Knowledge Management and Innovation in Service Companies – Case studies from Tourism, Software and Mining Technologies

STUDY FOR THE DEPARTMENT OF INDUSTRY, TOURISM & RESOURCES

by

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Authorship

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Disclaimer

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Executive Summary

This project was commissioned by the Department of Industry, Tourism and Resources as part of a larger project for the Organisation for Economic Co-operation and Development (OECD). The aim of the project was to examine the role of knowledge-intensive service activities in innovation, by obtaining qualitative data on innovation in the tourism, software and mining technology industries. More specifically, the project focuses on the decision-making processes which lead the case study firms to outsource some components of their innovation to knowledge-intensive service providers.

Eighteen case studies were completed (six tourism firms, six software and six mining technology firms). Participants were drawn from most States and Territories and from regional and metropolitan areas. Firms ranged in size and age. In general, IT firms chosen for case studies were the youngest and smallest in the sample, with tourism firms second and the mining technology firms the oldest and largest.

In this report, the case studies illustrate use of external and internal services to support incremental innovation. Only a small amount of turnover is spent on knowledge-intensive services, however they can play an important role in introducing innovations into the firm. Across the tourism and IT sectors, smaller firms are more likely to use more tailored services. It was generally observed that, while most tourism and IT firms embraced innovation to improve internal processes, mining technology firms innovated to add value to both internal processes and to the services the offered to their clients.

During interviews it became obvious that companies were outsourcing services for different reasons. We developed the following framework to describe the different drivers for outsourcing:

- Compliance, where firms use external service providers to ensure that they comply with regulatory or taxation regimes. These services are most likely to be provided by accountants, lawyers and quality management auditors.
- Routine, where firms purchase standardised services for routine matters. These may include some types of market research (e.g. purchase of reports on markets), legal services (review of standard contracts), sales (relationships with ITOs or resellers), IT (maintenance of computer systems and networks) and accreditation (quality assessors for ISO accreditation).
- Tailored, where the service was modified to suit the needs of the client. For example, tailored surveys of customers, one-off design of new equipment or installations and legal advice on specialised contracts.

Innovation

The tourism and software firms interviewed for this study all demonstrated the importance of the initial concept (e.g. an idea, a location) developed by the company as the key “radical innovation”. Most of these firms were the first business of their kind in Australia. The mining technology firms, in contrast, were quite diversified and had built up a business around providing a range of services to mining industry clients, many moving into product development in response to opportunities. For these firms, the main innovations centred on service scope and and the product/service mix, rather than internal company operations.

Tourism firms relied on a stable core product (often based on the assets of a particular location) as the cornerstone to their success. However the firms modify

their products and services in response to changing customer demands, other external influences and management drive.

IT firms were more likely to actively modify and grow their products, in response to changing market opportunities and changes in technologies. The IT firms were also often heavily focused on international markets, so they had to take a more global view of their competitors and strive to distinguish themselves at the global level.

Mining technology firms relied on a range of services that had been developed over time and perhaps enhanced by being formalised into products such as software. Their drive to modify their service was based more on changes in market opportunities and technologies which enhanced their service delivery. Mining technology firms were mainly focussed on national customers and had variable experiences of exporting.

Across all the three sectors, customer feedback about products and services played an important role in driving some aspects of innovation within the firm. Management of the firms, however, also had a major part in determining which changes to make in response to customer feedback and other environmental pressures.

Differences between case studies in the three sectors were also apparent. IT firms were more likely to use an Advisory Board to seek external information and to enhance their personal networks and also relied on their technical staff for input on technical issues. Tourism firms also made some use of personal networks but these operated at a national rather than international level. Mining technology firms used their technical staff as the main gatekeepers plus word of mouth contact with clients in relation to obtaining information from outside the firm.

The participating tourism firms did not perform formal R&D and were not likely to have any formal relationships with R&D institutions. In contrast, IT firms were more likely to be associated with an R&D institution with four of the six case study firms having been either spun off from or having founder associations with R&D institutions. R&D played a very critical role in the mining technology firms. Most of the mining technology firms did their own R&D but few had formal relationships with R&D institutions because of competition with these institutions for clients.

The role of staff in innovation amongst tourism firms was limited. This was likely to be result from the large numbers of casual staff with only basic training and usually only working for the firm for a short period of time. Management teams were more likely to be responsible for scanning the outside environment, generating ideas and implementing them. In contrast, IT and mining technology firms had higher proportions of permanent, tertiary-qualified staff who were expected to use their professional networks and remain aware of new technology trends to obtain information from outside the firm and therefore play a greater role in innovation within the firm.

Use of Knowledge-Intensive Services

Within the participating firms across the three sectors, the amount spent on external knowledge-intensive services was low. The value obtained from the services was, however, often significant in the development of the company. Reasons for using outsourced services cited by the case study firms commonly centred on the need to obtain special expertise or to have someone external to the firm provide a service for reasons of compliance or for objectivity.

IT firms were more likely to outsource business planning, capital raising and operations than were tourism firms. Tourism firms were more likely to outsource advice on R&D, product development, establishing offices overseas, accreditation,

training and establishment of IT networks. Mining technology firms, on the whole, outsourced very little – mainly HR and IT networking services. They relied on informal technical networks and their own internal skills more than firms in the other two sub-sectors. Project management was the only knowledge-intensive service that was not outsourced by any of the participating case study firms.

Participating firms in IT and tourism used knowledge-intensive services to make changes within their firms. IT firms were more likely than tourism firms to use knowledge-intensive services to acquire knowledge and skills and had to ensure they had systems in place to capture the knowledge and skills they gain. Tourism firms appeared to use the knowledge-intensive services to implement capital expenditure decisions and to develop facilities. Mining technology firms tended to use knowledge-intensive services to acquire expertise in areas that are not already available in-house. These mainly included legal, accounting/financial and recruitment services.

Conclusions

These case studies have illustrated a range of use of external services by a small selection of IT, tourism and mining technology firms in Australia. Although only a small amount of turnover by value may be expended on these services, they can be essential to the firm's ability to introduce innovations. The most significant finding for the group as a whole was the link between small size and greater use of tailored services.

Introduction

This report forms part of a project being led by Australia for the Organisation for Economic Co-operation and Development (OECD). The OECD decided to examine innovation in services, and the role of knowledge-intensive service activities (KISA) in innovation, because of the rising importance of the services sector and the lack of information about services in policy analysis and practice.[1]

In 2002, Australia agreed to co-lead a project to gain a better understanding of the role of KISA in companies. The other participants in this project were Korea, Finland, Ireland, Japan, Spain, New Zealand, and Norway. Researchers in these countries have completed quantitative and qualitative surveys in one or more of the following sectors – tourism, software, mining technologies and health. To date, these have been published as the following reports[2]:

- *Knowledge-Intensive Service Activities – Facilitating Innovation in the Software Industry – Final report of the KISA-SWC Finland Project*
- *KISA in Korea's Innovation System*
- *KISA and Innovation in the Norwegian Software Industry*
- *KISA in the New Zealand Software Industry*
- *KISA and Innovation in Public Home based Services to Elderly in Norway*

Many of the studies undertaken by the partner countries for this project have examined the bundling of knowledge-intensive services with outputs – for example the production and integration of service activities by firms in combination with manufactured outputs or as stand-alone services.[3] The Australian study, however, examined the role of KISA as inputs to innovation – that is, the role of outsourced services in development of new innovations by the case study firms. Software (IT), tourism and mining technologies were chosen because of the Australian government's interests in these sectors as contributors to exports and Australia as a whole.

The Australian component of this project has been completed in two stages. The first stage comprised a quantitative survey of the software and tourism industries in Australia, conducted by the University of Western Sydney. The second stage is reported here, in the form of 18 case studies of tourism, software and mining technology firms. The aim of this component of the study was to obtain qualitative data on innovation firms in order to illustrate the role and impact of knowledge-intensive service activities on firms, considering their effects on capability-building within firms in different industry sectors and the comment on the complementary nature of publicly and privately provided services.

Theoretical Framework

Innovation

Innovation is usually defined as the introduction of new products and services onto the market. This is an essentially "black box" approach whereby innovation is measured by the variation in outputs from the firm. While it is useful in terms of inter-

[1] Miles, Ian (2002): *RTD Policy Implications for Practice of Innovation in Services Sectors and the Role of Business Services in Innovation* Note for benchmarking group, PREST, University of Manchester, UK

[2] All can be downloaded from http://www.oecd.org/document/43/0,2340,en_2649_34273_15709675_1_1_1_1,00.html

[3] OECD DSTI/STP/TIP(2003)11.

firm comparisons it does little to explain how firms manage themselves internally to achieve change and ensure that it is sustainable.

Governments seeking to support and encourage innovation by firms need to have an understanding of what happens inside – in particular, how the firm organises itself to obtain ideas, and put these into practice in a way that adds to its bottom line. Any changes are likely to be gradual, or incremental. A deeper understanding of how and why these changes occur in innovative firms will provide a better understanding of the basis of innovation and how governments can encourage and support it.

A useful framework for this analysis has been developed by Koberg[4], drawing on earlier work by Herbig:

> "… procedural (management-determined innovations in rules and procedures); personnel-related (innovations in selection and training policies, and in human resource management practices); process (new methods of production or manufacturing); and structural (modifications to equipment and facilities and new ways in which work units are structured)."
>
> Koberg *et al*. (2003: 24), following Herbig (1994)

This definition breaks away from the usual focus of the innovation literature on minor changes in outputs (products or services). Koberg's definition provides a framework for categorising those internal processes within firms that lead to the changed products or services as perceived by the consumer. Koberg's review of the differences between these two types of innovation highlights four key components of incremental innovation — changes to manufacturing or production processes, changes in personnel management, changes in company procedures and structures, and changes in equipment, facilities and work units.

While Koberg's published model is limited to manufacturing, we extended it to encompass new service offerings in a study completed in 2003[5]. The current study has also relied on this framework in the context of change within firms, but has added new considerations of the role of knowledge-intensive services in the economy.

Australia has moved from being a mining-agricultural economy to a strong service focus, with about 70.2% of GDP now drawn from service industries.[6] Bundling of services with manufacturing outputs has also been an important source of innovation and growth in Australia.[7]

These activities have been used to structure the interview guide and focus the discussion during the case study interviews.

Knowledge Management and KISA

The OECD has recently issued a discussion paper on knowledge management, describing it as how organisations track, measure, share and make use of intangible

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[4] Koberg, C., Detiennde, D. & Heppard, K. (2003): *An empirical test of environmental, organisational, and process factors affecting incremental and radical innovation.* Journal of High Technology Management Research 14:21-45.

[5] Thorburn, LJ and Langdale, J (2003): *Embracing Change - Case Studies on How Australian Firms Use Incremental Innovation to Support Growth*, Department of Industry Tourism and Resources, Canberra.

[6] *CIA World Factbook 2004.* http://www.cia.gov/cia/publications/factbook/

[7] AEGIS (2002): *Selling Solutions - Emerging Patterns of Product-Service Linkage in the Australian Economy*, Australian Expert Group on Industry Studies and Australian Business Foundation, Sydney, 2002

assets, and manage knowledge.[8] The four main components of a knowledge management system described in that paper are knowledge sharing culture, incentives to retain employees, alliances for knowledge acquisition and a written knowledge management policy.

Other studies assume that knowledge management is a function of IT and software – these focus on the ways in which firms manage and use information about customers to focus their customer interactions.

The focus of this study, however, is on the decision to use service providers external to the firm for knowledge-intensive services, versus the drivers or capacities that enable the firm to provide these services in-house, and the way that firms use information when they acquire it from outside the organisation. The research base for this approach is derived from studies asserting that the rise in vertical integration and the vertical division of labour in the mid 1900's was replaced by:

a) a social division of labour as specialist service providers arose in regions and clusters of economic activity – for example flexible specialisation of the Third Italy craft districts;[9] or

b) a technical division of labour where firms provide inputs to systems integrators, as in the large IT or manufacturing districts[10] and in the construction industry.

In this case, however, it is not the clustering of firms which arises from these changes in industry structure. Instead, the project is focussing on the decision-making process which leads them to choose outsourced service providers.

Methodology

The project conducted eighteen case studies – six of tourism firms, six of software firms and six mining technology firms. Interviews were conducted in late 2004 and early 2005 and each interview followed an agreed interview guide that was cleared with the Department of Industry Tourism and Resources (DITR) prior to the first interview (Attachment A). This interview guide was developed following a review of the methodologies and issues covered by studies in partner countries and uses some questions common to these studies. It was framed to gather data around innovative activity within the business, focusing on the generation and utilisation of knowledge, but collecting a range of information about subjects. The Australian interview guide was also structured to allow for the particular circumstances of Australian firms and the Australian R&D support system.

Names of potential tourism firms were provided by the Tourism Division of DITR and were also sourced from internet searches of firms which had won awards for tourism innovation. Some names were also supplied by Green Globe 21, an industry group which accredits tourism firms against criteria related to sustainability and ecological impact. This list of firms was discussed with the Department and a shortlist of six firms was agreed, chosen to give a broad representation of the following characteristics:

- type of tourism business (accommodation, tourism attraction or travel management);

[8] *The Significance of Knowledge Management in the Business Sector*, OECD Observer July 2004

[9] Piore, MJ and Sabel CF (1984): *The Second Industrial Divide - Possibilities for Prosperity,* Harper Collins

[10] For example, Florida R and Kenney M (1990): *High Tech Restructuring in the USA and Japan* Environment and Planning 22:233-252

- type of innovation (new product or service, management innovation, training and staff innovation or use of equipment). This typology follows that of Koberg et al, and gives a broader dimension to the concept of innovation as it applies to firms;
- size (small, medium, large); and
- age (range).

The tourism firms selected are listed in Table 1. Location was not used as a selection factor.

Table 1: Characteristics of Tourism Case Study Firms

Name	Location	Type of Firm[11]	Size[12]	Age (Yrs)
Australian Outback Travel Group	Victoria	Tour operator	Large	17
Banrock Station	South Australia	Cafes and restaurants	Small	10
Binna Burra Mountain Lodge	Queensland	Accommodation	Medium	71
Goana Air Safaris	Queensland	Tour operator	Small	10
Skyrail	Queensland	Other transport	Medium	9
Tjapukai Aboriginal Cultural Park	Queensland	Entertainment Services	Medium	17

Names of potential software firms were suggested by the Department of Communications, IT and the Arts and were also identified through internet searches of firms which had won awards for software innovation. As with the tourism firms, a shortlist of six firms was agreed. These firms were selected according to the following criteria:

- representative of a range of target markets (in these cases, markets were education, health, business services, environment and planning);
- type of innovation as above (new product or service, management innovation, training and staff innovation or facilities);
- size (small, medium, large); and
- age (range).

In general, IT firms chosen for case studies were slightly younger and smaller than tourism firms (Table 2).

[11] Following classification in Table 3.1 in Bureau of Tourism Research (1998): *Tourism Business in* Australia – Occasional Paper 34

[12] In keeping with definitions used by the Bureau of Tourism Resources, micro businesses have four or fewer employees, small businesses have between 5 and 19 employees and medium to large businesses have 20 or more employees.

Table 2: Characteristics of IT Case Study Firms

Name	Location	Market	Size	Age (Yrs)
Callista	Victoria	Education	Large	5
Gecoz	Northern Territory	Environment and planning	Small	3
Hatrix	Australian Capital Territory	Health	Small	3
Maxamine	South Australia	Business services	Medium	5
Prophecy International	South Australia	Business services	Medium	24
YourAmigo	South Australia	Business services	Medium	5

Names of potential mining technology firms were suggested by the Department of Industry Tourism and Resources and were also located by internet searching of firms that had won awards for export, customer and employee service as well as innovation.

A shortlist of 6 firms was agreed (Table 3).

Table 3 : Characteristics of Mining Technology Case Study Firms

Name	Location	Type of Firm	Size	Age (Yrs)
Ausenco Limited	Queensland	Engineering and project management services	Large	13
RSG Global Pty Ltd	Western Australia	Mineral exploration and resource consulting		4
SoftRock Solutions Pty Ltd	Western Australia	Computer Services	Small	15
Runge Limited	Queensland	Technical Services and Scientific Research	Large	23
Lakefield Oretest Pty Ltd	Western Australia	Technical Services and Scientific Research	Large	11
Advitech Pty Ltd	NSW	Technical Services and Scientific Research		18

Each firm was approached first by telephone by the consultants, and then formally by a letter sent by DITR. Interviews were conducted face-to-face with the Chief Executive Officer or member of senior management from the companies. Each interview was written up as a case study (Attachment B) and was cleared by the company prior to inclusion in this report.

Definitions

The focus of the interview was on knowledge-intensive services, defined as follows in the context of the project:

- Business Planning
- Legal services
- Accounting and Financial Services
- Capital Raising Services
- Technology awareness (interpreted as technologies potentially of use to the firm)
- Technology trends (interpreted as emerging technologies which may displace the firm's current framework or base technology platform)
- Formal research and development
- Market research (including formal customer surveys as well as broad market analysis)
- Product development
- Project management
- Operations
- Marketing (including advertising)
- Sales (for IT firms this included distributors and for tourism firms this included inbound tourism operators and those selling on commission)
- Export strategy
- Establishing overseas offices
- Performance Benchmarking
- IT/Networking setup or operations
- Staff Recruitment
- Quality Accreditation
- Compliance with Standards
- Staff Training

Although the list above are all "knowledge-intensive", during interviews difference in the type of service delivery were identified. The remainder of this report uses the following definitions for the three types of service level:

- Compliance, where firms use external service providers to ensure that they comply with regulatory or taxation regimes – in Australia, this usually relates to:
    - Accountants' completion of annual company tax returns and Business Activity Statements related to the Goods and Services Tax;
    - advice from lawyers regarding corporate governance and the corporations law; and
    - auditing and accreditation of quality management systems by quality consultants.
- Routine, where standardised services are purchased for routine matters – these included some types of market research (e.g. purchase of reports on markets), legal services (review of standard contracts), sales (relationships with ITOs or resellers), IT (maintenance of computer systems and networks) and accreditation (quality assessors for ISO accreditation).

- Tailored, where the service was modified to suit the needs of the client. For example, tailored surveys of customers, design of new equipment or installations that are one-off in nature and legal advice on specialised contracts.

Validity of Comparisons

This project sought six case studies each of IT firms, six of tourism firms and six of mining technology firms. The similarities and differences in these firms' use of knowledge-intensive services were analysed. Comparisons of the three groups have been attempted but a number of confounding factors mean that it is not possible to be definitive about the reasons for observed similarities and differences between the groups. These factors include:

- Sample size – a sample of six case study firms from each sector is insufficient to draw valid comparisons at the sector level.
- Age – tourism case study firms were aged 22.3 yrs on average compared to 7.8 years for IT firms and 14 for mining technology firms. However the spread of ages within the groups means that they are not significantly different.[13]
- Size – tourism case study firms were had 58 staff on average compared to 36 staff for IT firms and 105 for mining technology firms. As above, the groups are not significantly different.[14]

Location – tourism case study firms were more likely to be in regional cities or more remote locations whereas all but one IT firm was in a capital city. Most of the mining technology firms were located in either Queensland or Western Australia, close to the head offices of their major customers. The comparisons at the end of this report need to be read in this context.

[13] T-test of the samples returns a P value of 21% which is not significant
[14] T-test of the samples returns a P value of 30.5% which is not significant

Tourism Case Studies

Tourism Industry in Australia

According to the Bureau of Tourism Research, a tourism company is one that sells goods or services to tourists. As at 1998, there were over 60,000 tourism businesses in Australia, of which around 35,000 (58%) were micro businesses (<5 staff) and a further 19,500 were small businesses (5-19 staff).

