completed a similar project. The Northern Rivers has an IT web-site at (<http://www.nrit.com.au>). Ballarat has released a 2010 plan for IT. The Central Coast has also recently released an IT Strategy.

³¹ IT engine room, DCITA 1999.

There is national evidence that there is a strong willingness for IT SMEs to share a number of important activities with other SMEs³². Over 65% of IT SMEs in a 233 firm sample indicated their willingness to share the following activities with another SME.

- Technology Information (73%)
- Joint R&D (70%)
- Management Information (69%)
- Export Channels (77%)
- Facilities and assets (65%)

In particular, there is the strong potential, in Penrith, for activities that aggregate non-competitive functions such as sharing export channels and infrastructure that are open to partnering and clustering between SMEs. Additionally, this evidence suggests that IT&T SME executives are happy to share management information and their experiences to leverage each others' successes.

Community Networks

Potentially one of the most important networks that can be developed in Penrith is a community network. Examples of these types of networks are provided in the Smart Cities program in California, the West Finland Alliance and the PARADDIS³³ project in the EU. Penrith has already made significant advances in this area with its own Smart City site (see Chapter 3 and/or www.smart-city.com.au).

The West Finland Alliance aims to promote democratic, social and economic progress by developing the information society. In this context, IT is used to improve services and government information, decrease regional displacement and satisfy business needs and to promote the competitiveness of local enterprises.

Further development of ***Business - Business Networks***

Business Networks can be further developed for both the IT&T industry and IT in industry. The existing business networks such as the Penrith City Chamber of Commerce and Industry and the Business Enterprise Centre operate successfully in Penrith and IT networks can be used to drive projects. IT business networks can operate at low cost by using virtual networks. These business networks can focus on developing and promoting IT capacity and trade within and between businesses.

Increased utilisation of ***Business – Government Networks***

Governments are progressively providing more services on-line. For example, the State government is funding a range of government projects to support the provision of on-line services. Within Penrith there is potential to increase the involvement and role in Business – Government Networks. Currently, the main body is an EDEC IT sub-committee. Business and government need to continue to work collaboratively, identify new needs in the city and drive IT projects.

IT&T Action Plan 3: Develop and Promote Online Services

Penrith LGA and Penrith Council are becoming well-recognised for national leadership in the provision of on-line services. As such, there is increased scope for promoting the “Smart City” theme and the services

³² Survey results presented in IT Engine Room, DCITA, 1999.

³³ The Project for Applying Regional Applications for Developing a Democratic Information Society (<http://www.dmi.tut.fi/paraddis>)

that are available to residents, business and the community. There are also significant opportunities to help promote the profile and identity of Penrith outside the LGA. In particular IT workers are individuals that, in general, would need to be 'attracted' to the area. Discussions with a number of IT professionals and focus groups suggest that many people view the Lane Cove-Ryde corridor, ATP and major IT&T companies as the areas for IT professionals. Providing, and referring, to on-line information that promotes the Smart City theme, details IT initiatives and schemes in the LGA and provides lifestyle information, will assist in promoting a high-tech image for Penrith. Firms could also be allowed the opportunity to utilise this type of material in recruitment and selected marketing (for example a Smart City partners theme).

Businesses in Penrith also need to be encouraged and made aware of the opportunities of on-line services. This project found that 70% of Penrith firms with a PC are connected to the Internet. This is higher than the 50% of employing businesses with PCs reported in a national ABS survey. To develop this advantage there must be a strong drive for businesses to become IT users and have an active involvement with on-line products and services.

The provision of e-information is potentially a suitable first step that can be promoted to a majority firms, before the adoption of e-commerce is 'sold' in specific product markets.

IT Action Plan 4: Promote Regular Use of E-commerce

The industry survey found that between one third and one half of Penrith firms use e-commerce. However, a much lower proportion of firms use e-commerce applications on a daily or weekly basis. The various explanations for this finding include that Penrith may have been a late starter in IT adoption and/or that there are specific barriers to the adoption of e-commerce. Given that there are specific barriers to the adoption of electronic commerce strategies will be required to overcome these. Barriers include perceptions of the product not being suited to a business. These barriers may be removed by developing strategies such as a system which enables firms to evaluate customer needs, and overcoming lack of knowledge by providing specific courses at local education providers such as TAFE and UWS.