During 2002-03, Australia's tourism industry accounts for about 4.2% of GDP, or about the same amount as the agricultural industries. Inbound tourism is a significant contributor to Australia's balance of trade and accounted for about 11.2% of export earnings in 2002-03 (higher than the export value of Australia's coal, iron, steel and non-ferrous metal sectors).[15]

Tourism is often a major contributor to rural and regional economies. Of the total tourism businesses active in 1998, 42% were in regional areas[16] of Australia.

The tourism case studies were chosen to give a broad overview of different types of tourism businesses. Because of the importance of inbound tourism to Australia's tourism industry, selection of case studies favoured these target groups – four were targeting inbound tourists and two focused on the domestic market.

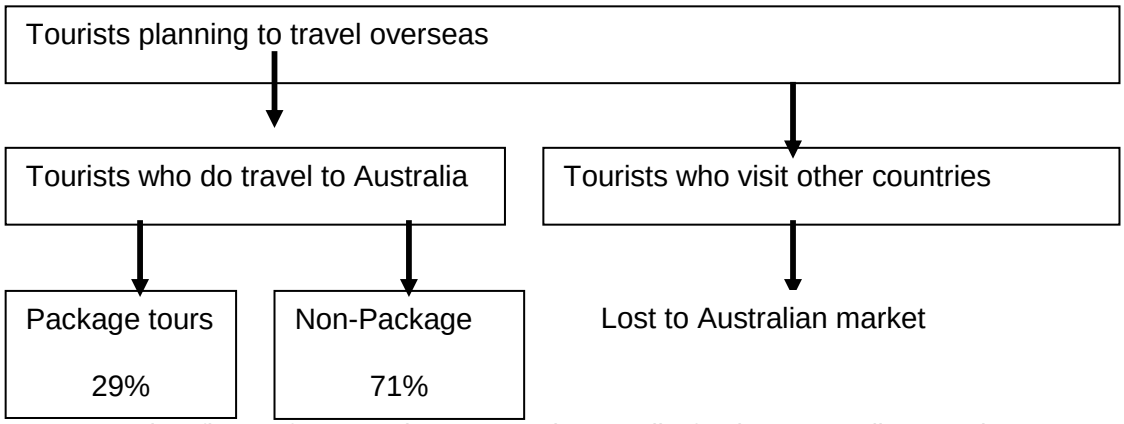
In 2003, Australia's inbound tourism market of over 4 million tourists was dominated by New Zealand (839,100 visitors), the UK (672,800) and Japan (627,700).[17] People from non-English speaking countries account for 60% of inbound tourists.

Market Access

The challenge for any company that is targeting inbound tourists is to reach their target customers at the time that they are planning their itinerary. A significant proportion of Australia's inbound tourists come on package holidays that are arranged well in advance by Outbound Tourism Operators (OTOs) in their home country. These people may make decisions to visit particular attractions well in advance of their visit. The system is described in Figure 1.

[15] ABS Tourism Data, provided by DITR
[16] i.e. outside the State capital cities and the Gold Coast
[17] ABS Tourism Data, provided by DITR

Figure 1:



Source: Tourism figures from *Tourism Research Australia*, for the year ending March 2004.

Innovation in Tourism Case Studies

Many tourism businesses gain their initial competitive advantage from the location in which they are found or the idea on which they are based. In these cases the initial idea is the "radical" innovation that forms the basis of the business (Table 4).

Table 4: Radical Innovations of Tourism Case Studies

Case Study	Key Idea
Australian Outback Travel Group	Tour packaging and online bookings
Banrock Station	Mixing wine tourism and ecotourism
Binna Burra Mountain Lodge	Accommodation in national park
Goana Air Safaris	Self-fly air tours
Skyrail	Cable car over World Heritage rainforest
Tjapukai Aboriginal Cultural Park	Cultural experience based on Aboriginal culture

Source: Case Studies

These six case studies all demonstrated the importance of the initial concept and most were the first business of their kind in Australia (Binna Burra, e.g. commenced in 1933, and was one of the first eco-accommodation tourism businesses in Australia). Tjapukai has changed the most since its beginnings – its original concept was an Aboriginal dance troupe and it has since expanded into an Aboriginal cultural park offering a range of experiences with the dance troupe still being the central attraction.

In a sense the absence of radical change in their core product is also the cornerstone of these firms' success. Tjapukai is in the Guinness Book of Records for the longest running (unchanged) theatrical performance in Australia; Binna Burra's basic concept has been unchanged since its first set of wooden cabins was built (and indeed, the site is World Heritage listed and these cabins cannot be altered architecturally under the World Heritage guidelines). Even in the younger firms, the basic tenet has remained the same.

Nevertheless these firms are still innovators in the way they have changed their products and services, sometimes subtly, in response to changing customer demands and other external influences. Most of the firms provide a mix of products and services that exemplify the value-added nature of many tourism offerings:

- Banrock, Binna Burra and Skyrail provide ranger-guided walks and other ways to experience nature to visitors to their facilities.
- Goana tour guides accompany guests on their trips around Australia.
- Tjapukai opens its facilities at night as well as during the day.
- AOT Group offers tourists package tours as well as the ability to mix and match individual accommodation purchases and has moved into sports and entertainment packages.

The case studies highlight incremental change in all of the four areas identified by Koberg et al (Table 5).

Table 5: Incremental Innovation in Tourism Case Studies

Name	Product/ service	Procedural	Personnel related	Structural
Australian Outback Travel Group	Sports and entertainment packages, sale of online content	Pilot testing of paperless office	Staff suggestion system linked with management meetings	Use of XML for online content; IT Division in company
Banrock Station	Feral proof fence and mammal reintroduction	Expectation of input from professional staff	Build capacity of all staff including casuals	Restructuring management as company grows; Wetlands construction
Binna Burra Mountain Lodge	Playground and games design; CD of virtual walks	Role of Board	Success kit, induction program and environment awareness	Eco-friendly water and asset management
Goana Air Safaris	Revised tour book and on-ground itineraries	Role of tour directors in customer feedback	Appointment of IT staff member	Upgrading GPS in aircraft
Skyrail Cable Car	New guided interpretive walks	New firm specialising in attraction management	Structured training for all staff	Retrofitting of cableway
Tjapukai Aboriginal Cultural Park	Tjapukai at Night	Quality circle for managing response to customer feedback	Mystery shopper for quality feedback	Departments formed as company has grown

Source: Case Studies

Use of External Knowledge-Intensive Services

Use of external knowledge-intensive services varied widely between the case study firms (Table 6). Firms outsourced from 26% - 75% of the knowledge-intensive services on the list provided during the interview. There was a large range of percentages of external services considered of high importance (meaning that there was no equivalent skill inside the firm), ranging from 0% to 57% of the external services. Of the services outsourced, the range of services that were tailored for the firm was 0% - 85%.

In many cases, firms would have preferred to use in-house service providers but their small size meant that they could not justify recruiting a specialist. Some recognised the value of an external service provider who was at the cutting edge of their field and could provide high level on-off project support when required – the view was that if such people were employed full time within a firm they would lose their edge and would find the work insufficiently challenging.

Table 6: Use of External Services by Tourism Case Studies

	AOT Group	Banrock	Binna Burra	Goana	Skyrail	Tjapukai
Planning						
Legal	routine		routine	TAILORED	TAILORED	COMPLIANCE
Acctg/Financial	routine		compliance	TAILORED	COMPLIANCE	Compliance
Capital Raising			N/A	N/A	N/A	
Tech awareness		tailored			tailored	Tailored
Tech trends					tailored	
Formal R&D	routine	N/A	N/A	N/A	tailored	N/A
Market research		TAILORED			tailored	Routine
Product devt			tailored		tailored	
Project manag't		TAILORED				
Operations						
Marketing			routine	TAILORED	tailored	Tailored
Sales	routine		routine		ROUTINE	Tailored
Export strategy			N/A	N/A	tailored	Routine
Establishing o/s offices	tailored	N/A	N/A	N/A	TAILORED	N/A
Benchmarking					TAILORED	
IT/Networking			routine	TAILORED	ROUTINE	TAILORED
Recruitment				routine		
Accreditation	routine	routine	tailored		compliance	Routine
Standards		tailored		tailored		
Training	routine	tailored	tailored	tailored	tailored	Tailored
Total Outsourced	7	6	8	7	15	10
% Outsourced	33%	31%	47%	41%	75%	52%
Of these:						
% High	0%	33%	0%	57%	40%	20%
% tailored	14%	83%	0%	85%	73%	50%

Notes: Words in CAPITALS indicate outsourcing was of high importance; words in lower case indicate outsourcing of medium importance; blanks indicate no outsourcing. N/A indicates not relevant to that firm

Nevertheless, in all but two firms, tailored knowledge-intensive services were reported in at least half the outsourced services. In many cases, these services were

brought in to implement particular strategic plans developed by the company but not able to be implemented by employees. Examples of such practices include:

- Banrock's external engineering works and interpretive signage for nature trails.
- Tjapukai's IT system and translation of brochures into 8 other languages.
- Skyrail's construction works and interpretive material for interpretive stations.
- Binna Burra's playground and games design.

In these cases the client may not need to acquire the skills (tacit knowledge) used by the service provider because the consultant is either providing the skill to create a physical installation that remains behind, or leaves a report or text which embodies their knowledge in a way that the client can use.

In other cases, however, there is a need for the tacit knowledge to be transferred. This is most evident in training where the service provider aims to transfer enough information for the staff to use the skills gained in-house. This is achieved by both verbal transfer of information (during training courses) and written transfer (through course notes and manuals). Some firms, such as Goana, had formed close relationships with selected service providers and these people contributed to the firm in the same manner as someone on staff.

There are cases where knowledge could be transferred from service providers to client firms, but is not. This might be because the skill offered by the service provider cannot be transferred without a great deal of cost or effort (e.g. Tjapukai's use of a specialist Japanese marketing firm).

Role of R&D Institutions

Only one firm had formal links with R&D institutions – Skyrail was working with both the Co-operative Research Centre for Tourism and CSIRO to help develop interpretive signage and deal with longer term issues relating to ecotourism. Banrock had commissioned a private sector naturalist for its interpretive signage.

Role of Industry Associations

Broadly speaking the role of industry associations in innovation is minor in the case study firms. Most belong to associations that will help them lobby government on regulatory issues and also belong to associations that will bring them closer to customers. Neither of these types of associations contribute significantly to innovation but do contribute to marketing to Free and Independent Travellers as they are heavily linked into the tourism industry itself and may be mediated through government – for example Tropical Tourism North Queensland is run by the Queensland State Government, and the Riverland Tourism Association is run by the South Australian Government.

Role of Informal Networks

All tourism case study firms were involved in local networks of tourism industry operators. While these provided important links through to customers and alerted them of trends in visitor numbers, they provided little in relation to innovation.

The important innovation networks reached outside the local area in which the firm operated. These networks were national or international, rather than local, and were often of like-minded business people running companies within the industry. Companies such as Tjapukai and AOT Group had networks at a national level. Entering (and winning) national award competitions often provided access to new networks and raised the status of the firm so that others paid attention.

Boards sometimes offered access to these networks. For example Binna Burra's Board has links to non-tourism organisations which are a source of ideas. The same is true for Skyrail (a group of companies involved in a range of ventures) and Banrock (owned by Hardy Wines). Goana has developed similar networks by attending annual trade shows in the US.

Role of Government

These firms do not do formal R&D and hence cannot access the majority of government programs. Firms have not used COMET[18] which, while it provides support for business planning, market research and training, is focused on commercialisation of technologies not services.

Many tourism firms have obtained support from State Departments, which are keen to support firms that are growing or exporting. Some of these firms have also accessed Austrade services. In the main, however, these services are aimed at identifying customers rather than supporting innovation.

There is some use government-produced tourism statistics but those that do find that they are not either timely enough or specific enough to support business decision-making.

Various Government regulations can have a major impact on innovation. Goana made a commercial decision not to introduce a new product into the market because of the expected time required for government approval and the resulting impact on costs. Firms must also comply with environment protection regulations operating in all jurisdictions. Several firms (for example Banrock, Skyrail and Binna Burra) have extra standing in the sector for exceeding the minimum requirements.

Learning by Firms

Marketing

A number of companies therefore place a large amount of effort into marketing to ITOs. This was particularly the case for Tjapukai and Skyrail, both of which attracted more than three quarters of their customers from overseas. These medium to large companies used their own staff to visit ITOs in Australia and the outbound tourism operators in key markets (who compile packages for tourists intending to visit Australia) and provide them with promotional material. Binna Burra, a smaller company which still has a significant overseas-based international clientele, relies on the annual Inbound Tourism Operators conferences, organised by Tourism Australia, to meet the ITOs and provide them with information (and perhaps encourage them to visit to see for themselves). ATO Group relies largely on its website and its dominant position in content development to ensure that it reaches potential customers.

Goana Air Safaris also has a large proportion of its clients from overseas. It, however, is targeting people who already have pilots' licences and this means that ITOs are not an effective mechanism for marketing. Instead, it markets direct through newsletters relevant to its clients (aircraft owners magazines and nature magazines) in key countries.

These marketing strategies have been developed over time and are largely supported in-house. Firms will outsource the production of marketing and interpretive material in languages other than English (Tjapukai) or containing technical information (Banrock and Skyrail re nature interpretation). Tjapukai has also decided retain a specialist Japanese marketing company to promote its offering

[18] Commercialising Emerging Technologies, www.ausindustry.gov.au

to inbound Japanese tourists, as this market is highly specialised and the company does not have the resources to recruit its own Japanese market specialist. AOT Group has made a strategic decision not to target the Japanese market because of the level of specialisation required.

Customer Feedback

All case study firms had processes in place to obtain feedback from customers. In some cases this was formal (for example visitors' books and information on registration forms) but most firms also had ways to capture informal comments – often through staff having casual conversations with guests. All firms also had processes in place to use this feedback to make incremental changes to their product and service offerings. This feedback also told firms when not to make changes (this was particularly notable at Binna Burra whose clientele values the consistency of service and experience delivered over many years).

Quality Systems, Customer Service and Intellectual Property

All firms had quality systems or standard procedures in place for example:

- Skyrail is certified to ISO9001, an international quality standard for business.
- Skyrail and Binna Burra are Green Globe 21 certified.
- Tjapukai runs a quality circle.
- Banrock complies with Hazard Analysis Critical Control Point, and internationally recognised food safety certification system.
- Goana complies with the Civil Aviation Safety Authority's risk and quality management systems.
- AOT Group has standard operating systems that have evolved over time.

Most firms had developed their own standard operating procedures, drawing on past experience and the requirements of the various standards to which they wanted to comply. These systems were recognised as a valuable part of firms' capacity to service clients, manage risk and ensure that customers received an experience of a high standard.

Some, notably Tjapukai and Skyrail, also recognised that these standard operating procedures formed a component of the firm's intellectual property. AOT Group had also recognised that its content database (lists of accommodation and details of features and prices) was valuable and had diversified its business by providing this content to other tourism companies. These three firms recognised that they could sell their expertise to others and were actively expanding their business by capitalising on this body of knowledge. Skyrail in particular has a strategy to prevent loss of knowhow by only bidding for projects where it can also enter into a long term contract for operations so that the knowledge remains in-house.

While tourism firms were aware of the value of their trademark, few also recognised the value of their standard operating procedures. There is potential for firms to use this tacit knowledge to deliver consulting or operational services to others – of particular interest when it is difficult to replicate the other key component of attractiveness, location. Some case study firms reported that government agencies were encouraging them to give away their tacit knowledge by giving presentations to visiting delegations (often to people from overseas). This needs to be discouraged.

Staff

Many tourism firms rely on staff employed as casuals. These may also have relatively low educational qualifications and may not stay with a company for very long. In several case study firms it was only the management staff who had specified roles in obtaining feedback from customers and suggesting change. Two firms, Tjapukai and Banrock, had made changes to their internal systems to try to encourage lower level staff to participate more actively in contributing to change and incremental improvements.

Knowledge Management and Decision-making

The reasons for outsourcing services varied and included:

- The need to access particular skills not available in-house on a one-off basis (for example Binna Burra commissioned a playground designer to develop a children's play area and activities).
- The need to access complementary skills on a longer term basis (for example in awareness of new technologies).
- The need to obtain greater objectivity (for example customer service assessment and accreditation/quality auditing).
- The need to ensure staff viewed the service provider as an expert (e.g. training services).

In most cases the case study firms retained the knowledge imparted by the service provider in the form of a design or construction (e.g. Banrock's wetland engineering works) or a report or record (e.g. Tjapukai's foreign-language brochures). Where it was important for staff to absorb the learning then external service providers provided notes or trained staff direct, or there were feedback systems in place (e.g. the quality circles in Tjapukai).

Most firms said that they would prefer to employ staff in some of these jobs but they could not justify the expenditure in a small firm when the need for the service fluctuated and they wanted to obtain people who had a knowledge of the wider industry and best practice (which may be difficult to maintain once someone was working full time for a single company).

IT Case Studies

IT Industry in Australia

The Australian IT industry comprises businesses delivering information services, communication services, information and communications equipment and content. In 2001 there were over 25,000 businesses in this sector in Australia, of which 73% were in information services (this includes development and sale of software). Just under 100,000 people, or 36% of the total industry, were employed in the information services firms in Australia in 2001.[19] The domestic market totals AU$61.5 billion.

Businesses in the IT industry are small, with over 95% employing less than 20 staff. Information services businesses are mostly smaller than average – in this sub-sector, 97% of firms employ less than 20 staff and only 0.4$ employ more than 100 people. The IT industry in Australia is highly skilled, with over 40% of employees in computing and technical positions. Most jobs are in capital cities.

Unlike in the tourism industry, Australia runs a net deficit in its balance of trade in relation to IT. The industry is dominated by overseas-owned firms. Further, domestic production as a share of total production in information services has fallen in the last five years. The Australian Computer Society's most recent report asserts that there appears to have been a significant decline in the competitiveness of domestically produced packages software, ICT hardware and information services.

There is limited data available on innovation in the ICT industries in general and information services in particular. Most reports equate innovation with R&D. R&D intensity stands at about 3.3% per annum across the industry as a whole, with information services being the largest and fastest growing sub-sector. Other data suggest that there has been a shift in the capital intensity of ICT-related R&D. The main centres for computer software and services R&D are NSW and Victoria.

Market Access

Companies that sell software traditionally use distributors, termed "resellers", to reach a wide market. This is particularly so if the firms are aiming to sell product in international markets. This was the case for four firms – YourAmigo, Hatrix, Maxamine and Prophecy. All these firms had relationships with resellers who acted on their behalf. As these resellers supplied services to the case study firms, they have been included in discussion of KISA later in this section. Gecoz is currently only selling to organisations in Australia and its service requires a large amount of tailoring so it is working directly with customers. The same is true of Callista, whose market is focused on Australia's higher education institutions. The others have developed mechanisms to interact directly with customers even though their direct line of sale is to a reseller and this is discussed later in this section.

[19] Houghton, J (2003): *Australian ICT Industries Update 2003*, Australian Computer Society, Canberra

Table 7: Reseller Arrangements for IT Case Studies

Case Study	Market	Reseller Arrangements
Callista	Australian Higher Education Institutions	Direct to customer
Gecoz	Australian government agencies and local councils	Direct to customer, and industry partnerships
Hatrix	Australian and New Zealand hospitals	With partners who sell other hospital management software
Maxamine	Other businesses	Tier 1 partners include Dell and EDS; other Tier 2 partners
Prophecy	Major utilities and large companies	Through partners who sell other utilities and back office software
YourAmigo	Other businesses	Through a Certified Integration Partner Program with firms which can integrate YourAmigo software into business offerings

Source: Case Studies

Innovation in Case Study Firms

The six IT case studies also demonstrated the importance of the initial concept developed by the company as the key "radical innovation" (Table 8Four are also heavily focused on international markets – YourAmigo and Maxamine on the US, Prophecy on Asia and Hatrix on New Zealand. This means that the firms take a global view of their competitors and strive to distinguish themselves at the global level.