Additionally, an education program must be initiated that is directed to all business and should, at the very least, mean that each enterprise carefully examines and/or seeks advice, on whether and how the internet and e-commerce could benefit their business. This may involve promoting improved contact between business and IT vendors, promoting programs through business functions, and increasing the awareness of government services and on-line payment options.

IT&T Action Plan 5: Develop IT&T Promotional Material and Promote IT&T Events

Penrith Council currently produces marketing material for business development purposes. It is recommended that 'IT&T development' material is produced and released with these folders. This would be consistent with the aim of becoming a recognised centre of excellence in IT. This information can be used for general release and also to strategically target organisations that will have an involvement (active or passive) in the Games. The focus of this information will be to use the pull of an Olympic venue and associated events and to encourage companies to spend additional time in the LGA, or to include Penrith in their Olympic itineraries for the purpose of a business visit.

Conferences, Summits and Expos are events that have the potential to contribute to economic development and the profile of IT&T capacity in the area. The first major IT conference in the region was held in 1999. This event, *Advancing Information Technology in Western Sydney*, was organised by the Office of Western Sydney and contributed to the development of a number of key IT action areas for GWS. A number of Penrith organisations participated in the event. IT events and conferences are also organised by Industry Associations such as the Australian Computer Society (ACS), AIIA (Australian Information Industry Association) and the AIMIA (Australian Interactive Multimedia Industry Association). Penrith can promote involvement in these events as appropriate.

Focus groups have highlighted a remaining opportunity for Penrith to hold a low-cost business development and IT awareness event(s) to profile local firms, learn about others' approaches to technical issues, form alliances and promote and explain the IT infrastructure of the LGA. There is a vital importance to structure any such event as both an IT conference and a significant opportunity for economic development. Participants must be able to obtain information, and contacts that they can use to grow their own business and/or use as an incentive to examine Penrith as an area for future investment. Importantly, there also needs to be a strong emphasis on Penrith, and in discussing new opportunities and strategies or details about implementing these.

IT Action Plan 6: Develop Information and Technological Infrastructure

To become a centre of excellence in IT Penrith needs to further develop its information infrastructure, telecommunications and technological infrastructure. This includes:

- Technological infrastructure such as training and marketing boards can be developed in Penrith based on the specific collective needs of local firms. This collaboration between firms may need to be initiated by public sector support.
- IT&T infrastructure, that can be grouped into three categories.³⁴ These are:
 - telematics: including on-line administration, tele-medicine, tele-education, tele-working and infrastructure to enable these processes;
 - generic Services: such as Internet services, databases and data networks;
 - basic networks and telecommunications infrastructure: telephone networks, mobile networks, and ISDN.

Other information infrastructure that will continue to be developed should include high speed low cost connections, increased use of high bandwidth cabling for appropriate industries, increased access to computing equipment at community centres.

Penrith may also find interest in examining the infrastructure programs of other areas and research conducted by international centres such as the Virtual Academy of Local Government Studies (VALOGOS) in Finland. The project team can provide these contacts, alternatively information is available on the Web.

³⁴ Alabau 1997, Telecommunications and the Information Society in European Regions, Telecommunications Policy, Vol.21 No. 8 pp 761-771.

IT Action Plan 7: Promote More Mature IT Management Practices

Mature IT management practices are increasingly critical for business efficiency and effectiveness. High levels of IT maturity ensures IT provides real business value to an enterprise.

Approximately 1/3 rd of Penrith firms currently undertake “reviews of business needs, reviews of IT to meet customer needs; IT security procedures and have developed IT plans and strategies” often or very often. This suggests that their level of IT maturity is relatively advanced. However, equally a significant number of firms (40% of firms that undertake these activities never or rarely) need to undertake these practices more frequently.

There is also scope for increasing the proportion of firms that practice disaster recovery procedures and conduct assessments of IT use by competitors. The majority of firms have not reached mature levels in these two areas and are participating rarely or never in these practices.