Table 8: Radical Innovations of IT Case Studies

Case Study	Key Idea
Callista	Student enrolment management software for tertiary institutions
Gecoz	Salinity maps from radar data
Hatrix	Software to reduce adverse drug events
Maxamine	Analysing websites so all content is visible to search engines
Prophecy	Software combining logistics, billing and back office management
Your Amigo	Internet search engine software using novel architecture

Source: Case Studies

In addition to providing software, these firms offer value added services to their clients:

- Callista and Hatrix tailor some of their software to their clients.
- Gecoz provides mapping and consulting services.
- YourAmigo and Maxamine both train customers and provide customer support.
- Prophecy has offices in its customers countries for local support.

All the firms were able to demonstrate some changes in each of the four categories identified by Koberg et al (Table 9

Table 9 Incremental Innovation in IT Case Studies

Name	Product/ service	Procedural	Personnel related	Structural
Callista	Development of support systems for remote region clients	Project lead staff for scanning environment	Developing creativity of IT staff	Restructuring of company into teams
Gecoz	Development of methods for producing inundation maps	Develop on-line investor-ready documentation	Company director training	Access to new sources of data through alliance
Hatrix	Extension of main product to XML	Quality management ISO9001	Hire in staff with new skills for OTJ training	Move to handheld PC technology
Maxamine	Extension of basic product to search engine strategies	Internal departmental plans and targets	Adaptation of training for US and Australian staff	Advisory Board
Prophecy	New billing product for utilities	Corporate governance systems to comply with changes in listed company rules	Move staff through product development teams; mentoring	Product advisory team co-ordinates input to management
Your Amigo	Extension of product to automatic search and alert	Customer account managers	Training technicians in sales	Advisory Board

Source: Case Studies

Use of External Knowledge-Intensive Services

Use of external knowledge-intensive services varied from 19% to 45% of the KISA list discussed with the IT case studies (Table 10There was a large range of percentages of external services considered of high importance (meaning that there was no equivalent skill inside the firm), ranging from 14% to 75% of the external services. Of the services outsourced, the range of services that were tailored for the firm was 13% -100%. This was particularly related to legal advice (which includes advice on patenting and intellectual property) and capital raising (important when entering US markets or seeking venture capital investment in Australia or overseas).

Several of the case study firms demonstrated strong use of their Board in planning, legal, financial advice, capital raising and general environmental scanning. These firms were also highly likely to have sought external assistance for business planning and tailored legal services, accounting and technology awareness services. Few IT firms outsourced aspects of technology scanning, product development or project management as their technical staff in-house were used for these functions. Many IT firms had long term relationships with their service providers.

Table 10: Use of External Services by IT Case Studies

	Callista	Gecoz	Hatrix	Maxamine	Prophecy	Your Amigo
Planning	tailored	TAILORED	tailored			
Legal		TAILORED	tailored	TAILORED	routine	TAILORED
Acctg/Financial	routine	TAILORED	COMPLIANCE	TAILORED	routine	
Capital Raising			tailored	TAILORED	TAILORED	TAILORED
Tech awareness	routine	TAILORED				
Tech trends	routine					
Formal R&D						
Market research		TAILORED		tailored	TAILORED	
Product devt						
Project manag't						
Operations	tailored	routine				
Marketing				routine		tailored
Sales			routine	TAILORED	Tailored	TAILORED
Export strategy			tailored			
Establishing o/s offices		N/A				
Benchmarking	ROUTINE					
IT/Networking				TAILORED	tailored	
Recruitment	tailored			tailored		
Accreditation			tailored			
Standards				N/A		
Training	TAILORED	compliance		TAILORED		
Total Outsourced	8	7	7	9	6	4
% Outsourced	38%	35%	33%	45%	28%	19%
Of those:						
% High	25%	25%	14%	67%	33%	75%
% Tailored	13%	71%	71%	89%	66%	100%

Notes: Words in CAPITALS indicate outsourcing was of high importance; words in lower case indicate outsourcing of medium importance; blanks indicate no outsourcing. N/A indicates not relevant to that firm

Role of R&D Institutions

All IT case study firms expected their professional staff to keep abreast of technical developments and all but Prophecy had in-house R&D programs. They often obtained this information from external sources (trade magazines, conferences) but the role was played by staff rather than external advisers.

Three of the IT firms' founders (for Maxamine, YourAmigo and Gecoz) had moved directly from employment with Australian R&D institutions to their new firms and two firms (YourAmigo and Callista) had spun out of research institutions.

- Callista had spun out of Deakin University after the software had been developed by a university working group comprising Deakin and three other institutions;
- YourAmigo's founders had licensed the software from the university but had rewritten the original code to ensure that it was able to be technically supported;
- Gecoz's founders had developed ideas for the product while in the university but the product itself was developed by the company;
- Maxamine's founder had applied logic learned while working on artificial intelligence at the university to a new area of website management.

Few of these had continuing formal relationships with these institutions but they did maintain informal networks, which were used to keep up with trends. However all R&D was undertaken in-house. Universities' main function was as a source of technical staff. Keeping R&D, and hence intellectual property, within the firm was also a key issue.

Two firms, Hatrix and Prophecy, did not have any contact with research institutions. Hatrix was concerned about expectations that IP arising from research funded at a university would have to be shared, and Prophecy had not considered forming relationships with R&D institutions because it did all its R&D in-house.

Role of Industry Associations

Of the six IT companies interviewed only a two were active in industry associations, although most were members of the key national association, the Australian Information Industries Association. Gecoz is a founding member of the Spatial Sciences Institute which has been formed to promote standards development and best practice in what is a relatively new field. Prophecy has also joined a new water industry body, relevant to its customers, in its home State. These associations did not provide any particular inputs in relation to innovation although industry newsletters did give some leads in relation to emerging technological trends.

Role of Informal Networks

Maxamine, YourAmigo and Callista all rely on extensive personal networks of the founders for innovation inputs. In Maxamine and YourAmigo these networks are formalised in an Advisory Board structure (however these boards don't meet together). Callista's current CEO has wide personal networks outside the education sector and uses these to bring in ideas from outside the organisation. Hatrix relies on attending industry conferences and trade shows for some informal networks and ideas.

Role of Government

IT firms in general were very aware of the range of services and grant programs offered by the Australian Government. One had been granted funds under COMET and several others had successfully received R&D START grants.[20] Two firms had been involved in Government-sponsored incubator programs – Gecoz had been

[20] The R&D START grant program provides up to several million dollars funding for R&D projects, with the company being required to match Government funding. The program is competitive and firms must be able to demonstrate that they have the matching funding when they apply for the grant. www.ausindustry.gov.au

funded by the building on IT strengths incubator in Darwin and Your Amigo was funded by the Playford Centre, an incubator in Adelaide. Maxamine had not received startup government support but did have private investors. Three case study firms also used Austrade at varying levels:

- Maxamine was selected to participate in the 2002 Austrade Euro High Tech Tour.
- Gecoz was supported by Austrade market assessment in China (and also received State funding for a mission to Singapore).
- Hatrix is a member of the Austrade Tradestart program.

There is no doubt that the funding provided through these programs helped to kick start these companies. Gecoz, in particular, spoke highly of the COMET program, which provided significant support to directors who had little business experience. Gecoz also reported that the firm's business plan, developed by an adviser and with the COMET funding, it provided an independent, arms length assessment of the business opportunity and helped to convince investors that the firm had prospects.

Learning by Firms

Marketing

All IT firms marketed themselves heavily through their website, as well as through the various channel partners/resellers. They all had sophisticated website strategies and were heavy users of the internet. Callista had used a brand consultant to reposition itself in the market but all others had developed their own strategies. Two firms (Callista, Maxamine) purchased pre-packaged market reports from firms which specialise in this area. YourAmigo had been offered pre-packaged research but had decided not to purchase it, and now believes that such reports are of little use.

For those who export (Prophecy, Maxamine, YourAmigo and Hatrix), marketing is heavily focused on those overseas. All except Hatrix had also established overseas offices to support this process. They had often sought advice from patent attorneys, accountants and lawyers in these markets prior to establishing their offices or subsidiaries. Maxamine also contracted a specialist US market analyst who played an important role in environmental scanning.

Customer feedback

As noted above, four case study firms relied on resellers so there is an intermediary between the firm and its eventual end customer. These firms had developed a range of methods to obtain feedback from their eventual end customer without potential "filtering" by the reseller. These enabled them to read market needs, as well as get direct feedback from their distributors. Callista had also established customer feedback groups to address key issues of software development.

Table 11: Customer Feedback Methods for Case Study Firms

Case Study	Main Customer Feedback Method
Callista	Customer working groups
Gecoz	Direct feedback from customers
Hatrix	Direct feedback from customers through installation and delivery
Maxamine	Embeds staff in Tier 1 partner firms; provides customer support from Australia & the US as part of its 24x7 coverage
Prophecy	Own offices to support customers in-country
Your Amigo	Customer account managers

Source: Case Studies

Quality Systems, Customer Service and Intellectual Property

Firms were very aware of the importance of intellectual property and three (Maxamine, Gecoz and Your Amigo) had protected their intellectual property by patenting in Australia, the US and elsewhere. All others, however, protected their IP by ensuring the source code stayed in-house and used trademark and copyright to keep their intellectual property from being stolen.

All firms had quality systems or standard procedures in place. For example:

- Maxamine has formal processes for sales management and written procedures for roll-out of the sales management systems;
- Hatrix is ISO9001 certified, primarily because its hospital customers require this;
- Gecoz's investors appointed a business manager who set up key business systems which are now followed; and
- Prophecy has standard operating procedures covering development methodologies, technical processes and checklists.

Staff

Staff contribute significantly to innovation and environmental scanning, primarily because they are more likely to be tertiary-qualified and hence will have their own professional networks. This usually related to information on technology awareness and technology trends, both of which were important to these firms in fast-moving markets. Callista had the most formal of these arrangements, with technical staff assigned to scan the environment for potential improvements to support customer management and product rollout.

Knowledge Management

The main reasons IT firms outsourced services were:

- The need to access particular skills not available in-house (e.g. both Maxamine and YourAmigo had sough advice from patents attorneys to support patenting and Gecoz had outsourced market research to identify and analyse its market when it was first established).
- The need to access complementary skills on a longer-term basis (e.g. the use of channel partners in US markets).
- The need to obtain greater objectivity (e.g. software productivity assessment and accreditation/quality auditing).

Firms expected external service providers to provide reports and other written materials in order to retain knowledge gained. Where the relationship was longer term (e.g. with channel partners) then interaction with these service providers had been formalised and meetings were held to share information and ideas with the firm's management.

Mining Technology Case Studies

Mining Industry in Australia

The mining industry is one of the largest industries in Australia, with an annual turnover of over AU$30 billion.[21] It contributed nearly 5.3% to Australia's GDP in 2001-2002.[22] Australia has some of the world's richest mineral deposits and ranks as the largest producer of bauxite, alumina and diamonds. Australia's mining industry ranks as the sixth highest producer of coal in the world, in addition to being one of the world's largest exporters of minerals such as bauxite, lead and mineral sands.[23]

Australia has developed a large support industry in mining technology services. These encompass firms delivering construction services, software services, exploration and other mining services, scientific and technical research services. The recent Action Agenda report on the mining technology services sector estimated that there were over 400 such firms in Australia, with a turnover of AU$3 billion.[24] Companies in the case studies were chosen to represent each of these sub-sectors.

From interviews with the case study firms, the main customers for these firms are the major Australian-headquartered mining firms, which have operations world-wide, and the so-called junior firms which are exploring and developing smaller deposits, mostly in Australia. Like many service firms, expansion of the customer base relies strongly on word of mouth. Most mining firms are headquartered in the major cities of Melbourne, Perth and Brisbane, but their sites may be in very remote areas of Australia and overseas, often in developing countries. The ability of mining technology firms to service these customers therefore also relies on a capacity to travel to remote areas.

Apart from software sales and training, most of the mining technology case study firms deliver customised, tailored project services whose main output is delivered in a report to the customer. The firms will quote on a particular project and will then put together a team from their own staff, sometimes with sub-contractors, to deliver the service. Many of these firms work on fixed price quotes for these projects. All but one of the case study firms works solely for the mining industry.

Innovation in Mining Technology Case Studies

Despite the segmentation of the mining technologies sector in the Action Agenda report,[25] the companies in the case studies delivered a very broad range of services. A number of firms sold software, either as stand alone packages or bundled with their services (Table 12). Several firms offered a range of exploration and other mining services, often related to determining the value of the core body so that customers can obtain bank financing for further exploration, extraction and processing.

[21] www.trade.uktradeinvest.gov.uk
[22] Australian Bureau of Statistics
[23] www.trade.uktradeinvest.gov.uk
[24] *Mining Technology Services – Australia Leading the World: The Mining Technology Services Action Agenda Strategic Leaders Group Report to Government 2003*, Department of Industry Tourism and Resources, Canberra
[25] Ibid

Table 12: Coverage of Mining Technology Sub-Sectors by Case Study Firms

Name	Exploration and other Services	Construction Services	Computer Services	Technical and Scientific Services
Advitech	No	No	Yes	Yes
Ausenco	Yes	Yes	No	Yes
Lakefield Oretest	No	No	Yes	Yes
RSG Global	Yes	No	Yes	Yes
Runge	Yes	No	Yes	No
Softrock Solutions	No	No	Yes	Yes

Source: Case studies

Because they offer tailored services, many of these firms gain their competitive advantage from the skills of the people who work for them – they rely on staff with deep technical knowledge and who can effectively determine a solution for the customer and can deliver it in the time and for the cost specified. The case study firms are also quite opportunistic – many of those that have developed software have commercialised software first developed in-house to meet internal needs.

Most case study firms reported that their incremental change spanned all four areas identified by Koberg et al (Table 13). However, most firms' innovation was concentrated on enhancement of service delivery i.e. it was based on development of new products and services and the procedures required to ensure that these were delivered effectively.

Table 13: Incremental Innovation in Mining Technology Case Studies

Name	Product/ Service	Procedural	Personnel related	Structural
Advitech	Risk management software, Environmental noise services	Quality management system (ISO 9001 accredited)	All personnel trained in new products	Computer based project assessment system.
Ausenco	New technological processes	Formal quality management system	Formal positions in health and safety, environment, business development	Internet based presentations to clients
Lakefield Oretest	Hydrometallurgical testing processes	Standardisation of testing procedures in-house	Incentives for meeting budget	Online tracking of projects by clients
RSG Global	Introduction of metallurgical services	Development of induction manual and formal timesheets	Change in Divisional structure	Customers can download time limited demonstration versions of software

Runge	Range of software packages	Work to a very formal strategic planning framework	Employee share options program	Remote delivery of training programs
Softrock Solutions	Automatic slope monitoring equipment	Standardisation of information collection to build database	Appointment of training manager	Remote monitoring of mine site slopes via internet, new equipment

Source: Case studies

Use of External Knowledge-Intensive Services

Firms outsourced 24% to 57% of knowledge-intensive services discussed during the interview (Table 14). However, only a few percent of turnover was usually spent on these services. Those of high importance ranged from 11% to 50% of the services outsourced. Services that were tailored ranged from 20% to 60% of those outsourced.

The most commonly outsourced services included legal, accounting and financial services (largely compliance), capital raising and IT/networking. Several firms had outsourced various aspects of business planning. Several also outsourced recruitment to some extent, although not always successfully.

Table 14: Use of External Services by Mining Technology Case Studies

	Advitech	Ausenco	Lakefield Oretest	Softrock	RSG Global	Runge
Planning	tailored	tailored		tailored	tailored	ROUTINE
Legal	ROUTINE	Routine	tailored	tailored	TAILORED	tailored
Acctg/Financial	compliance	compliance		compliance	compliance	compliance
Capital Raising		TAILORED				TAILORED
Tech Awareness						
Tech Trends				routine	ROUTINE	
Formal R&D						
Market Research		tailored				tailored
Product devt.				TAILORED	ROUTINE	
Project manag't						
Operations	tailored	tailored			TAILORED	
Marketing	routine				TAILORED	
Sales						
Export Strategy					tailored	
Establishing o/s offices		routine			routine	compliance
Benchmarking						
IT/Networking			routine		TAILORED	
Recruitment	routine	tailored	routine		routine	tailored
Accreditation	compliance		COMPLIANCE			
Standards						
Training	routine	routine	routine		routine	routine
Total Outsourced	8	9	5	5	12	8
% Outsourced	38%	43%	24%	24%	57%	38%

Of those:						
% High	13%	11%	20%	20%	50%	25%
% Tailored	25%	56%	20%	60%	50%	50%

Notes: Words in CAPITALS indicate outsourcing was of high importance; words in lower case indicate outsourcing of medium importance; blanks indicate no outsourcing. N/A indicates not relevant to that firm.

Role of R&D Institutions

Links with R&D institutions were surprisingly limited given the technical nature of the case study firms. Ausenco develops a range of its own technologies in-house and through contract research with external research organisations. It has a specific staff member whose job it is to develop and cultivate these linkages. Lakefield Oretest is a Registered Research Agency in its own right. It sees major research organisations as a competitor and does not have any formal links with external R&D institutions for this reason. It is also aware of the Australian Minerals Industry Research Association but does not work with it. The remaining case study firms do their own R&D work in-house, relying on their own technically qualified staff. Softrock does contract some development work to suppliers through purchasing custom-made equipment which it integrates into its own product/service offering. Advitech has, to date, carried out all its R&D in-house, however it is now looking for an appropriate R&D partner for a particular project.

Role of Industry Associations

There were no significant linkages with, or involvement in, industry associations. Most case study firms reported that these associations were not relevant to their innovation. Advitech was the only exception to the rule. The senior staff are actively involved in local Hunter valley industry groups. These industry groups are seen to play a major role in broader knowledge acquisition.

Role of Informal Networks

Word of mouth was very important to all firms in order to obtain customers and to identify emerging technical trends. These networks were based around their technical staff who were expected to maintain them through attending technical and trade conferences and through review of technical literature. The networks operated mainly at national level although those case study firms which did export significantly also had international links. However, most firms obtained their export projects through links with major Australian miners (customers) who were operating in these regions. Board members often maintained international-scale networks.

Role of Government

Firms had limited links with Government, but Advitech did have government customers. Ausenco and Advitech also had found that their State's industry development departments and federal Austrade staff were extremely helpful. Lakefield has also used Austrade to some extent for export assistance. Several of Advitech's innovations spawned from its close working relationship with regulatory agencies in NSW.

In general, the firms seemed to have limited awareness of government grant programs.

Learning by Firms

Marketing

All case study firms had developed websites and were active users of online technologies to promote their firms. However, marketing is largely by word of mouth so these sites are more general promotional tools, with the exception of companies like RSG Global whose site was used to promote software packages through trial downloads. Formal market research seemed to play a relatively minor role.

Customer Feedback

Case study firms reported that the main driver for innovation was a combination of new technologies and customer feedback. New technologies were identified in-house and then implemented through technical staff. Customers provided feedback not only on the content of services but on the manner of their delivery.

The processes in place to obtain feedback from customers were largely informal. Runge had completed formal customer surveys but these were not regular. The other case study firms had tried a variety of ways to obtain feedback but these were not always successful. Several firms reported that feedback from customers had led them to launch new services, mainly software, that had been developed to solve in-house problems but were later realised to be marketable.

Quality Systems, Customer Service and Intellectual Property

Smaller firms often had less formal quality systems in place, but three of the larger firms (Ausenco, Lakefield Oretest and Advitech) had well developed quality systems and highly structured internal procedures. Ausenco was the most structured and had also introduced a number of new staff positions that were designed not only to improve internal systems and structures but were aimed at raising awareness amongst customers of its quality system. Advitech has an extensive quality management system and has been accredited for the most recent version of the ISO 9001 standard. Intellectual property was largely held in the skills of staff and only one firm had any patents. The competitive advantage of these firms was centred on their ability to bring together teams of experts to solve particular problems, which varied from customer to customer.

Staff

All case study firms employed expert technical staff who acted as the main gatekeepers for new information coming into the firm and were responsible for much of the environmental scanning. Ausenco had the most formal of these arrangements but all firms relied on technically qualified engineers, geologists and/or surveyors for these roles.

Knowledge Management and Decision-making

The main reasons that mining technology firms outsourced services was lack of internal capacity and a complementary need to obtain particular skills for their ongoing operations and innovation. As firms relied on their technical staff for bringing in many new ideas, the main system for managing this knowledge was through management meetings. Runge had the most formal knowledge management system but this was driven by its formalised business planning methodology, which had been brought into the firm from outside. Ausenco was moving toward a much more formalised system, through changes to its internal staff structure and information flows.

Comparison of IT, Tourism and Mining Technology Case Studies

This section discusses the similarities and differences that emerged between case study firms in the three sectors. Some of these differences may be due to inherent differences between the sectors. However, as noted in the section on Methodology at the beginning of this report, there are several confounding factors such as differences in age and size between the three groups that mean that this discussion must only be indicative. A much larger study using matched examples would be required for the inter-sectoral differences to be confirmed.

The discussion is divided into two sections – the first highlighting differences in innovation styles and sources, and the second discussing the use of knowledge-intensive services.

Innovation Styles and Sources for Ideas

The case study firms all affirmed the important role of customers in obtaining feedback about products and services and in driving some aspects of innovation within the firm. However it was also clear that management of the firms had a major role in choosing which changes to make in response to customer comments (or demand), and in driving other components of innovation.

Five differences between case studies in the three sectors were apparent and are discussed below:

- Use of Boards/advisory boards
- Role of R&D in innovation
- Customer feedback systems
- Role of staff
- Role of management

Board/Advisory Boards

One of the striking differences between the IT, tourism and mining technology case study firms was the use of Advisory Boards to seek external information and to enhance their personal networks by the IT firms.

While senior staff in all companies across the board had excellent and active external networks, some IT firms had formed these networks into a more formal system. They viewed a finite set of individuals with whom they interacted as a formal Advisory Board. These Advisory Boards rarely met in person but had been compiled to provide skills and information in particular areas which complemented the skills of the CEO/Managing Director. In some cases, Advisory Board members were paid through access to options to buy shares. The Advisory Board members acted as an extension of the eyes and ears of the CEO of these firms. They were often selected for their knowledge of overseas markets, as well as other people that they knew. When they were used, these Advisory Boards provided valuable links through to other sources of expertise, ideas and information.

In contrast, the managers of both tourism and mining technology firms had excellent personal networks but a much less formal approach to seeking advice and ideas from their peers. While tourism firms were highly reliant on overseas visitors, their networks were largely Australian-based and were related to obtaining market

feedback about tourism trends. This may have been because the statistics collected by public agencies did not meet their needs. Mining technology firms, on the other hand, relied heavily on their technical staff. While IT firms also used their technical staff to search for information outside the firm, they may have needed a more formal information gathering system (i.e. their Advisory Board) because of the inherently global nature of their business.

R&D

As might be expected, the tourism firms interviewed did not perform formal R&D and had few formal relationships with R&D institutions. They saw themselves largely as locations where other people came to perform R&D and there were often few mechanisms in place to develop those relationships beyond providing access to natural sites (e.g. rainforest) which provided an opportunity for ecology and other students to work. Binna Burra had the most extensive set of relationships of this type, but still played a passive role, being happy with an informal association whose payoff was occasional talks to guests by visiting researchers.

In contrast, IT and mining technology firms were much more focused on formal R&D. However, IT firms were more likely than the mining technology firms to source R&D from outside the organisation. This was likely to be because four of the six IT case study firms had either been spun off from R&D institutions or their founders had associations with these institutions. However, formal links between R&D institutions and IT firms were sometimes seen as a threat to the firm's ability to capture the results of its research. Links were more likely to be informal and related to staff acquisition (although these needed on the job training to adjust them to business priorities).

Mining technology firms, while relying heavily on R&D, contained this largely in-house. This was partly for commercial reasons (i.e. keeping ahead of competitors), and partly because some saw R&D institutions as competitors. Further, with the exception of software development, the R&D performed by mining technology firms was probably more "D" in nature and relied on the skills of staff to develop existing technologies, rather than develop new technologies from basic research.

Customer feedback systems

In all cases the tourism firms, although they may acquire their customers through an intermediary, did have direct contact with their customers at the time that these people visited their venue or used their services. This enabled them to develop and implement a range of formal systems to obtain suggestions and feedback from these customers.

IT firms largely had to use more indirect systems to achieve this. They often had arrangements in place with channel partners to sell product but also managed a number of methods to obtain customer feedback.

Mining technology firms were in direct contact with customers but had largely informal systems for obtaining customer feedback. These firms are supplying custom made services to large firms, and it is possible that the variable nature of their service delivery, and the importance of word of mouth referrals, plays a larger role than in the other sectors.

There is an impression that the feedback received by IT firms often suggested more extensive changes to the basic product than the feedback received by tourism firms. For example, IT firms selling software to a range of customers have to consider the impact on one customer of making changes requested by another, given potential differences in the customers; hardware systems, product use and the common

practice of integration with channel partners' systems. Tourism firms, on the other hand, are selling a much more stable product whose attraction is essentially based on location – in these cases customer feedback often is directed only at the edges of the product and service offering. IT firms therefore had a more formal system in place to assess and determine the response to customer-suggested changes.

Use of Staff for Innovation

There were significant differences in the use of staff for generation of ideas and contribution to innovation in the tourism, IT and mining technology firms. All firms, however, have mechanisms in place to capture ideas suggested by staff and to ensure that customer feedback heard by staff was passed on to management.

Tourism firms rely heavily on casual staff, who often have only basic training and may not stay with the firm for very long (although tourism firms in more remote areas are likely to have a more stable workforce). The role of these staff in innovation was limited and the management teams appeared to be responsible for scanning the outside environment, generating ideas and implementing them.

IT and mining technology case study firms had relatively high proportions of tertiary-qualified technical staff. As professionals, they were expected to use their professional networks to obtain information from outside the firm. This usually related to information on technology awareness and technology trends, both of which were important to these firms in fast-moving markets.

Role of management

The senior management in all case study firms had a significant role in identifying potential new areas for innovation and the decision to respond to these. All CEOs interviewed relied heavily on their personal networks to assess market trends, to confirm or test the results of formal market surveys or other sources of quantitative market data and to find people to deliver services when these were not available inside the firm.

There appeared to be some differences in the scale of the networks used. In general terms, tourism firms obtained their immediate data from the local region (e.g. information on passenger movements at local airports) and used their personal networks at national level to obtain broader trend information outside their immediate sales interests. IT firms on the other hand used national and international market level reports, and had international scale personal networks which gave them the edge on emerging trends. Mining technology firms were largely reliant on national scale networks, although those firms which did export also had a range of international links (often also through technical staff).

In all case study firms, management also drove innovation in the softer areas of innovation relating to staff development and training, company structure and upgrading of equipment. In the IT and mining technology case studies, some of these changes flowed from customer feedback, but the link was less apparent in the tourism case studies – in these the driver seemed to be more related to quality systems and the need to enhance and maintain customer service through management of a largely unqualified workforce.

Developing New Services and Business Ideas

All firms were actively modifying and growing their products and services to meet changing customer demand, and to take advantage of new ideas and technologies which would enable them to deliver a more consistent service or to do so at a lower cost.

In the IT industry the custom is to release product upgrades and all IT case study firms were involved in this. Most were also planning, or had introduced, more significant product changes. These were responses to changing market opportunities and were often enabled by changes in technologies (e.g. the advent of XML, the ability to service customers over the internet and rising market sophistication about their internet strategies). All IT case study firms were very conscious of the role of intellectual property and the need to protect it in these circumstances.

Tourism firms were generally not changing their product and service mix significantly and were focussing more on the softer side of innovation. They were generally unaware of intellectual property (apart from trade marks) and the value of some of their internal processes and operating procedures. While there were some examples of firms branching into significantly new business areas, these business areas were not tourism ventures but were in construction (Skyrail) and IT (AOT Group). In the main, tourism firms were constrained by the fact that their attractiveness to customers was tied to a particular location – it may be difficult for them to identify more radical business opportunities for this reason.

Mining technology case study firms were tailoring a set of services according to customer needs, and in some senses every project required innovation. These firms also innovated by identifying an external market for internally-developed software and project management skills so that in-house innovations eventually were packaged as a saleable good or service. These events were highly driven by customer demand.

Although all the mining technology firms have considerable IP in the form of in-house developed software, scientific know-how, project processes etc, there has been little patenting of this IP because of concerns about revealing in-house secrets.

Use of Knowledge-Intensive Services

The total amount spent on external knowledge-intensive services by the case study firms was low but the value obtained from these was often significant in the development of the company. Overall, the reasons cited by the case study firms in the three sectors were similar and were centred on the need to obtain special expertise, or to have someone "at arm's length" for reasons of compliance (auditing) or for objectivity (training, customer service assessment). While there are differences between the groups in the figures below, it is likely that only the propensity to outsource truly differs given the size of the sample.[26]

Table 15: Summary of IT and Tourism Case Studies' Use of Outsourced Services

Per Firm Outsourcing	Tourism Firms	IT Firms	Mining Technology Firms
Average percent of turnover spent on outsourced services	5%	11%	7%
Range of percentage of service types outsourced	31% to 75%	19% to 45%	24% to 57%
Average of percentage of service types outsourced	46%	33%	37%
Range of outsourced services of high importance	0% to 57%	14% - 75%	11% to 50%

[26] A two tailed t-test between the results for each sector reveals that only the propensity to outsource gives a P-value of less than 15%.

Average of service types high importance	25%	39%	23%
Range of outsourced services tailored	0% to 85%	13% to 100%	20% to 60%
Average of outsourced services tailored	51%	63%	44%

Source: Case Studies

The choice of external service providers varied between the three groups:

- Some IT and mining technology firms outsourced business planning, capital raising and operations whereas no tourism firms did.
- Unlike the IT and Tourism firms, none of the mining technology firms outsourced any Technology Awareness services.
- Some tourism and mining technology firms outsourced advice on R&D, product development and establishing overseas offices, whereas no IT firms did.
- More tourism firms outsourced accreditation than both the IT and mining technology firms.
- Tourism firms outsourced training and establishment of IT networks more often than both IT and mining technology firms did.
- None of the mining technology firms outsourced any sales services, a service that both the IT and Tourism firms invested in.
- The only KISA that was not outsourced by any case study firms was project management.

An analysis of the average age of the case study firms in each sector shows that tourism firms are the oldest on average, followed by mining technology firms and IT firms. However, there is unlikely to be any significant difference between the samples as the ranges for each sub-sector overlap significantly.[27] There are no significant relationships between age and propensity to outsource, age and percent tailored services outsourced, and age and percent of outsourcing rated of high importance.[28]

The same is true for the relationship between size of firm and propensity to outsource, size of firm and percent tailoring of outsourced services and size of firms and percent of outsourced services rated high.

Finding Service Providers

In general, the tourism firms did not report any difficulty in finding external service providers once they had made the decision to use them. These providers were available locally or in the nearest large city (e.g. trainers, lawyers).

IT firms had outsourced more tailored service advice, which was likely to be more expensive because of the level of tailoring required. However, they did not report particular difficulties in finding them. The impression is that firms' informal networks provide them with sufficient contacts to identify the most appropriate person for their needs.

Mining technology firms did not report any particular difficulty in obtaining service providers but they did have a great deal of difficulty in finding suitable staff.

[27] 9 – 71 yrs for tourism, 4 – 23 yrs for mining technologies and 3 – 24 yrs for IT.

[28] R^2 values for each of these plots was 0.023, 0.28 and 0.18. The relationship is generally only considered significant if R^2 is over 0.5.

Managing Change Within the Firm

The tourism firms appear to be using knowledge-intensive services to implement capital expenditure decisions and to develop facilities. These did not affect their innovation capability long-term and were more in the role of implementation of ideas that had been generated from within the organisation. Change management in this context related more to the need to train staff after the new facility or equipment was in place.

IT and mining technology case study firms used knowledge-intensive services to acquire knowledge and skills and needed to have a system in place to ensure that this knowledge was captured by the firm. Their relationships were more likely to be long term.

Conclusions

These case studies have illustrated a range of use of external services by a small selection of IT, tourism and mining technology firms in Australia. Although only a small amount of turnover by value may be expended on these services, they can be essential to the firm's ability to introduce innovations. The most significant finding for the group as a whole was the link between small size and greater use of tailored services.

Attachment A – Interview Guide

BACKGROUND

This is an interview guide which contains some set questions and some starting points for discussion of issues. The depth of discussion on the issues raised in the guide will depend to some extent on the company that is being surveyed. However, during the interview it is expected that the majority of factual questions will be answered. The first section of the guide seeks answers to factual questions about the company while the next section analyses use of knowledge intensive business services in a range of areas within the firm.

BACKGROUND INFORMATION ON THE FIRM (MOSTLY OBTAINED PRE-INTERVIEW)

1. Date firm established/registered

2. Ownership (name of parent)

3. Location of owner

4. No. staff (FTE)

5. Describe the most recent product/service launched in the past 2 years

_____

6. Describe any management-determined changes in rules/procedures or business processes intended to improve production systems or service delivery in the past 2 years?

_____

7. Describe and changes in selection and training policies or HR management practices intended to improve production systems or service delivery in the past 2 years?

_____

8. Describe any modifications to equipment/facilities or work units which have been intended to improve production/service delivery in the past 2 years

_____

9. In general, what barriers were faced in implementing these changes?

_____

10. What is the firm's primary competitive strategy? (for example...)

a) Introduce new products/services ahead of competitors

b) Offer higher quality products/services than competitors

c) Offer customised products/services for customers

d) Offer quick service/turn-around

e) Offer lower prices on comparable products/services cf competitors

f) Stick to a small market were there is little competition

g) Other

USE OF KNOWLEDGE INTENSIVE BUSINESS SERVICES

11. From where does the firm obtain its services on each of the following items? (Identify High medium and low importance, or N/A)

Activity	**External firm**	**R&D Instn**	**Other Extnl orgn****	**In-house (staff)**	**Boar d**	**Is service tailored, routine, compliance or other?**
Business planning						
Legal services						
Acctg/Financial services						
Capital Raising						
Technology awareness						
Technology trends						
Formal R&D						
Market research						
Product/service development services						
Project management						
Outsourced operations						
Marketing/promotion *						
Sales & distribution						
Export strategy						
Establishing offices overseas						
Performance benchmarking						
Networking services						
Recruitment services						
Accreditation/quality management						
Standards						
Training services						

* incl. e-commerce

** incl. government organisations such as business enterprise centres, government grants

For each of those above that are outsourced (KIBS, R&D, other), why is this? Discuss

Impediments to use of outside providers

Importance of outsourced providers

Impact of external providers on learning

Types of providers

Impact on innovation capacity

Impact on innovation performance

Is the service simply outsourced or is it a collaborative arrangement?

How is the knowledge shared?

DRIVERS FOR INNOVATION

12. How frequently do you need to bring out new products/services? What determines the timing?

13. What are the main drivers for innovation (e.g. customers, suppliers, new regulations, competitors, staff, management...)

14. Of those listed in Q13, which is the most sophisticated innovation driver and what demands does it make on the firm?

15. If the main innovation driver is within the firm, what is the reason for this?

16. Describe the main customer base for the firm (e.g. large number of end-consumers, mix of firms and consumers, small number of government clients)

17. What proportion of your customers are

From your local region?

From other areas within your State?

From other areas of Australia?

From overseas?

18. Do customers from different regions have different needs/characteristics which require you to modify your products/services for these groups? (if yes, how to you meet this challenge)?

19. What other stakeholders do you need to work with (or at least be aware of) to ensure your business is successful? (e.g. govt for regulatory issues)

20. What is the balance of small (incremental) and step-change (radical) innovations in the firm?

21. Have small (minor) business changes led to significant competitive advantages over competitors? (if yes, expand)

KNOWLEDGE ACQUISITION

22. What continuing arrangements or procedures are there for seeking new ideas or business improvement information from external sources?

23. How does the firm develop a balance between choosing to acquire new technologies to support innovation and choosing to introduce new management practices or training to support innovation?

24. How has the firm structured itself to be able to respond to external opportunities?

25. What is the balance (by value) of all services sourced from outside the firm vs internal costs? (is easily available)

TRANSFORMING INTERNAL PROCESSES

26. How have the changes identified in affected the business? (e.g. productivity improvements, new markets, exports, lower costs)

27. What management practices help to support the process of innovation within the firm?

28. How important are existing vs new personal contacts in deciding to implement an innovation?

29. How does the firm establish internal procedures to ensure that knowledge brought in from external service providers is maintained within the firm?

IMPACTS ON STAFF OF INNOVATION

30. Where do you look to find employees that you most rely on for business changes and improvements (vs KISA)?

31. How do you ensure employees are trained to deliver new innovations in product and services to your customers?

32. Do you maintain company practices or procedures that enable you to benefit from ideas brought forward by other employees?

33. What are the relative roles of staff skills and knowledge, and formal procedures in each of the above questions?

Attachment B – Case Studies

CONTENTS

Tourism Firms

The Australian Outback Travel Group

Background

The Australian Outback Travel Group (AOT Group) was founded in November 1987 by its current Managing Director, Mr Andrew Burnes and family. The AOT Group initially specialised in safari tours out of Cairns in northern Queensland. In 1989 it started offering inbound services, primarily to visitors from Europe. The company is based in Melbourne, Australia with branch offices in Sydney, Brisbane, London and Los Angeles. The company now has 150 staff (up from 40 staff ten years ago).

Today the AOT Group offers inbound and destination management services throughout Australia and New Zealand for visitors from Europe, the U.K., North & South America and South Africa. A total of over 100,000 tourists would use an AOT Group service in each year and its clients (travel agents) include some of the world's leading travel wholesalers. AOT Group aims to provide clients with the best possible service at the most competitive prices. Its business covers online booking of accommodation by tourists, tailor made tours for free and independent travellers, package tours sold to travel agents, sports and events packages sold to travel agents, and conventions and group business.

AOT Group's domestic wholesale division operates under the TravelPoint brand, and its fly-drive programs are operated through Fly-Drive Australia. While the customer groups are different, and have different needs, they are essentially choosing from the same smorgasbord of options and offerings. AOT Group caters for non-English speakers from Italy, Germany and France by running its own tours, but does not offer services to Asian non-English speakers as there are other companies which specialise in this market.

Within Australia and New Zealand, AOT Group offers its clients a toll-free 24 hour-a-day assistance with full-time bilingual staff (German, Italian, French, Spanish and Greek) and retail customer service centres in Melbourne and Sydney. AOT Group also offers online reservations, bookings and confirmations via the internet. Its inventory of accommodation and venue options has grown tenfold since it was founded and now contains the equivalent of 2,200 pages of information.