IT Action Plan 8: Develop Programs to Overcome Barriers to IT

Analysis of survey results identified five important reasons for Penrith firms not to use IT. These reasons are:

- Not suited to business
- Lack of knowledge
- Cost
- Don't need it
- Time.

Three of these responses are of particular concern and also have potential solutions.

- i. The first two are that businesses perceive that they don't need IT and that businesses believe that IT is not suited to their business. As stressed throughout the report, IT is an imperative for all businesses. To overcome this barrier firms can be informed of successful case studies in Penrith, informed of mistakes to avoid, be encouraged to participate in a business network, be presented with reading material and publications (such as NSW Small Business Development Corporation, 1999, brief on Information Technology for Small Business) and/or information outlining trends in IT usage and opportunities in the IT area.
- ii. Develop programs for late industry adopters of IT.
Examining survey results from Penrith firms identifies Accommodation, Cafes and Restaurants and Retail Trade as late adopters of IT. There is potential for a number of specific initiatives to be developed to target these industries and/or to provide a focus on acquiring IT and using IT.

IT Action Plan 9: Minimise IT Skill Shortages

In Penrith the majority of respondent firms (56%) are not currently experiencing a shortage of IT skills. However, 44% of Penrith firms have indicated that an IT skills shortage exists in the LGA. These firms have indicated that this shortage is equivalent to over 3,000 positions. This situation must be addressed in Penrith to prevent this from becoming an impediment to the growth and competitiveness of local industry.

Specific IT roles that are identified as having the highest number of positions were:

- IT support
- Network Management
- Technical Hardware
- Programming and Systems Analysis and
- Software and Applications.

These skill shortages can be addressed in three ways through external training, through internal training or through additional recruitment.

External training was discussed above and the identified skill shortages indicate that additional training may need to be developed that cover these skill areas.

Internal training is conducted by a large number of firms in Penrith. However, the most frequent types of IT training received by employees over the past 2 years were software use, Internet, data entry and hardware use. This may suggest that firms need to develop new internal programs or that there is an opportunity for external providers to present firms with training packages that build these skills.

Strategies for external recruitment were discussed previously and firms, either individually or collectively, are in the best position to target certain types of IT skills.

Enhancing IT Capacity and Establishing Penrith as a Centre of Excellence in Information Technology

The following section examines the components of 4 specific action agendas that Penrith's key stakeholders can become involved with to enhance the existing IT capacity. It also presents a number of initiatives that can be developed and applied within these to promote the city as a centre of excellence in IT.

In presenting these action agendas the team has taken into consideration a number of factors. These include the current gaps and strengths in IT capacity; appropriate mechanisms for sharing intellect and resources; the IT opportunities and IT action plans appropriate for the LGA and the local stakeholders that will be involved in engaging these action agendas.

The action agendas are intended to draw out and concisely present a number of major themes, findings and recommendations from the report, plus identify the main organisation(s) to be involved in each initiative.

<p>Industry Actions</p> <ul style="list-style-type: none"> • Promote of the importance of IT. • Increase the regular use of e-commerce and Internet for value-adding. • Develop technological infrastructure. • Involvement with initiatives to overcome barriers to IT. • Develop active training program to overcome IT skill shortages. • Attract new IT professionals. • Develop flexible working practices. • Involvement in industry networks collaboration and other initiatives to support innovation. • Use new IT applications and develop increasingly mature IT practices. 	<p>Government Actions</p> <ul style="list-style-type: none"> • Business Development • Develop, promote and expand the SmartCity website. • Develop initiatives for industry development strategy – involving increasing the IT capacity of existing firms, promoting new start-ups and attracting new IT companies. • Develop a business register for technology companies • Produce and release IT marketing material • Develop IT infrastructure – particularly through provision of services, zonings and smart building codes • Community Development • Increase numbers of public access computers and Internet connections • Develop public domain for increased community input and increase linkages for dissemination of information • Continue to develop internal IT systems and get appropriate services on-line • Provide funds to support community IT projects
<p>Infrastructure Actions</p> <ul style="list-style-type: none"> • Develop Technological Infrastructure • Develop of Information Infrastructure iv. Telematics v. Generic Services vi. Networks 	<p>Education and Training Actions</p> <ul style="list-style-type: none"> • Develop IT skills • Produce knowledge workers • Facilitate the development of a learning region • Increase enrolment and improve IT courses in schools • Develop new IT courses or contents within R.T.Os • Improve linkages between R.T.Os and industry • Increase training within industry