> *"We have a very broad product range catering for many different sectors of the market."*
>
> Andrew Burnes, CEO

AOT Group has been recognised for excellence within the Travel and Tourism industry, and has received the 2003 Australian Export Awards Accor Tourism Award and the 2003 Governor of Victoria Export Award. The firm has also been recognised on the Business Review Weekly Top 500 Private Companies list and the Business Review Weekly Top 100 Fastest Growing Private Companies list, both in 2000.

Recent Innovations

AOT Group has responded to new opportunities in the tourism and travel market as they arise. It has two wholly owned subsidiaries. AOT (New Zealand) was formed to provide inbound services in the New Zealand market in 1999. AOT Group also wholly owns the Australian Incentive Travel Company, which specialises in incoming meetings, conference and shipping business (established in 1994). Two years ago it

saw an opportunity in sport and event packaging. The firm now packages accommodation/transfers/event tickets for major sporting fixtures such as the Grand Prix and the Australian Open Tennis. These have been very well received.

AOT Group is highly dependent on its computer systems and has introduced a number of innovations around online access by its customers. It has made extensive use of XML[29] since it was introduced in 2003. The firm now sees itself as both a tourism company and a technology company and has enhanced its resources for technology development. It has a formal R&D program to support IT development and to get its content into formats that enable it to set up automated client interfaces. While it uses a commercially available booking engine, it has its own proprietary database for all its content (text and photos) about properties and tours.

"We started out in 1994 looking at EDI as a method for our clients to source information from us. Applications were very costly and we spent a lot of time and money converting databases. XML was an enormous leap forward and we can now export data in a free flowing format and it is much cheaper. We now have an XML interface and 6 customers accessing products using XML. It has changed my fundamental view of the company – we are now a technology company. As much as I have tried to resist the cost of the technology, I now accept that we need it. We have whole teams of people on IT and a separate team on e-commerce."

Andrew Burnes, CEO

The firm has been involved in the internet since 1998. More recently a number of online travel sellers have emerged, pitching to the "lates market" (business travellers who make an accommodation booking only shortly before they travel). AOT Group was approached by some of these providers who wanted to buy AOT Group's databases of accommodation and venue details. The databases also have details of the wholesale rates for accommodation, transfers and other tourism options. The firm has struck a deal with several of these operators and now not only supplies its own business with content but several online sellers. The firm has the 4th and 6th most visited online portals, but provides content for the 2nd, 5th and 7th ranked, so it has 5 of the top ten spots for reaching potential customers online.

"The major change is that we have been able to recognise the value of our content (the database of information on accommodation and tours) is valuable in and of itself. In the past content aggregation was part of a process we had to go through in order to distribute our product. We saw the distribution process as fundamental but we never recognised that the content had its own intrinsic value. We have restructured the company to be able to respond to this new market and we now have a separate department marketing our content aggregation services and the sales and marketing group devote considerable resources to selling content in multiple channel environments. It is a different mindset."

Andrew Burnes, CEO

[29] Extensible Markup Language

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning				H		
Legal services	M			M		Routine
Acctg/Financial services	M			H		Routine
Capital Raising				H		
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research			M	H		Routine
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion				H		
Sales & distribution	Agents			H		Routine
Export strategy				H		
Establishing o/s offices	M			H		KI
Performance benchmarking				H		
IT/Networking services				H		
Recruitment services				H		
Accreditation/quality management	M			H		Routine
Standards				H		
Training services	M			H		Routine

H = high, M = medium; remainder are low.

Nearly all services are obtained in-house. The firm uses external lawyers and accountants for routine services including auditing. It purchases the Bureau of Tourism Research data on tourist numbers and other reports from State agencies. It also sought external legal and accounting advice when it established its office in New Zealand. It also must be audited by the Travel Compensation Fund which is a consumer protection agency for travellers. It uses external training services but for "train the trainer" programs and then it uses its in-house trainers to train its staff.

The firm is shy of using consultants as it has found that few have a good enough understanding of the travel industry to be of much use. In the past the firm has paid a lot of money to consultants to do "scoping documents", which were part of the process by which the consulting firm learned about AOT Group and worked out what questions should be asked.

"We needed advice in IT at the same time as everyone else did. We had contracted with some consultants and they were charging like wounded buffaloes. Half way through the project they were awarded another contract by the government. We suddenly found that the people we had been dealing with had disappeared and that we got the johnny-come-latelies who had been in the company ten minutes. We have decided now that if we want a job done then we should employ someone within the company to do it."

Andrew Burnes, CEO

Drivers for Innovation

> *"The company is in a constant state of evolution – this is one of the exciting things and one of the frustrating things. The sourcing of the ideas is internal but the stimulus is always external. The main stimulus is the internet and the possibilities for online distribution. We are continuing to support traditional distribution channels as much as we always have, but are also biting into new distribution technologies at the same time. At some time it will all morph into one – the traditional people are moving online and by 2010 it will be a much more cohesive distribution channel and it will all be online."*
>
> Andrew Burnes, CEO

There are a number of systems in place to obtain feedback from customers, but these influence the detail of the package offerings rather than the broader scope of the business. The firm seeks direct feedback from customers by offering questionnaires that can be filled in and it deals with the customer service departments of wholesalers.

The firm is supplied by a large number of independent and chain operators of accommodation, tours and other venues. It has a system in place to review these suppliers and feedback comments from its own customers. It has a team of people whose job is to inspect the accommodation and tours that it offers to its customers. Andrew Burnes estimates that this team will inspect about 1,000 properties over the course of the year.

> *"We blind test the tours. If we get negative feedback from people about a particular tour, we will send someone to blind test it once or twice. We then provide feedback to the tour operator and expect them to implement changed to fix the problem. After that we will blind test it again to make sure that it is satisfactory."*
>
> Andrew Burnes, CEO

Suppliers are also a source of new ideas – if a supplier develops a new attraction then AOT Group will see an opportunity to build a package around it – for example the opening of the Longitude 131 5-star accommodation at Uluru in Central Australia. The firm uses its existing skills to create a new variation of the product that it can sell into a new market segment.

Knowledge Acquisition

Andrew Burnes obtains most ideas from his personal informal network. Through his long standing in the industry he has a range of personal contacts with senior people and he keeps this network active. The firm also uses networks developed through industry associations and received industry journals and magazines, including those from the major tourism associations in Australia.

The firm recruits junior staff locally but it is finding it harder to do so as the travel industry is not as attractive as it was ten years ago. At senior level Andrew Burnes utilises his extensive network to find the right people. These are rarely available in Melbourne – of the last 6 senior staff hired, 3 have been from Europe, 2 from Sydney and only one from Melbourne.

Transforming Internal Processes and Impact on Staff

Systems used by the firm have evolved over the years and the firm is happy that its practices are effective and best practice because it has been recognised through a number of awards.

> *"The only external motivating factor at the end of the day is the market. You can be as ISO qualified as you like and still fail to deliver a quality service. We are a service company and we have to use people to deliver our services. We utilise technology to achieve this but it is not a case of choosing between equipment and people."*
>
> Andrew Burnes, CEO

Each department within the firm has weekly or monthly staff meetings and at these the staff are encouraged to make suggestions about change. A recent example of this is a suggestion for a paperless office which came up from staff in one department. The team leader met with the IT department to see if it was feasible and the IT department identified some software which had been bought for another purpose but which could be used. The firm has decided to run a pilot project with one customer for one month to see if it will work. If it does then it will expand the pilot to six customers, and possibly roll it out across the Division. Andrew Burnes estimates savings in the order of $250,000 per year if this is successful.

The firm also has a suggestion box outside the lunch room but employees only use this if they have been offered incentives such as a dinner at a nice restaurant. The most effective suggestions for the development of the company come from the team meetings.

Summary

- AOT Group has a suite of service offerings and responds to different customer needs by allowing them to pick and choose what they want.
- The firm is heavily reliant on IT and most of its innovation is in IT systems that make it easier for customers and agents to work with it online.
- The firm makes little use of external knowledge-intensive services but it has systems in place to bring ideas in from outside the firm and implement them.
- Internal management structures enable staff to suggest ideas and they will be trialed and, if successful, implemented.

Banrock Station

Background

Banrock Station is a 4,200-acre property located on the River Murray in South Australia, 200km from Adelaide. Banrock Station, owned by the Hardy Wine Company (formerly BRL Hardy, Australia's largest wine company), combines wine tourism and ecotourism. The property includes a Wine & Wetlands Centre (including restaurant and cellar door sales), 600 acres of vineyards and wildlife viewing and nature trails. The Centre overlooks the wetlands on the property and the cafe features dishes incorporating native Australian ingredients.

Established in 1994, Banrock Station was opened as a wine tourism centre when its Wine Centre, offering cellar door sales and light meals, was launched in 1998. At about the same time, Banrock decided to link its market message of "Good Earth, Fine Wines" with environmental management and restoration. It announced that it was donating a percentage of every wine sale to environmental projects. Donations generated by the sale of Banrock Station wines have now passed AU$2 million.

Manager of the Centre, Tony Sharley, was appointed in 1999. His background was in science and ecology and he brought ideas about linking the wine tourism aspect of the business with restoration of the wetland on site. The aim was to target different markets and to expand the messages to customers about the things that can be experienced when they come to Banrock.

"We realised that wine tourism needs to be more than people coming in to as facility to taste wine. We extended the infrastructure through restoration of the wetland so that people can walk through the landscape we are restoring. We wanted them to understand its history and how man has affected it. We have made the move from traditional wine tourism to ecotourism."

Tony Sharley, Manager

Part of the strategy to move into ecotourism entailed working closely with voluntary organisations such as Landcare Australia (which has volunteers that work to restore degraded landscapes in Australia and plant trees) and groups such as Wetland Care Australia (which at the time had just been established to restore wetlands). The Landcare logo is on many of Banrock's labels to reinforce the environmental credentials with customers for the wine. However the main component of the ecotourism is travellers who drive past the property, which is on the main highway between South Australia and Victoria and is on the western edge of the Riverland district – the area encompassing the Murray River, Australia's largest waterway.

The main customers are those who are travelling in the region and are looking for a convenient place to stop for a break. Banrock offers these people with an option to taste and buy wines in a traditional cellar door setting, but have a meal and afterwards walk in the wetlands. A boardwalk trail has been built to protect the landscape and there are short and long walk options from which to choose. A booklet has been printed to provide background on each of the key sights in the wetland and it also includes plant and bird lists. Visitors are charged $5 to go on the walk and $5 for the book. Use of the area is managed so that it does not become too crowded – walkers are allowed to leave every hour, so that groups can experience and enjoy the isolation. The cellar door area itself is directly connected to a balcony with panoramic views of the wetland. There is also a conference room on site for meetings.

Banrock Station is accredited under the National Ecotourism Accreditation Program and was awarded an Advance Accreditation from Ecotourism Australia in November 2003. In September 2004 Banrock Station won a $100,000 Australian Government grant for the next phase of its ecotourism development. The property aims to use the funding to construct fencing to keep out feral animals (e.g. foxes and cats) that will enable the reintroduction of native mammals such as bettongs and bilbies at the Station.

Banrock Station won the Tourism Winery category in the 2003 South Australian Tourism Awards and in 2002 became the first Australian company to achieve a listing for its wetlands as a wetland of international importance under the Ramsar Convention.

In 1995 Banrock Station employed 5 staff. It now employs 15 staff, of whom a majority are employed as casuals. About 90% of its ecotourism visitors are Australian (of these, about 65% are from South Australia) and 10% are from overseas. The overseas visitors usually speak English and hence there is little or no need for multilingual interpretive materials.

Use of Knowledge-intensive services

Tony Sharley estimates that 20% of turnover is expended on external services, many of which come from the parent organisation.

Activity	**External firm**	**R&D Instn**	**Other Extnl orgn**	**In-house (staff)**	**Board/ Parent**	**Type of Service, if external**
Business planning				M	M	Knowledge Intensive (KI)
Legal services					H	KI
Acctg/Financial services				M	M	KI and compliance
Capital Raising				M	M	Routine
Technology awareness	M			M		KI
Technology trends				M		
Formal R&D						N/A
Market research	H					KI
Product/service development services				H		
Project management	L			H	M	
Operations				H	M	
Marketing/promotion			M	M	M	KI
Sales & distribution				H		
Export strategy					H	
Establishing o/s offices						N/A
Performance benchmarking				M	H	
IT/Networking services				M	H	
Recruitment services			M	M	M	
Accreditation/quality management	M			H	H	Routine / compliance
Standards	M			H	H	KI
Training services	M			H	M	KI

H = High, M = Medium; remainder are low.

While the impetus for development of the wetland came from Tony Sharley, the company needed outside expertise to implement the vision. People were employed on the project for many purposes:

- to design and develop interpretive signage and to plan the wetland walk;
- to design and construct the inlet/outlet which enabled the wetland to be drained in summer (to reintroduce seasonal drying);
- to take and interpret a series of aerial photographs to record the changes taking place once the wetland was restored to its natural drainage pattern;
- to design the wetlands centre and ensure that it was environmentally sensitive, including use of solar power and passive solar principles;
- to develop some of the monitoring systems that provide feedback on the wetland systems and environment.

The next phase of the development, involving the re-introduction of mammals that have been extinct in the region for some time, will also include commissioning of external advisers. These projects require a high percentage of input from external sources – perhaps 50% of the project cost, but day to day usage is low.

In day to day operations, most external support comes from the parent company Hardy Wines. This organisation supplies legal services, some business and accounting services, assistance with capital raising and planning, IT systems and services and the overall marketing strategy. Hardy Wines also provided the systems that were put into place when Banrock Station set up its cellar door sales (e.g. stock control) and cafe and it benchmarks the performance of Banrock Station against its other similar outlets for wine sales (but not for ecotourism). However, Banrock did employ a consultant chef to design the Australian bush foods menu and train staff.

External providers of knowledge-intensive services are used for technology awareness (e.g. regarding wetland restoration) and market research. Local tourism associations, such as the Riverland Tourism Association, are important for the brochures and other regional material that they publish, and for promotion of the region at trade fairs.

External providers have been important for the introduction and auditing of a number of quality management systems. The kitchen is compliant with HACCP (Hazard Analysis & Critical Control Points). And the ecotourism certificate awarded by Ecotourism Australia also required external auditing.

There are no formal links with research institutions although the site is of interest to ecology and biology researchers and is used by researchers from the University of Adelaide with the company's permission.

Drivers for Innovation

The main driver for innovation is internal, using the skills of staff employed for particular jobs. The staff have the expertise to identify opportunities that are likely to be attractive to customers and which will maintain the sort of ambience that their clientele are likely to want. However the views of customers are also apparent – for example the walking trails were introduced partly because customers at the Centre asked about going down to the wetland area. The plan for mammal re-introduction was developed by the management, who wanted to ensure the ecotourism experience continued to be exciting and innovative. The skills of the staff and their understanding of what this class of customer wants to experience provides a synergy which results in innovations which are successful in the context of what Banrock Station is trying to achieve.

"We want people to experience the magical elements of Banrock and we want to create a point of difference consistent with the values of the brand. One objective is to restore the landscape and be leaders in landscape restoration but the other is to create economic opportunities, for example when we complete the new fence and can reintroduce native mammals, we can create an experience where people come here to dine and then do a night walk where they see bilbies and bettongs. Sometimes you have to have the vision of a fantastic and unique experience and then get the feedback."

Tony Sharley, Manager

Staff provide feedback on customers' responses to the feel of the place and to the facilities and experiences available. There is also some opportunity for feedback from the forms that those who want to use the trails must fill out before they go. The registration form also has checklists to ensure that walkers are likely to be safe (e.g. be wearing enclosed shoes to minimise foot injuries).

The parent firm is the other key source of innovations but these relate almost entirely to management systems. These have been implemented elsewhere in the company.

Knowledge Acquisition

Suppliers during projects are a key source of ideas and innovation. However these are implementing concepts and ideas that have been identified by key staff. When longer term knowledge is required the firm will hire specific staff (e.g. the hiring of Tony Sharley in 1999 and the recent appointment of a full time ranger/ecologist who will be in charge of the new project to build 9.5 km animal-proof fence for the government funds recently granted).

Management staff are encouraged to maintain memberships of relevant professional associations as well as community groups which will be a source of new ideas. Several staff play key roles in advisory committees to the State government and local volunteer groups. These provide contacts, some business opportunities and a way of staying up to date in aspects of tourism that provide insights for the firm.

By way of example, these types of networks have provided the organisation with information on equipment that has been used to plant trees to revegetate wetland areas and methods of direct seeding. These ideas can be implemented or modified by skilled staff members. Tree planting equipment can also damage the land surface and so a staff member has just designed a new tree planting technique which is now being considered for production and sale.

Transforming Internal Processes

Most of the internal processes have been imported from the parent company. Staff are the other main source of process transformation and these have been recruited from the local region or from Adelaide (250km away).

The firm has grown three-fold in the last ten years. There has been a shift in structure on site in the move to ecotourism, for example the old position of Functions and Administration Manager has become a Tourism Manager. Staff are recruited for the right attitude for hospitality, and are then trained in the systems operating on the site. Training is provided in food and wine service, using an accredited training program purchased by the parent company.

The organisation has a large proportion of casual staff and in the past these have not been involved in modification of systems. The approach now is to build the capacity of all staff so that casual employees can also have a meaningful input to the

development of new ideas. The firm now has a book through which is seeks ideas, comments and feedback from staff including passing on of comments from customers.

Summary

- Banrock Station has relied heavily on knowledge-intensive service providers for implementing its vision to move from wine tourism to ecotourism.
- It also relies heavily on expert staff input and the external informal networks of these staff for new ideas.
- Feedback from customers results in incremental changes in the way the service is delivered.
- The parent company, Hardy Wines, has provided most of the internal systems and these are standardised across the group, enabling benchmarking.

Binna Burra Mountain Lodge

Background

Binna Burra Mountain Lodge is an accommodation and holiday lodge located in the mountainous hinterland 30km to the west of the Gold coast, Queensland. The Lodge was established in the 1930s, about 20 years after the mountains in which it is situated were declared a national park. The Lamington National Park is 20,000 hectares in size and consists primarily of wet sub tropical rainforest. The Lodge itself is also World Heritage listed. The Lodge can house up to 110 guests staying in 2-4 bed rooms, most with en suite bathrooms facilities. During the school holidays the main clientele is families but during school term the main guests are retired people and couples without children.

The main Lodge offers accommodation with all meals and activities (for example guided walks and evening entertainment) included in the overnight price. About 500 metres from the main lodge the company also runs a campsite and a group of "canvas cabins" (wooden huts with canvas roofs) which offer lower priced accommodation for up to 120 people per night. The emphasis at both sites is on nature-based activities – there are many self-guided walks in the National Park, and children's activities include spotlighting for nocturnal animals at night, and learning about the environment during the day. Evening entertainment includes Australian traditional poetry, singing and slide shows on nature-based topics. Meals are served at set times in a communal dining room to tables of 8 people who may not have met before.

Binna Burra is a public unlisted company with approximately 800 shareholders. It is run by a Board of 6 people which include a descendant of the original founders, an accountant, an environmental expert, a tourism expert (who is also an academic at Griffith University in Brisbane) and two people with experience in local government. No shareholder is allowed to own more the 2.5% of issued capital.

Binna Burra's clientele is primarily Australian (89%) with a high proportion of these being returning visitors. Of the 11 % who visit from overseas, the main nationalities are Western European, American, English and New Zealanders. The venue mainly attracts people who like bushwalking, nature conservation and photography.

Linus Bagley, employee of Binna Burra for 9 years, came to the company from prior experience on large resorts and running 5-star restaurants. He stresses that Binna Burra's culture and ethos has been handed down from the founders and its constancy is what makes the place attractive for returning guests.

"You have to recognise that 57% of our guests are return business. They come back here for a number of reasons and it isn't just the way we serve food. We want guests to feel part of the extended Binna Burra family, but not only through their interaction with staff and the physical things. The culture of Binna Burra includes the changing weather, and the mystical feel when the mountain is suddenly engulfed in cloud. Watching sunrise in the morning can be just as glorious as watching a blood red sunset over the Darlington Ranges. The experience of nature brings everyone together – people who love nature seem to love each other as well."

Linus Bagley, Lodge Manager

Binna Burra has a strong sense of social commitment and a desire to work closely, often on a voluntary basis, with other like-minded groups. Binna Burra works closely with local schools and runs 3-day programs at its purpose-built educational centre.

Students who attend these sessions often then convince their parents to visit during the holidays. It has relationships with 13 universities including those as far away as Sydney, whose researchers use the Park as a research site. Binna Burra often has informal relationships with these researchers so that when they visit they will give talks to guests or take them on field excursions. The field staff all have at least one science degree and have particular interests and skills in different aspects of the local fauna and flora. They contribute to preservation by recording sightings of rare species to the Queensland Naturewatch.

Binna Burra also works with local environmental groups and the Friends of Binna Burra contribute to weed-removal activities. Further, it has links with local craft associations who can use the Lodge for displays and sales (on commission). Staff members will also address local groups (for example Rotary) on environmental management.

The firm's main competitive advantage is its location and the consistency of its service.

Recent Innovations

The service style and lodge accommodation at Binna Burra has been very constant over the years. There have been many customer surveys but there is no great push for change and quite a deal of resistance to it from returning guests. About 9 years ago it was decided that staff should clear plates from tables during the meals rather than waiting for guests to take their own crockery to a central clearing table. There are still guests who started coming to Binna Burra before that time and who refuse to allow staff to take their plates from them.

Nevertheless there have been a number of new components to the product offering that have been introduced in reaction to customers' needs. These are mostly focused on children. When groups of children stay the Lodge rangers arrange activities for them for most of the day. The children's playground has 4-5 components around which environmental games are played. Each component is made up of equipment (for example a maze with a tree in the middle) around which a game has been designed. The facilitator takes groups through the game and afterwards the group goes to another area of the forest where the learnings from the game are discussed. The learnings might relate to group behaviours or to the environmental lesson on which the game was focussed (e.g. predator/prey interactions in the rainforest, the water cycle or how rainforest trees get their nutrients). These game areas were designed 7 years ago by Kate Bishop who had won an Australian Churchill Fellowship and had designed playgrounds for disabled children. She was commissioned to design the play areas and the games and the Binna Burra staff built the equipment.

In 2002 the firm released a CD about Binna Burra. This was developed by Dr Tony Young, a member of the Binna Burra Board and General Manager Linus Bagley. The CD took over 18 months to complete. The CD provides a virtual interactive tour of the Park and its walking trails, a complete plant list of Lamington National Park and Lamington's fauna, information on the meanings of Aboriginal plant names, maps of the area and a complete history of Binna Burra Mountain Lodge. It was developed with its older guests in mind (some of whom can no longer walk the trails) and however its main aim was for use as an educational tool for schools – so far a copy has been given to some schools in the Gold Coast region and approximately 30 schools in the Brisbane suburban areas at this and permission has been granted for them to load it on as many computers as they want and to reproduce any material for school lessons. The CD has also been very popular amongst people with a love of nature who visit Binna Burra and wish to take a piece of it home with them.

The major innovations have been in management and the quality management systems implemented in the last decade. These include a management manual (termed a "success kit") which details all staff responsibilities (e.g. environmental management, health and safety, emergency responses to fire and also sickness in guests, employment conditions) and the response expected from management if staff obligations are not met. There is also a manual for all aspects of office administration and an environmental management manual which documented all the environmental legislation that affected the Lodge and Binna Burra's response to it. There is a Land Management Plan which documents systems how Binna Burra cares for the plants in the area, including weed control, revegetation and tree management. Binna Burra's achievements under this system are monitored by the environmental monitoring group at Gold Coast City Council, which is downstream of the Lodge.

In the recent past the firm has been upgrading its reservation systems and the website is also constantly upgraded and amended (although only about 15% of guests first find out about the Lodge through this medium). Office equipment is upgraded as old equipment is written off.

There have also been innovations in staff training. Staff turnover is very low as Binna Burra is in a relatively remote area and there are few local employers. The 65 staff are mainly customer service, maintenance and kitchen staff. New staff are trained in the ethos of the company first and foremost. Every 2-3 years the staff have a 3 day meeting where they work through all the issues that make Binna Burra attractive to returning guests. New staff have a 2-3 day induction period where all components of the success kit are explained. Staff are also trained in-house on customer service.

In general, change is relatively slow and incremental. Most new service modifications are more than five years old. However modifications in staff management and internal training systems are more recent and change further according to need.

Use of Knowledge-intensive services

Linus Bagley estimates that 1% of turnover is spent on external services listed in the table below.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning				H	H	
Legal services	M					Routine
Acctg/Financial services	H				H	Compliance
Capital Raising						N/A
Technology awareness				H		
Technology trends				H	H	
Formal R&D						N/A
Market research				H		
Product/service development services	M			H		Tailored
Project management				H		
Operations	M			H		Routine
Marketing/promotion	M			H		Routine
Sales & distribution	M			M		
Export strategy	H					
Establishing o/s offices						N/A
Performance benchmarking				H		
IT/Networking services	M			H		Routine
Recruitment services				H		
Accreditation/quality management	M			H		Tailored
Standards			M	H		
Training services	M			H		Tailored

H = high, M = medium; remainder are low.

The stability of the staff and the make-up of the Board mean that most services are internalised and provided in-house. The Board members are the main "forward-thinkers" but the management of the firm also have a future development committee which is responsible for forward planning. The Board is also very important for its links to other key stakeholders – research and educational institutions, local councils and government agencies (particularly State government environment and sustainability agencies).

It outsources limited legal services and its auditing is done by a local accounting firm. Products are developed in-house with the exception of the playground initiative summarised above. All operations are also run by staff, except in busy times the firm may bring in interpretive staff to lead walks – these people each have their own specialty and will "flavour" their presentations accordingly but there is no attempt to formalise these roles.

The firm runs its own marketing via a newsletter sent to past customers, its website and advertisements in newsletters issued by bushwalking clubs, national parks associations, photography magazines and bird watching clubs. All guests receive a letter when they return from their first visit, offering them something special if they return. The Lodge also issues a seasonal newsletter highlighting things of interest within the Park and the firm is able to segment its database to target particular groups when necessary.

It reaches the inbound tourism operators who market to overseas guests via an annual trade show organised by the Australian Tourism Commission – there the firm will contact ITO's from key customer countries, will explain Binna Burra to them, provide materials and invite them to visit the Lodge before they go back to their home country.

It/networking services are provided by a local IT firm and specialised training (for example firefighting, first aid, food and beverage handling), when required, are also sourced locally

Drivers for Innovation

As noted above the guests at Binna Burra often resist change and the firm works actively to maintain a certainty about the service and, above all, the feel of the place. Although some guests come from overseas the firm makes only minor adjustments to what it offers to cater for their needs – when there is a large proportion of Asian visitors they will alter their menu to suit, and when there are many overseas guests they may change the evening entertainment to account for language difficulties. In addition, staff speak German, French and Japanese.

The main driver for operational change comes from within the firm, through the Board and management, and often in response to perceived desire to minimise environmental impact and ensure that the firm is operating using the best environmental practices. The firm was the first to take up the Queensland Government's Cleaner Production Partnership, a program which offers Queensland businesses financial assistance and expert advice on how to improve environmental performance. The firm was also the first accommodation provider in the Asia Pacific to be benchmarked and certified under the Green Globe 21 system – a major part of this is the extensive system of environmental measurement that is in place to ensure that waste is minimised. Binna Burra Mountain lodge has also achieved advanced accreditation through the National Ecotourism Accreditation Program of the Ecotourism Association of Australia.

Service providers are mostly arms length but the firm does receive newsletters from both its accountants and its lawyers and these inform them of new laws. Changes may be made to internal procedures as a result.

The firm finds that the Green Globe registration and its links to the Queensland Government mean that it is in demand for providing advice, particularly to overseas visitors who come on industry or government delegations.

> *"I am always invited to give talks to visitors. When I do I give them information on how we have set up our systems. It is part of our ethos and we are keen to help others to minimise environmental impact. However, exporting this skill as a service is not part of our strategy."*
>
> Linus Bagley

Knowledge Acquisition

Most external ideas come through the Board and the management, who keep alert for new ideas. Many ideas come through a range of newsletters the firm receives as well as existing informal networks. The firm is a member of the Queensland Chamber of Commerce and Industry, which it uses for advice on industrial relations issues. It also belongs to the Queensland Hotels Association and the Australian Institute of Management.

Human resources management is also important and the HR/financial manager also looks out for new ideas in this area. New knowledge is acquired here by attending training courses.

The firm is looking for other ways to expose staff to new ideas. A relative of one of the managers runs a very busy five star restaurant on the Gold Coast, a major tourist area. The firm is arranging for its kitchen and service staff to each spend one week working at this restaurant to experience a very busy high service environment.

Transforming Internal Processes

The extensive system of staff success kits and manuals is the method by which learning is captured. There is a manual, for example, on how to operate the playground so if a staff member leaves then a new person can step in quickly and easily. The manual is written to still allow room for individuals who run the playground sessions to show their personalities.

Staff are always in close contact with their supervisors as they work together each day so there are always opportunities to make suggestions. Departmental managers and supervisors meet in a management committee once per week. There is a full staff meeting on average four times per year so that all staff meet together. The meetings are documented and effort is made to get back to individual staff members to give feedback in relation to their suggestions, issues that have been raised and any actions that have been taken. The most important issue from the company's perspective is that staff know that management is interested in listening to them and it is important for management to give feedback if a staff member raises an issue.

Summary

- Customers value the constancy of the service received from Binna Burra.
- Most changes are management induced and relate to the quality management and internal processes within the firm. Many of these relate to environmental management which is part of the ethos of the organisation.
- The Board is also a driver for change and Board members provide key skills and personal networks.
- The firm has an extensive network of like-minded organisations with which it exchanges ideas.
- Most services are provided in-house. External service providers are used in a limited way. Lawyers and accountants who provide compliance-type services also serve to alert the firm of changes to laws that may impact in terms of legal obligations and human resource management.

Goana Air Safaris

Background

Goana Air Safaris is a family company based about one hour north of Brisbane, Queensland. The company runs self-fly tours around Australia using its own fleet of Cessna 172 planes. The service was launched in 1993, following the introduction of GPS into civilian use, and this year will reach 35,000 flying hours and over 200 tours since launch.

"Australia as a country is devoid of traditional navigation aids. The advent of GPS satellites made that irrelevant, so people can safely and certainly navigate by air to unique destinations in outback Australia."

Mal Shipton, CEO

Goana Air Safaris appeals to a niche tourism market comprising licensed pilots who are attracted to the idea of a self-fly holiday around Australia. Clientele is 99% from overseas, largely from the US, but there are significant numbers of people who come from the UK, Scandinavia and Germany. Countries such as Bermuda, Slovenia, Poland and Paraguay, which have relatively low numbers of people with private pilot's licences are also represented. The market is very specialised and Goana cannot use traditional inbound tour operators to support marketing, mainly because of the need to arrange for reciprocal recognition of pilots' licences to enable customers to fly in Australia. Customers flying the planes need to have good private pilot standard with around 100 hours total flying time, except for the Circumnavigator tour, which requires a greater level of experience. About 25% of bookings are from returning customers.

The firm's main marketing tool is its website plus a regular monthly newsletter. The firm also attends two major trade shows in the US each year in April and July and these then generate business for the following season/s, as people can take up to 4 years to decide to visit Australia to go on an air safari.

Goana (which stands for Great Outback Air Navigation Adventures) organises tours along a number of pre-planned routes which comprise about 3 hours flying time or 600 km per day, with accommodation and tours at each stop along the way. Tours can range from 4500km to 7500km depending on the route. Tours only take place from March to November when the weather is more reliable for flying and is less turbulent (parts of northern Australia have heavy rain and some cyclones in the summer months – December to February). Pilots who book flights can bring their families with them to fly in the same plane and are responsible for arranging their own travel to Brisbane. Goana will arrange for their Australian pilot's licence with the Civil Aviation Safety Authority (CASA), will program the itinerary and provide maps and a full briefing on arrival.

Most tours have 6 four-seater aircraft with 5 couples/families and the Goana tour director flies the 6th aircraft. His job is to manage any day to day issues that arise and to coordinate on-ground activities. Prior to departure Goana will book accommodation and day tours en route and also provides each participant with a *Goana Tracks* book which gives a potted history of each place visited and explains the background to many of the attractions and customs in Australia. Thus, when people arrive at a particular attraction, they will already have some background information about it. This is important for newcomers to Australia who may be

struggling with colloquial language, particularly in remote locations. English is the universal language for pilots so there is no need to worry about translations.

Use of Knowledge-intensive services

Founder Mal Shipton estimates that 5 % of turnover is expended on external services.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning	H			H		
Legal services	H					Tailored
Acctg/Financial services	H					Tailored
Capital Raising						N/A
Technology awareness				H		
Technology trends				H		
Formal R&D						N/A
Market research				H		
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion	H					
Sales & distribution				H		
Export strategy						N/A
Establishing o/s offices						N/A
Performance benchmarking						Not done
IT/Networking services	H			M		
Recruitment services	M			M		
Accreditation/quality management				H		
Standards	M			H		
Training services	M			M		

H = high, M = medium; remainder are low.

The firm outsources legal and accounting services but these are value-added rather than compliance services because of the difficulty of dealing with CASA in Australia. The external accountant also provides advice on business planning.

The majority of other requirements are supplied in-house by staff (the Board has no non-family members). Marketing/promotion and IT are provided by the one person, an IT consultant who manages the firm's website and writes much of the monthly newsletter that is sent to past clients and those met at trade shows. The website is the main promotional tool for the firm and a lot of time is spent on it.

The firm recruits rarely but has had equal success using recruitment agencies and direct advertisement. External auditors are used for CASA-compliance and to ensure that the quality system is independently verified. Customer service training is provided externally.

The external service providers are chosen mainly on the ability to provide specialised skills that are not available within the firm. All the external service providers are at arm's length apart from the IT/marketing support person, who is closely involved in the firm. The firm has had no government grants and does not have any particular contact with government departments apart from Tourism Queensland.

Drivers for Innovation

The concept for the tours was the main innovation. Once the GPS was available then the whole system could be put together at relatively low risk.

"Australia was the country that God created for aeroplanes – the bulk of the country is dry and flat and it is a very safe place to fly. We have chosen a very reliable aircraft that every pilot in the world will have flown – it is virtually pilot-proof. The main risk is day to day weather changes and we have our own pilots who make the call on whether the group will take off or not, and they always cater to the weakest link. But we limit our tours to the time of year when the weather is most stable."

Mal Shipton, CEO

Customers are the main drivers for change in the tour itineraries and on-ground components. They provide feedback direct to the tour guide during the trip and the guide also takes not of any difficulties or anything that works particularly well. They also are able to look for new components of trips while en route with each group. The company is always looking for something more that it can provide to customers, so that the whole experience is satisfactory for all that are on the planes. The main attraction to the pilots who come is being able to fly in another country. Their partners are sometimes reluctant participants and Goana sells them the concept that the plane is simply a way to get from one point to another very efficiently, and provides the maximum sightseeing time at each location. So the activities arranged at each location have to be good value.

"Everywhere we go we do a small land tour after we spend the morning flying to a new destination. For example in Broome we go to a pearl farm. In Kununurra the guy that picks us up takes us in his truck past 1500 year old baobab trees and agile wallabies, he stops at a bowerbird's bower along the way, all these things are happening around us. When people get on the boat to go up the Ord River they see crocodiles and jabiru storks – they just love it. We just keep looking for good experiences like these."

Mal Shipton

Goana's suppliers do not play a major role in innovation, with the exception of the IT/marketing person who provides a lot of input and ideas. This person works 2 days per week for the firm and the relationship is quite collaborative.

The other main source of ideas is the annual trade shows which the firm attends in the US. These are a major source of new ideas (for example the GPS new equipment) and informal contacts who may help with marketing.

The firm makes little use of Australian industry associations and informal networks for innovation. It has no competitors in Australia and no interest in operating overseas. Almost none of its customers are from Australia so there is little need for any local links. The firm does receive the Queensland Tourism newsletter and gets an idea of trends in tourism but obtains more direct feedback from the level of business at the attractions it visits with clients around the country. The firm's directors belong to the Aircraft Owners and Pilot's Association and Airsafety Australia, both of which watch changes in the CASA regulations and lobby the government about regulatory issues.

According to Mal Shipton, the main impediment to innovation is the regulatory system. The company did plan some years ago to develop a bird-watching tour on a larger plane for non-pilots. It had planned the tours and printed brochures, but found that if it wanted to apply to CASA for an air operators certificate for this program, it

had to spend $3 million on the plane first and then wait for up to 12 months for the licence. It could not afford to do this so the plan never went ahead. CASA has also been more stringent on reciprocal arrangements for pilots licences since September 2001.

Knowledge Acquisition

Goana's product has been evolving gradually since it was first launched. The company makes minor changes to its routes and the way it offers its service and is always seeking out new attractions that it can include in its packaged tours. It introduced its Goana Tracks book in 2004 as part of these changes. Most of the input to these changes comes from staff who are in direct contact with customers during the tours and also make their own independent assessment of the success of ground activities.

Management has been evolving gradually. The firm is small (9 staff) and communication within the company is not difficult. The main change in recent times has been the appointment of a specialist staff member with IT skills. The firm has since developed an IT-based tracking system for its aircraft components and maintenance using this person's skills. This person also can act as backup for the marketing/IT role that is currently outsourced.

Equipment maintenance on aircraft is pre-programmed as all parts have a specified service life and must be replaced in accordance with the service schedule. This is part of Australia's air safety standards. Goana has recently decided to upgrade its GPS systems in all planes and is currently fitting new systems which have more features including a moving map which places the plane on its geographic co-ordinates and can zoom in to any scale. The new GPS will make it easier for pilots to plot their location as they travel. Goana found out about the new GPS options through its attendance at trade shows and through international industry journals and magazines.

Transforming Internal Processes and Impact on Staff

The firm has developed a manual for tour directors, who are trained in-house. Tour directors have to be able to deal with people, ensure things run smoothly, give a commentary on what they are flying over and be able to fix anything that goes wrong with the aircraft. Mechanical problems are rare because of the strict maintenance regime, but all the company's pilots have a mechanical background anyway.

Procedures have also been developed for administration including how email inquiries are handled. These ensure that steps aren't missed in dealing with customers and that service is consistent. Training on these systems is conducted internally. Recently, all staff have completed the externally provided Aussiehost Customer Service Workshops.

As the firm is still small and is run by its founders the systems in place for adopting and implementing new ideas is fairly informal. All staff are able to contribute to ideas through regular meetings and decision making on new ideas is rapid.

In 2002 Goana was a finalist in the Telstra Small Business Awards. These awards are based on growth, implementation of quality and risk management systems, and responsiveness to customer needs.

Summary

- Goana introduces changes to its itineraries in small steps, in response to customer comments and the input from its tour directors on staff.

- It has few informal networks in Australia as most of its customers are from overseas and it does not rely on local tour operators for business. Its main networks are developed by attending US-based trade shows and by reading international pilots' magazines.
- Most externally sourced services are knowledge-intensive due to the highly regulated field in which it works and the need to market to a specialised customer base.
- Internally all systems are codified and staff are trained in-house to manage these systems. Because the firm is small it can react quickly to implement staff suggestions for change.