Industry Action Agenda

The project has shown that new technology, particularly information technology, is changing the way business is conducted. Industry associations (such as the PCCI, BEC and PDBAC) and other business networks must promote IT as presenting new opportunities for business growth. This may include developing internal applications, through case-studies, workshops, newsletters and/or conferences and meetings. This may also be promoted through increased networking around technology events.

Empirical evidence shows that IT can be used in the creation and development of new products and to support and speed up innovation. The industry survey found that Penrith firms already have a high adoption of IT equipment firms, however the finding of lower regular use of e-commerce and Internet indicates that firms must now increasingly use this equipment to add business value.

Government, training providers and suppliers can help facilitate this process, however the drive must come from industry itself.

This project has identified a number of direct barriers to the optimal use of IT within firms. These include: cost; lack of knowledge; perception that IT isn't needed or isn't suited to a business; IT skill shortages;

lack of knowledge of research in IT conducted with research institutions; and a low number of IT professionals.

It is within these areas that organisations outside 'industry' can have the greatest impact, nevertheless firms must drive and/or at least be involved in the initiatives.

The development of technological infrastructure within Penrith is an important step for firms to meet their collective needs. This is infrastructure that firms provide collectively, such as marketing boards, export channels, training enterprises to meet their own needs. The industry associations are an appropriate mechanism to co-ordinate this development.

Industry must also take the lead in minimising IT skill shortages. The industry survey found that the main forms of IT training were skills learnt totally on the job or company provided training. These skills are most likely responsive and relevant, however they may also have limited transferability or be constrained in anticipating future demands. Industry has a number of options in providing IT skills to its employees, including unstructured and structured training and linkages with external training providers. This emphasis on training also becomes a key to the increasing knowledge intensity within industries, such that workers are now expected to function more autonomously, work as part of flexible teams, solve problems, use new technologies and think more creatively. Through the training that industry and employees undertake these skill areas need to be developed. This will involve the development and/or use of within Penrith of IT training packages, training competencies and also generic skills. Having a strong training culture within Penrith firms is a partial solution to meet skill shortages.

A second part of the solution is to attract new workers to vacant positions. There are two major talent pools identified in the report. The first is local university graduates and the second is IT professionals in Greater Western Sydney.

The further involvement of local industry in offering IT related placements, research projects and work experience provides one mechanism to attract local graduates. The involvement of firms in using an IT register and IT marketing material (both discussed below in the government action agenda) to promote the area could also assist in attracting IT professionals. The later education and training action agenda also provides details about initiatives involving education and training providers.

Penrith firms are also responsible for determining appropriate IT applications and IT management practices. This report found that there is a potential opportunity for more firms to use specific applications such as Point of Sale, Billing/Quoting Software and IT Administration Software. The introduction of the new tax system has the added potential to make these types of applications essential.

The IT management practices of Penrith firms can also be improved. Firms in Penrith may progressively take on mature IT management practices, particularly if Penrith firms are late starters in IT adoption. Consequently, the adoption of more value-adding IT applications and improved IT management practices should occur overtime. To increase the speed of this process industry associations and Penrith Council and other organisations such as the Penrith and Regional Chambers of Commerce can continue to provide information and host events to promote these activities. Further, the increased networking promoted through these events may assist better links between firms and suppliers.

In these processes industry obviously also needs to maintain a customer focus. The initiatives that businesses support and the speed of change should be guided both by economic imperatives and the needs of customers. This involves understanding current customer needs and also future customer needs. A

number of businesses have even participated in customer training to assist customers in dealing with the company.

Firms may also be able to make themselves more attractive to potential and existing employees, through flexible working structures. A major step in this area is to create opportunities for teleworking. The Penrith industry survey found (0.3%) of workers were telecommuting. Studies in the United States have estimated that managers in companies with teleworkers reported productivity increases of at least 10% amongst these employees. Penrith firms have an opportunity to increase productivity and increase the accessibility of certain jobs through telecommuting.