Skyrail Pty Ltd

Background

Skyrail is part of the Chapman Group of companies and is headquartered in Cairns, Queensland. The Chapman Group began as a surveying and real estate development consultancy over 40 years ago and has since diversified into a management and investment group. Major areas of activity are tourism, real estate (residential, commercial and retail property development, investment and management), facilities management, media and investments. The head of the group, George Chapman, is also director of a number of public companies, hence, there is considerable management experience in the group. Ken Chapman, CEO of Skyrail-ITM, was a Director of the Australian Tourism Commission for six years and was a founding director of the Queensland Tourism Industry Council.

Skyrail was founded in 1987 to build and operate a cableway from the foothills north of Cairns over the Barron Gorge National Park to Kuranda, a small town to the west of the city. A 7.5km rainforest cableway, Skyrail has 114 gondola cabins which glide just metres over the canopy of Australia's World Heritage listed Tropical Rainforests, providing guests with a bird's eye view of the rainforest, Cairns and the Cairns Highlands. Skyrail has two rainforest mid-stations, Red Peak and Barron Falls, providing guests with the opportunity to alight from the cableway and explore and learn more about this ancient environment from the forest floor on Ranger guided boardwalk tours and the Rainforest Interpretive Centre. Skyrail opened to the public in 1995 after a 7 ½ year approval process and a one year construction period. It can carry 700 people per hour. About three quarters of visitors come from overseas. The firm has about 100 staff, most of these are based in Cairns.

Skyrail has won a number of tourism awards, including the Greening of Business Tourism Award for 'Most Environmentally Conscious Visitor Attraction', presented at the European Business Travel and Meetings Exhibition, Geneva, Switzerland in 1996, the Queensland and Australian Tourism Awards for 'Best Tourist Development Project' and several other awards including Queensland and Australia's Best Major Tourist Attraction and the prestigious British Airways Global Tourism for Tomorrow Award.

Since establishing Skyrail, the Chapman Group has founded another company, Skyrail International Tourism Management (Skyrail-ITM), to manage tourist attractions. The firm was contracted to perform an environmental impact assessment and a major Feasibility Study for a tourism and cableway development on Cheju Island in South Korea. The firm was awarded a contract in 2000 to operate the Sky Safari cableway at Taronga Zoo in Sydney, and in 2002 signed a contract to operate a new cableway and theme village being built on Lantau Island in Hong Kong and which will be opened in 2006.

In February 2002 Skyrail was the first tourist attraction in the world to be certified under the upgraded Green Globe 21, the international travel and tourism industry's sustainable ecotourism benchmarking authority. Green Globe 21 certification is based on Agenda 21 and principles for Sustainable Development endorsed by 182 governments at the United Nations Rio de Janeiro Earth Summit in 1992.

Construction of the Cableway

The construction of the cableway was subject to numerous environmental regulations and also the company's own desire to minimise impact on the rainforest. Pre-construction studies and the approval process took approximately seven and a half

years and the construction a further year. The building program had to develop new techniques, as there was little experience either in Australia or overseas, in managing environmental impact for this type of development. For example :

- tower sites were selected to coincide with existing canopy gaps;
- the leaf litter and top soil was collected and stockpiled for reintroduction when construction was complete;
- plant seedlings were catalogued at each site, then removed and propagated during construction, and re-planted in their original locations, with the saved top soil and leaf litter, when construction was complete;
- tower footings were built largely by hand, using picks and shovels. Workers had to walk in to the remote tower sites each day, carrying their equipment, which took up to an hour each way. Helicopters carried heavy equipment to and from the work sites;
- No swathe clearing along the line. The towers, which are 6.5m wide at the base and up to 40m high, were erected in clearings no more than 10m x 10m. Tower components and concrete were transported to the clearings by Kamov helicopters, which the Chapman Group brought to Cairns from Russia specifically for construction. 60 metre lines were used to lower the custom designed towers into the small, isolated clearings, with the long lines minimising any potential turbulence impact on the rainforest canopy. This unique construction technique was a world first, which cableway manufactures had previously thought impossible;
- the two rainforest mid-stations were built in existing clearings.

"We had to be very proactive in order to protect the rainforest. We consulted with cableway construction firms in Europe and their first step was to 'get a bulldozer and clear the line under the cable'. We just couldn't do that. Our main attraction is the rainforest and we didn't want to wreck it."

Ken Chapman, CEO

The firm does not have design engineers on staff but is able to tap into local engineering expertise developed by firms that support the mining and agricultural / milling industries around Cairns and North Queensland. These include electrical, hydraulic and mechanical engineers.

The construction of Skyrail's boardwalks and educational displays within the rainforest had to be approved by the Wet Tropics Management Authority, a government body also headquartered in Cairns. To access expertise in this area the firm approached the Commonwealth Scientific and Industrial Research Organisation which has a rainforest research group in the region.

Operation of the Cableway

Skyrail's commitment to minimising environmental impact extends to its operations system. The firm is committed to resource conservation, control of noise, air and material pollution, and minimisation of energy and water use. It has implemented a range of procedures which aim to ensure that targets are met.

All staff undergo rigorous training in this regard. All staff (including those in the offices, who rarely visit the rainforest site) must attend a one day, internal training course on the environment where they are taught about the natural values of the area and the rationale behind the various company practices. The firm has been certified for ISO 9001 and is also the first tourism company in Australia to reach ISO

14001 accreditation, so, the aforementioned training also ensures staff understand the company procedures supporting these quality systems.

"*We are continually pushing the envelope of quality management and enhancing our training programs. This is partly because we want to be as good as we can be, but also because we are running a business managing tourist attractions. We need to have systems and procedures that are codified in order to ensure we deliver a consistent service no matter where we operate, so we might as well also be quality certified. Certification is also important to some organisations who may use our services, particularly government."*

Ken Chapman, CEO

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning				H	H	
Legal services	H			M		Compliance & Tailored
Acctg/Financial services	M			H		Compliance
Capital Raising						N/A
Technology awareness		M		H		Tailored
Technology trends	M			H		Tailored
Formal R&D		M				Tailored
Market research	M		M	M		Tailored
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion*				H		Tailored
Sales & distribution				H		Routine
Export strategy			M	H		Tailored
Establishing o/s offices	H					Tailored
Performance benchmarking			H			Tailored
IT/Networking services	H					Routine
Recruitment services				H		
Accreditation/quality management	M			H		Compliance
Standards			M	H		Tailored
Training services	M			M		Tailored (joint)

H = high, M= medium; remainder are low.

The firm outsources legal and accounting services to ensure compliance with Australia's taxation and financial services laws. Most of the other outsourced services have some component of knowledge-intensity.

The firm has an affiliation with CSIRO and the Rainforest Co-operative Research Centre. Both are government-funded R&D institutions which are working on aspects of forest ecology and tourism management. CSIRO was commissioned to undertake botanical impact assessment and entered into a joint venture to help develop the interpretive components of Skyrail Rainforest Cableway in Cairns. This included the development of the Rainforest Interpretive Centre and the production and launch (in 1996) of an educational, rainforest CD-ROM featuring materials / programs / content from the interpretive centre run by the company. The company

works with the CRC on ecotourism management and development of know-how for operating within sensitive heritage areas. However, the CRC's government funding will be cut after another two years. The project with CSIRO was on contract and there is no formal R&D component in this work. CSIRO also worked as a sub-consultant on the Cheju Project.

Technology trends are identified from within the firm but external service providers also play a role. For example, external service providers of non-destructive testing can be a source of information on new technologies. During construction the firm needed to bring in external providers of construction engineering services but it could not find any expertise to help it minimise environmental impact and it ended up developing this knowledge in-house.

Skyrail has also worked with another Australian company on a particular technology solution to a problem encountered during operations. The other company paid for the R&D and retains the IP. Skyrail solved a technical problem and also has the opportunity to on-sell the technology to other cableway systems as an agent of the technology company.

Skyrail uses tourism statistics produced by two government bodies: the Bureau of Tourism Resources (BTR) which analyses data in arrears and the Tourism Forecasting Council (TFC) which forecasts tourism numbers. BTR and TFC are now part of Tourism Australia. However, the value of this data is limited as the BTR data is too out of date by the time it is published and the TFC data seems to be unreliable. The most reliable data source is the Australian Bureau of Statistics data on accommodation and the passenger number data for Cairns airport. Other marketing support is supplied by Tourism Queensland and Tourism Australia which run co-operative marketing programs. However, were these not available, Skyrail would implement their own programs. For example, the company has recently brought three attraction operators in Kuranda together to co-market in conjunction with Skyrail tickets and this is working well. Skyrail also outsources customer satisfaction surveys.

The firm manages its own marketing and promotion but outsources graphic design. It also works closely with tourism wholesalers in Australia and overseas. While these are crucial to the firm's ability to market itself to domestic and inbound tourists, the services provided are routine and Skyrail provides most of the material that is used in promotional brochures.

It also relies heavily on outside organisations for performance benchmarking. However, this is achieved by attending international tourism conferences where the offerings of similar businesses (not necessarily competitors) are assessed. It also uses the Green Globe 21 program to help benchmarking on how to minimise the environmental impact of its operations.

Skyrail has started to export its services. It obtains some leads through Austrade but follows these up itself. It is currently contracted to operate a new cableway in Hong Kong and has established an office in Hong Kong to do so. It received advice on how to do this from specialists on Hong Kong.

All IT services are outsourced. Recruitment is handled in-house through direct advertising. While it has developed its own quality management procedures, these are audited by an external auditor as required under the quality management accreditation guidelines. Skyrail has also developed a number of management and service training courses in conjunction with a local supplier, which now delivers these to new staff.

The firm, or its directors, are members of a number of industry associations. The firm obtains industrial relations advice from the Queensland Chamber of Commerce and

Industry. The Chairman and CEO are both fellows of the Australian Institute of Company Directors (AICD). The Chairman was awarded the gold medal by the AICD last year. The CEO is also a fellow of the Australian Institute of Management.

The main driver for outsourcing services is the inability to justify a full time position within the company. However, some services are outsourced due to specific needs, but finding the right supplier is often difficult. The firm has difficulties finding high level human resource strategy skills in particular.

It has funded all the outsourcing itself, apart from using the Export Market Development Grant Scheme until it finished its cycle of seven years under this program. However, it believes that EMDG is not well suited for export of services, which need a good reputation and long term relationships to make a sale.

It is too large to qualify for COMET (which did not commence until after the firm had grown too large to qualify). It finds that with 100 staff it is too large to qualify for most government programs, but it is too small to be able to influence government and procurement like larger multinational firms that have the potential to bring large numbers of jobs to a region.

Drivers for Innovation

Skyrail is in a constant process of evolution. The company's management, and in particular Ken Chapman, found that following construction the company had a lot of 'know how' which it captured through the development of its standard operating procedures. Having developed this knowledge it seemed sensible to look for other opportunities to apply it, hence the interest in becoming a facilities management company. There is a high demand for these skills now, but the risk is that the firm will pass them on and lose its intellectual property. Hence, it is only seeking contracts where it can manage facilities in the longer term, so the skill does not leak out from within the company.

> "*Everyone wants us to be a consultant but we are only interested in projects where there is a possibility of long term involvement, not a one-off sale of IP. Australia has a long history of selling our skills and losing our competitive advantage as a result, and then having our competitors come back and knock us out of the water. What Australia needs to learn is how insignificant we are in the world and that we cannot compete on labour costs. The only way we can compete is in the smarts and we do not want to give that away."*
>
> Ken Chapman, CEO

Customers are the main drivers of innovation for delivery of services at the Skyrail site. It is through feedback from customers that the firm first identified growing demand for interpretive, ranger guided, rainforest walks; when these were first introduced ten years ago this kind of innovation was cutting edge.

Skyrail continues this innovation today with the introduction of a range of interpretive and interactive environmental education programs, including the Interpretive Ranger Option, Nature Link and Rainforest Link. Each of these packages have been developed to meet the market demands of several key and niche Skyrail market groups, including Japanese tour groups and the education market (local, national and international).

While inbound tourists are the major source of income it is not possible to communicate directly with this group. Instead, the firm markets directly to wholesalers of tourism products in overseas locations. This ensures that Skyrail is in

the offering put to potential customers who are considering a holiday in Australia. Another important source of marketing is the Visiting Journalists Program run by Tourism Australia.

The other major customer for facilities management is government. This places an additional set of demands on the company.

> *"The challenges provided by the new project in Hong Kong and the existence of a demanding client have caused us to take the development and operations to the next level. Hong Kong is now best practice for this type of facility. We intend to review the operations in Australia once the Hong Kong facility is operational and retrofit where possible."*
>
> Ken Chapman, CEO

The ideas for the move into attraction management came from within the firm. Although Skyrail is a family company, the Directors of the firm have many years of experience in business and know how to target new opportunities. The firm also keeps close watch on emerging trends through visiting comparable attractions around the world and attending key trade shows, in particular the annual conference of the International Association of Amusement Parks and Attractions (IAAPA) in the US.

> "*The IAAPA is bigger than Ben Hur. You couldn't hold it in Australia because we wouldn't have anywhere big enough. We send our senior management staff there and we use it to benchmark against other businesses. There are few businesses in the world like ours, but for product quality you can't beat Disney and this is a valuable opportunity to compare ourselves to the best."*
>
> Ken Chapman, CEO

While most suppliers have little influence on the company, there is a close dialogue with suppliers of cableway equipment.

Knowledge Acquisition

Finding the right person to run a particular section of the company is a huge challenge. Because the company is small, many of the key roles are not a full time job and Cairns is a small town so there are few people with the necessary skills. Further, over 80% of the company's employees are relatively low-paid service staff and most of these do not have the capacity to move into management positions. The codification of the delivery systems is part of the company's attempt to make service delivery foolproof, to the extent that this can be achieved.

Transforming Internal Processes

The management of the company is based around a small group of senior staff who meet regularly and then work with their own teams to pass information down the line. There is no formal system for seeking innovative ideas of staff to pass up the line in return. The main concern of management is that staff are aware of the importance of the environment and of minimising environmental impacts for the survival and growth of the company, and that they are well enough skilled to avoid intentional negative impacts by their own actions. Much of the company's internal processes relate to identifying and avoiding risk.

Summary

- Skyrail ensures consistency in service delivery and minimal environmental impact by codifying its standard operating procedures in a quality management system. This is implemented through rigorous staff training.
- It protects its IP (knowledge of how to run tourist facilities in an environmentally friendly manner) by only taking contracts where it has a long term involvement in management of the facility.
- Benchmarking occurs through attending overseas conferences and through formal accreditation such as Green Globe 21.
- Customer feedback is the driver for innovation in the main cableway operation, but working overseas with large demanding customers (for example in Hong Kong) has brought the construction capability to a new level and has further developed skills within the firm.

Tjapukai Cultural Park

Background

Tjapukai started in 1987 when its founders, Don and Judy Freeman, both experts in theatre and working with community groups, moved to Cairns in Australia. The local Aboriginal tribal groups, the Tjapukai, had been living in the region for thousands of years but had been displaced by the arrival of Europeans in the 1800s and there was high unemployment and a poor understanding of their cultural base within the local region.

The Freemans worked with the community and began the Tjapukai Aboriginal Dance Troupe, which over a number of years obtained a reputation for excellence and innovation. During this time it toured overseas on several occasions, in 1990 visiting 9 countries. The dance theatre is now in the Guinness Book of Records as the longest running show in Australia.

In 1996 the troupe entered into partnership with two local Aboriginal communities, the Djabugay and the Irukandji, Indigenous Business Australia and the Chapman Group, owners and operators of Skyrail in Cairns and moved their business from Kuranda onto land owned by Skyrail, closer to Cairns. This was developed as a cultural park in co-operation with the Aboriginal communities and their elders and is also part-owned by them. The park covers 12 hectares and contains a museum of Aboriginal archaeology, a creation theatre which portrays the Tjapukai's cultural beliefs and a history theatre which tells the story of the local people since European arrival. The Aboriginal people employed in the park also run information sessions on traditional Aboriginal culture (e.g. didgeridoo playing and bush foods), and teach visitors to throw boomerangs. Members of the troupe give regular performances throughout the day. All materials presented in the park have been approved by the local Aboriginal community. About 65% of visitors are from overseas. Those from within Australia are primarily from the main population centres of Sydney and Melbourne and from country Queensland.

In 2002 the Park also began opening at night and launched a new performance concept which made the most of the evening setting, using fire and light and audience participation to involve audience into the performance. The park also has a restaurant and retail outlet which sells authentic Aboriginal art works and Tjapukai merchandise. The Freemans maintain that Tjapukai is the only presentation of Aboriginal culture in Cairns that provides direct benefit to the local community. The park employs about 100 people of which 80% are of Aboriginal descent.

The park has received numerous awards including seven national tourism awards, 9 Queensland Tourism Awards. In 2001 it won the Australian Tourism Export Corporation Award for attraction excellence, voted by the Inbound Tourism Operators Association of Australia.

In addition to marketing to inbound tourists, Tjapukai Aboriginal Cultural Park has begun to market services in culturally sensitive theme park establishment. The impetus for this came through its link with the Chapman Group which has identified potential for cableway facilities in a number of countries. In Hong Kong the cableway being developed by Skyrail includes a theme village and a Buddhist interpretive experience and Tjapukai has successfully bid, with Skyrail, for a development contract. The firm is also waiting on the outcome of other bids submitted to governments within Australia, generated from its high profile in cultural tourist attractions and also from links with the Queensland Government.

Use of External Services

It is estimated that less than 10% of the services listed below are outsourced by value.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning				H	H	
Legal services	H					Compliance
Acctg/Financial services	M			H		Audit and compliance
Capital Raising				H		
Technology awareness	M					Tailored
Technology trends				H		
Formal R&D						N/A
Market research			M			Routine
Product/service development services				H		
Project management				H		
Outsourced operations				H		
Marketing/promotion	M			H		
Sales & distribution	M			H		Routine and Tailored
Export strategy			M	H	H	Routine
Establishing o/s offices						N/A
Performance benchmarking				H		
IT/Networking services	H					Tailored
Recruitment services				H		
Accreditation/quality management		M		H		Tailored then routine
Standards				H		
Training services	M			M		Tailored

H = high, M= medium; remainder are low.

A range of services are outsourced. To various extents, these include legal and financial services, technology awareness, market research, sales and distribution, IT and networking services and training.

Accounting and legal services are largely outsourced for compliance. Technology awareness mainly relates to IT hardware and software and technologies such as those which enable non-English speakers to hear audio-visual presentations in their mother tongue. Tjapukai's theatre presentations and brochures have been converted into 8 languages including English and external service providers have been used for the translations.

Market research is conducted in a number of ways and includes collection of visitor statistics internally and subscription to the Regional Tourism Activity Monitor which are compiled by the State Government. However, these are very general and do not provide comparative figures.

External service providers, in particular tourism wholesales, are also used for routine components of sales. The Queensland Tourism Commission develops generic promotional material about Queensland as a tourism destination. The firm spends a lot of time and effort in ensuring that it is included in the material that wholesalers offer to those intending to visit Australia. However these services are fairly routine apart from Japan, where a specialist marketing and sales firm is employed as the Japanese market is a significant percentage of their sales.

"We have a marketing manager who spends a lot of time overseas. He is just back from two and a half weeks in the US to train wholesale agents' frontline staff in our product and he is about to go for three weeks to Europe. The only area where we don't do this ourselves is Japan – this is a very specialised market and we employ a company which has expertise in this market to sell our product to wholesalers there."