Individuals within local firms also make choices about where the IT expenditure of their firm is spent, although this may be a choice constrained by the local availability of IT products and/services. It is important for Penrith firms to actively pursue opportunities to purchase IT goods and services locally where possible. The preparation of an industry database and attraction of new suppliers of IT, where necessary, may also assist this process.

Industry associations can also assist in development within Penrith by facilitating access to venture capital. This may involve direct contact with venture capital associations and/or brokering opportunities with venture capitalists. Industry may also become involved in this process by attending trade expos and trade missions.

Penrith industry also can become more involved in creating structures or pursuing opportunities for collaboration and interaction within and between firms. Pursuing these opportunities may involve:

- increasing the geographic concentration of firms (i.e. clustering)
- examining opportunities for vertical and horizontal integration
- promoting flatter organisational structures
- encouraging more team-based work practices
- engaging in some R&D or product and service improvements
- using IT for the exchange of information and for the demand and supply of goods and services
- encouraging interaction through the design of shared conference and meetings facilities
- attending networking events
- attending IT events and meetings.

Government Action Agenda

Government can pursue and support a number of IT initiatives. The following section outlines a range of actions that Penrith Council can pursue to assist in achieving the objective of becoming a centre of excellence in IT.

The SmartCity site provides a key area through which an increased amount of information can be provided. This site is currently being developed and expanded and can be promoted as both a reference point for business and the community and a benchmark for other organisations. The development of this site needs to be accelerated.

Council also has a central role in new enterprise attraction. The positioning of Penrith as an IT centre will require the growth of existing firms and the attraction of new IT firms. Both types of enterprises will need to be targeted in future development strategies. This may be facilitated through the development of:

- A business register focusing on IT
- IT marketing material
- Continued development of IT infrastructure – including the latest communication links
- Hosting of business development and involvement with networking events
- Special zonings and smart building regulations
- Local participation in major IT conferences
- Representation for State and Commonwealth IT funding
- Continued collaboration with research, education and training institutions and other local organisations.

The council also has a key role in promoting IT within the wider community. This may involve:

- Providing increased public Internet access and computers in public facilities, such as libraries and community centres.
- Providing competitive funding for local community IT projects
- Increasing awareness of funding opportunities and application mechanisms.
- Continuing to develop IT systems internally and move appropriate government services on-line.
- Promoting easy access to social and community organisations and quality of life assets.
- Fostering functional linkages between public and private agencies that can secure effective dissemination of IT information.

The United Nations Centre for Human Settlements provides a number of relevant examples of best practice IT initiatives developed by government organisations. Projects of this type have the potential to assist Penrith to

“provide better links across the local community while at the same time enabling access to wider national and international resources. Existing social infrastructure ... can be strengthened and enhanced.” (DCITA, 1999).

The Western Valley Development Authority developed one such initiative in Canada. The objective of this project was to establish a new community-based partnership linking government, the private sector, and other non-governmental organisations through a single economic development structure.

The strategy, that is also particularly relevant for Penrith business development, involved the establishment of an economic strategy for the region based upon the two pillars of environmental sustainability and information technology, positioning the region for the 21st century. The projects undertaken as part of this strategy were highly visible and concrete and have achieved a reduction in unemployment and a significant increase in business start-ups.

The second scheme and best practice initiative that is particularly relevant for Penrith in relation to community development, comes from the UK. This is the Innovations in Local Governance Electronic Initiative (LOGOV). The project is aimed at providing a worldwide, accessible and low-cost communications platform. This is to be used for the effective exchange of information among those

interested in the promotion of democratic, efficient, accountable and responsive governance at the local level.

Government involvement in IT initiatives within Penrith can focus on both industry development and community development. Part of this will also include the promotion of the image and lifestyle factors offered by Penrith and in generating a shared vision and a sense of excitement in the IT development of the city.

Infrastructure Action Agenda

Penrith information infrastructure is developed by both industry and by government. Both parties need to work collaboratively in developing infrastructure with a view to enhancing the area's IT capacity. Information infrastructure needs to be viewed in much the same way as the 'traditional infrastructure', such as roads, pavements, and bridges. Consideration needs to be given to improving access and providing connections to markets and in also in terms of the increased economic and social vitality of an area.

To become a centre of excellence in IT Penrith needs to further develop its information infrastructure, telecommunications and technological infrastructure. These include:

- Technological infrastructure such as training, marketing boards to meet the collective needs of local firms. This collaboration between firms may need to be initiated by public sector support and is intended to build the area's knowledge distribution capacity.
- IT&T infrastructure, that can be grouped into three categories.³⁵ These are
- Telematics: including on-line administration, tele-medicine, tele-education, tele-working and infrastructure to enable these processes.
- Generic Services: such as Internet services, databases and data networks
- Basic Networks and Telecommunications Infrastructure: telephone networks, mobile networks, and ISDN

Other information infrastructure that will need to be continually developed should include high speed low cost connections, increased use of high bandwidth cabling for appropriate industries, increased access to computing equipment at community centres and education training opportunities.

Education and Training Action Agenda

Education and training providers within Penrith have a vital role in developing a competitive and appropriately skilled labour force. In the field of IT these skills need to be responsive to industry demands, both current and forward focused, and include generic ('soft skills') such as communication, team work and critical thinking.

A number of local organisations – such as the Chamber of Commerce, the TAFE and UWS together with other GROW supported projects have developed initiatives to help address some of these skills issues and to increase the employability of residents.

Nevertheless, there is an important opportunity for post school training and education providers to develop courses and/or improve links with industry to meet the identified IT skill shortages. These new courses

³⁵ Alabau 1997, Telecommunications and the Information Society in European Regions, Telecommunications Policy, Vol.21 No. 8 pp 761-771.

can particularly focus on skills in Software Development and Software Use; Programming and Systems Analysis; IT Support; Technical Hardware and Network Management.

In addition to these specialist IT skills the industry survey highlighted that the majority of firms nominated Accounting, Word Processing, Database and Spreadsheets as the IT applications with a key importance for their firms. This suggests that these skills also need to be taught within the LGA. Particularly, with a large amount of training expenditure from Penrith firms being spent outside Penrith, training organisations must examine the IT applications of key importance and ensure that these skills are provided in the City.

To assist in overcoming the small number of workers in IT occupations in Penrith UWS is committed to continue to develop new knowledge workers. There is an opportunity for many of these graduates to have exposure to industry in Penrith through an involvement in work placements and/or by a company's support of student research awards. The University is also pro-active in the development of GWS as a learning region. Practically, this involves collaboration between a number of organisations and industries so together there is the provision of excellent education across all skill levels.

UWS should also investigate the development of new IT courses and program strands and the opportunities for funding research specifically directed toward IT. UWS will also need to continue to promote increased interaction with SMEs and in the context of this project continue to increase awareness, visitation and links with SMEs interested in IT.

Additionally, UWS can look at methods of increasing female enrolment in computing, IT and engineering courses, which are found to be at low levels nationally.

Overcoming the somewhat lower proportional levels of enrolment in computing at schools in Penrith will certainly mean increasing IT enrolments. This is an action agenda that can be taken up within each school and may involve developing programs more attractive to students such as web design, Internet and graphic design, 3D, animation, digital and music media and programming. To address low female enrolments in IT schools can also become more active in targeting girls, this can involve changing perceptions of IT amongst school students. Schools can also promote increased use of IT across a range of subjects – this has the potential to introduce students and teachers to the capabilities of different technology. Part of the education process will also involve providing opportunities for teacher training, a number of areas in the United States such as Washington provide examples of how this can occur.

Conclusion

This audit of IT in Penrith has identified strengths, weaknesses and opportunities for industry development that will lead ultimately to increased employment in GWS. The suggested action agendas outlined above, as well as the knowledge contained in the rest of this report concerning the development of IT applications to business and industry, provide a blue print for Penrith to establish itself as a 'smart city' with global reach and impact. The report also provides a set of strategies that other cities might consider to facilitate IT uptake and high technology employment growth in their regions.

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