Judy Freeman, Director of Marketing

Its export strategy has been driven by particular Board members with skills in this area. It has also received some assistance from the Queensland Department of State Development also is very pro-export and is keen to support firms which are interested in expansion overseas.

All the firm's IT system and operations are outsourced. The firm' advertises for its own staff but does deal with recruitment agencies occasionally when these organisations approach them about potential candidates for advertised positions. It also uses outsourced training providers as people from outside the company have more authority when imparting business skills and the firm needs to be able to tap into experts in particular areas – it would not be possible to find all skills required in a single person.

Performance benchmarking and quality management are closely linked. Quality management in Tjapukai is based on quality circles, first suggested by a retail manager employed by the firm, based on his experience in other companies. The firm has contracted with an external provider send a "mystery shopper" monthly to use all the park's services. This person fills out a 20-page report on their experiences and the service delivered.

The firm has not implemented formal written standard operating procedures – instead it has a series of weekly management meetings to directly communicate procedural and customer service practices as this is more in tune culturally with the needs of its staff.

"*Standard Woolworths procedures wouldn't work here. We are very 'hands-on' and this suits our workforce well."*

Judy Freeman, Director of Marketing

The firm outsources knowledge-intensive services mainly because it is too small to be able to employ people full time, and in any case good people with the skills they need are relatively hard to find.

"We are too small to be able to provide a full time position for the experts we need in some areas. When you have highly skilled people, to work in a company like this their skills would not be challenged. They would want a number of clients to diversify what they were doing and to keep their skills up. So they set up consulting companies to give them the variety and this allows us to use them just for as long as we need."

Judy Freeman, Director of Marketing

Drivers for Innovation

Customers, particularly tourism wholesalers, provide a lot of feedback through their comments to the marketing staff when they visit. They also get comments from

visitors to the park, who can fill in a visitors' book. These comments are then used to provide feedback to staff on customer service.

Local tourism operators provide some feedback but are very driven by margins and commission. There have been cases where the feedback provided by these groups has conflicted with feedback being received from elsewhere and the challenge then is to determine to whom they should listen.

The Board of the company also plays a major role in innovation because of its links to the Aboriginal community and the involvement of major shareholders who are also in the tourism industry.

Virtually no innovation input is provided by suppliers.

> *"We spend a lot of money on some suppliers, like banks, energy providers and telecommunications. You would think for this we would get some suggestions on new ideas but nothing is forthcoming."*
>
> Don Freeman, Managing Director

The firm also belongs to a number of industry associations. It belongs to the Australian Tourism Export Council because many of its customers also belong to this organisation. Tourism Tropical North Queensland as the peak representative tourism body in the region. It is also in the Queensland Chamber of Commerce and Industry but this provides little benefit in relation to innovation.

Knowledge Acquisition

External service providers are a major source of innovation in relation to training and market awareness and the firm relies heavily on its IT service provider for upgrading of IT and telecommunications systems.

In the main, new technologies were used in the park's establishment (e.g. the translation headphones in the cultural theatre) but only play a role now in office systems. The main changes now relate to staff management and service delivery, and these are incremental.

It is well networked within the Cairns region and its status as an award winning tourist attraction has given it a high profile. Judy Freeman has also won a Telstra Businesswomen's award and this means she is invited to functions run by organisations with which she may not usually mix. Both Don and Judy Freeman have extensive personal informal networks which provide an opportunity for identifying new business leads and ideas.

Transforming Internal Processes and Staff Impacts

The firm has grown from less than 20 staff in 1994 to 100 staff today. Running the company is much more demanding than it was 5 years ago and the demands on staff for service delivery have also increased substantially. Helping staff adapt to this has not been always easy and the need for awareness of cultural differences, both between Aboriginal and non-Aboriginal staff, and service delivery staff and customers, has been paramount. Largely the management team at Tjapukai has developed these skills on the job, although the background skills of the founders, and the Board, have been important.

There are two main feedback systems used to transform internal processes – the visitors' book and the mystery shopper. The visitors' book is used to collect comments direct from visitors to the site. Visitors will often write very frank

comments and these are used to provide feedback to staff on service delivery. Similarly, the monthly 'mystery shopper' report written by an outside provider is used by department managers to discuss service delivery and performance with staff in each department. Each month, one department in the firm is awarded the quality circle award and the scores aggregate so that every year one department wins outright. This serves to motivate the staff as the award has a high level of prestige within the firm. Prizes are given to any member of staff which is singled out by the mystery shopper for "service above and beyond" and the department that wins the annual award has a celebratory dinner.

The move to night operations required the establishment of another line of reporting within the firm. This is now managed by a duty manager who also feeds information back through the management structure.

Training is the main way that new systems and procedures are introduced. In these cases the external service providers are commissioned to impart their skills and knowledge to staff and staff are expected to demonstrate these skills, once learned, in their day to day performance.

Summary

- Tjapukai has developed a successful formula that is sensitive to the cultural needs of its staff and its customers.
- Outsourced knowledge-intensive services are important for marketing and measuring customer satisfaction. While customers provide input on product innovation through these systems, the Board is more important in driving strategic innovation and exports.
- External service providers have also been important in the past in developing the product so that it is attractive to non-English speaking tourists.
- A quality circle approach has proved most suitable for internal management and operational innovations.
- Skilled service providers are relatively scarce in Cairns and Tjapukai does not believe it will ever be able to have some particular skills on staff as their environment is not challenging enough.
- Local informal networks are important for identifying new business leads and ideas.

Information Technology Firms

Callista Software Services Pty Ltd

Background

Callista Pty Ltd was founded in 1997 in response to changes in the higher education sector introduced by successive Australian governments since 1987. The Australian Government funds higher education in Australia, partially and proportionately, but the universities themselves are usually set up under State Government legislation. Funding reforms introduced progressively since the late 1980s have included the forced merger of many Colleges of Advanced Education into multi-campus universities, and the introduction of a Higher Education Contribution Scheme (HECS). Once students enter full time work, they repay part of the cost of their tertiary education through the payment of an additional tax.

In order to manage the business changes required by these reforms, Deakin University in Geelong sponsored a working group (which included 12 leading universities), to develop specifications for new software to apply the necessary government reforms. In a new era of choice for international and off-campus study, they also provide greater flexibility and information access to students and university management.

Callista was formed as a wholly owned subsidiary of Deakin University. It operates out of university-owned premises in Geelong and has other offices in Melbourne.

> *"Universities working by themselves would never have managed to develop this software economically. If our staff were spread across 12 institutions, they would only have 8-10 IT development staff each."*
>
> Peter Langkamp, CEO

Callista now specialises in management software for the tertiary education sector, allowing students to enrol in courses or units offered by international institutes over the web, as easily as if they were there in person. The firm's product is technically complex – with 26,000 function points. Callista CEO, Dr. Peter Langkamp, believes it is the biggest such program in Australia. The software provides all the support and functionality that higher education institutions need to deal with student's. From the time that they first think about applying, to their actual enrolment, course choice, course progression, examinations, graduation and alumni networks. The software manages interactions that would be relatively standard across a range of institutions, and yet interface with the different syllabi within the institutions, in a way that ensures that students can only enrol in subjects in accordance with the rules of their courses. It not only has to deal with what educational institutions need from a management perspective, but what is required of them under the government's higher education reforms. These changes often have a major impact on the sort of information that institutions need to collect from their students, and how it is kept and reported.

Callista's main products are:

- The Callista Student Management System for Higher Education (HE)and Technical and Further Education (TAFE) – a complete management system that can deal with such things as admissions, advanced standings, assessments, progression, correspondence, course structure and planning, enrolments, graduations, statistics, student finances, audits and calendars.

- Callista Relationship Management (CRM) – this technology allows institutions to leverage highly responsive student care centres, access multiple student contact channels, develop proactive communication with prospective students, analyse the effectiveness of recruitment strategies, while developing creative outreach to enrolled students and Alumni for closer relationships.

In addition to its software, Callista offers a range of professional services to assist its clients to implement its products and offers customised software development.

Peter Langkamp believes achieving economies of scale in the Australian higher education system is a major challenge. Most international generic software companies have thousands of customers and would be able to program changes well in advance. But their level of local adaptation for student management in Australia is minimal. In education, the cost of localisation is high and major changes are induced by funding agencies that require the impact which these changes may have at an institutional level. Further, academic institutions traditionally invest less in their back office operations – instead, they divert funds to supporting their prime rationale - education and research, and often do not focus on the cost of servicing a student and how this might be reduced by clever uses of technology.

While the company now sells its software to 12 of the 37 higher education institutions in Australia, relatively few higher education institutions have the numbers of students required to really be able to get their own economies of scale. Collaboration between institutions is therefore important in an environment where economies of scale, skill and scope are required to reduce the cost of back office operations. The software is also applicable to the Vocational Education and Training Sector, (VET), with functional variations that reflect, amongst others, the levels of skill competency achieved during training.

Recent Innovations

Callista usually issues one major update (with significant new functions), and one minor update (primarily to implement government reforms) of its software per year. This year the major changes in government reforms required several thousand programming days. The new updates incorporate changes to both processes and enabling toolsets. Whilst Callista licences the source code from Deakin University, it issues client universities with new version discs and trains them in the new functions. It has a collaborative business relationship with its customers as many installations need to be tailored to the institution's needs.

The company used to see itself as a seller of software. Since Peter Langkamp joined the firm in 2003, it has been restructured so that the emphasis is on knowledge and knowledge sharing. The firm now has three groups which interface with the customer at different levels (Corporation Communications, the Commercial Group and Customer Delivery Services). This group is backed up by a product development and innovation team (including analyst programmers, business analyst, software engineers and quality assurance experts, forming the largest group in the firm). Behind that is a business organisation capability team which covers human resource management and other company support systems. The company has been relaunched under this new structure and its promotional material emphasises knowledge sharing, leverage of shared insights and creation of trust.

"No-one here has a franchise on knowledge. Higher education institutions understand the operational needs of students in the context of their business plans. Callista needs to develop internal systems which provide the most efficient way of meeting these needs at the lowest cost."

Peter Langkamp, CEO

The firm is also exploring new business models to sell software to smaller institutions that are in rural locations and hence are unlikely to be able to attract the technical staff needed to run the systems once installed in-house. In one case, the firm has taken on a management role in conjunction with a large systems integrator which is managing the hardware. The remote area client is now being served from Sydney and will be able to operate its student management system when the installation goes live in November.

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl Orgn	In-house (staff)	Board	Type of Service, if external
Business planning	M			M		Knowledge intensive (KI)
Legal services	M					Advice
Acctg/Financial services	M			M		Routine
Capital Raising					M	
Technology awareness	M			H		Routine
Technology trends	M			H		Routine
Formal R&D				H		
Market research				H		
Product/service development services				H		
Project management				H		
Operations	M					KI
Marketing/promotion				H		
Sales & distribution				H		
Export strategy						
Establishing o/s offices						
Performance benchmarking	H			M		Routine
IT/networking services	H			M		KI
Recruitment services	M			M		KI
Accreditation/quality management	M			H		Routine
Standards	M			M		Routine
Training services	M			H		KI

H = High, M = Medium; remainder are low.

Several services are provided from outside the firm. Many of the people brought in to assist in these areas are usually identified through Peter Langkamp's personal network, developed over several years working for large companies such as Shell, National Australia Bank, NRMA and Acxiom, and his own background in marketing. Hence, the firm has used an external business planning facilitator as well as advisers to help re-position its brand and recruitment advisers in both Geelong and Melbourne.

"We are a relatively small company and enjoy the benefits a regional workforce can bring. We leverage outsider skills to broaden our planning approaches and to bring in new ideas and skill sets not available in the company."

Peter Langkamp, CEO

Deakin University provides back office operations (HR and accounting) for the firm.

The firm's relationship with Oracle, on which its software is based, provides a useful conduit for information about new technologies and the firm also subscribes to external trends surveys produced by an international consulting company. It is developing relationships with other hardware and software providers which will help it deliver operations services to remote area training institutions. These value added services help the firm deliver these services cost effectively without having to 're-invent the wheel', in terms of delivery and failsafe systems.

"We have a number of alliance partners. We go through a capability mapping process against our potential projects. If there are holes we procure other services which complement our expertise in technical areas and system architecture."

Peter Langkamp, CEO

Callista keeps a close eye on its software development productivity and also subscribes to industry surveys which allow it to benchmark its performance. These figures are also provided to clients to reinforce that they are getting value for money with tailored software development.

"We can say we are in the 75th percentile for software development productivity. This is very important when you are dealing with customers who want demonstrated efficiencies in software procurement. It shows that we are efficient as well as effective."

Peter Langkamp, CEO

Recruitment services are sometimes outsourced because of the importance of getting people to work in Geelong – the recruitment firms can recommend people from Melbourne and these will sometimes commute, or move to Geelong. The firm also has a graduate program through which it tries to capture outstanding students from client Universities across Australia.

Drivers for Innovation

The main driver for business functional change within the firm is the Government through client higher education institutions. Their policies on cost recovery and student fees, drive changes to the software and customer universities demanding greater functionality to provide services to students and management. According to Peter Langkamp, demand for change has been increasing exponentially.

The second major driver is the changing expectations of students to be able to enrol without having to visit the university, a form of 'non face to face' administration and processing. Although students are not part of the firm's direct customer base, they are certainly the group that the main customers, universities, are serving.

The firm is also very conscious of the cost of IT and the potential cost (or savings) of emerging hardware. Its clients currently make hardware purchasing decisions individually, so Callista's software has to operate on a wide variety of platforms. If the universities could share hardware planning, it would be easier to premise updates

and would introduce other economies of scale and scope. This issue also affects customer service.

> *"Someone in the IT department of a university decided to upgrade their operating system across the board. After they completed this operation, they found some aspects of our software failed to operate. They ring us and want to know when we will re-certify our software on the new upgrades. Many large companies will be aware of this issue and will plan upgrades with suppliers up to five years in advance. Universities might benefit from such a collaborative approach."*
>
> Peter Langkamp, CEO

Suppliers could be a major source of ideas. Peter Langkamp is a member of a number of tertiary education networking groups who share ideas and benefit from the 'minimum intellectual critical mass' such meetings bring.

Knowledge Acquisition

Callista publishes a bi-weekly 'Callista Bulletin' to keep clients up to date with software changes and to comment on minor technical issues. The firm's three customer contact groups (Corporation Communications, the Commercial Group and Customer Delivery Services) all provide customer feedback as a result of informal contacts.

The firm has invited customers to participate in a number of working groups which link in different key groups within its collective academic clients:

- The Callista Client Strategy Group is made up of senior operational executives in customer universities and meets quarterly to discuss operational and strategic issues; and
- The Callista Senior Executive Group includes senior administrative staff in these same universities to help them align capital expenditure with the tool sets required to manage the student administration.

In software there are often a number of ways that a particular problem can be addressed – the solution, however, may limit the ability to introduce other changes later. Callista's client working groups also serve as a sounding board to assess potential technical solutions to software development.

Within Callista, 'practice leads' (senior middle managers) have to keep up to date with new technologies and techniques in given areas. For example, professional services delivery and management of new releases. These people have been chosen for their particular focus and potential. The practice leads play the role of scout and bring new information into the company from outside.

Transforming Internal Processes and Impact on Staff

The firm goes to a lot of trouble to recruit people to work in Geelong (1.5 hours south west of the State capital Melbourne), because once they have taken up residence, they usually stay with the firm for a long time. The company has a stable workforce and many staff have been with the firm for 5-10 years.

Many of staff have qualifications in IT and many are graduates of Deakin University. The company finds that there is a significant culture change required when people first start work with them, and they need to develop a business focus. Peter Langkamp is also concerned that programming staff do not end up too 'narrow', and increasingly they become involved in defining the companies business and performance outcomes.

"We want people to be able to contribute more than great IT performance alone and take full advantage of well rounded personalities. We brought in an artist one day and gave everyone a small blank canvas and asked them to paint their vision of the future of the company. These 90 works are now displayed in groups in the offices and are our corporate artworks."

Peter Langkamp, CEO

As the firm has grown, the staff have worked on specialised parts of the software package. They now need a way to understand what they do fits into the rest of the product mix and company ethos. The firm has recently started running seminars internally about products so that people are not working in isolation.

Staff are employed under the firm's Australian Workplace Agreement. This includes a system of management by objective and bonuses are paid to staff in that context. The office designed with lots of open space and no offices, so that people have lots of opportunity to meet each other informally and generate ideas. The entrance to the company is an 'airport lounge' including coffee and TV facilities, where staff will often play table tennis and will have a drink after work. The firm also creates situations where staff will meet people from other groups in the company – for example functional groups were given money to host breakfast for everyone else in the company over a number of weeks. These breakfasts turned into creative sessions where people dressed up and played roles and this ensured interaction within the firm.

Summary

- Callista's main innovation drivers are to deliver client higher education business objectives, often driven by government requirements for student enrolment and administration, and the need for improved information access for students and institution management.
- Many external services are knowledge intensive and are identified through the CEO's personal network, built on a varied career in non-education fields. Service providers are chosen to complement the firm's skills and provide a different point of view to ideas arising from a mainly technical staff.
- The firm has a small number of clients, all within Australia (representing a 30% market share), with whom it has close working relationships. It has a formal set of working groups which are used to enhance clients' understanding of the product as well as to seek customer feedback.
- Major changes to the firm's structure have enabled it to enhance customer relations and establish a formal group of 'lead' staff whose role is to keep abreast of changes in technical and service areas and bring the information into the firm.

GecOz Pty Ltd

Background

GecOz Pty Ltd was incorporated in February 2001 by three graduates of the Northern Territory University (Now Charles Darwin University) – Dr Darren Bell, Ms Renee Bartolo and Mr Josh Forner. These three founders had expertise in applying geospatial solutions to the management of assets and natural resources in the Northern Territory (NT) and other locations in Australia. The Northern Territory is located in Australia's tropical north and land is used primarily for agriculture, tourism and mining, although there are several major national parks including the World Heritage listed Kakadu National Park. The firm is headquartered in the capital of the NT, Darwin, a town of about 100,000 people.

Darren Bell had developed methods for using data from Synthetic Aperture Radar (SAR) for mapping earth resources, in particular for mapping surface soil salinity. This is a particular problem in Australia – dryland salinity is estimated to cost the Australian economy AU$3.5 billion per annum and is related to the relative dryness of the continent, the type of soils and past management practices. Although there are many different mechanisms that cause soil salinisation, one example is rising water tables. If the water table rises due to land clearing, inefficient irrigation regimes, etc, the salt is brought to the surface and poisons agricultural land. Roads and other infrastructure are also affected as the salt damages the structural integrity of building materials. Dryland salinity has already affected 2.5 million hectares of arable land and it is predicted that up to 14 million hectares of pasture in Australia will be lost to salt in the next 50 years. World-wide, over 200 million hectares are suffering from similar problems.

The techniques developed by the team for mapping salinity can also be applied to the mapping of acid sulphate soils. Additionally the team has developed techniques for mapping biomass. These assessments can be uses for crop yield and carbon counting analysis. SAR also has the capacity to produce Digital Elevation (or topographic) maps, and can be used for disaster management for flood, oil spill and bushier mapping. The company has more general skills in the application of remotely sensed data for land environmental and asset management. The firm's staff use a range of remote sensing data sources to analyse change in natural resources, process and manipulate digital data, produce maps and other visualisations in a range of formats. This is of interest in asset management, environmental management and other geospatial fields.

GecOz was one of the first two start-up companies to be incubated by Darwin business incubator ITCINT Pty Ltd (now Original IT Investments). Original IT Investments received $5 million under the $76 million Building on IT Strengths (BITS) Incubator Program. This program has recently been extended but the Darwin incubator has had its funding cut. As part of its acceptance into the incubator, GecOz received $600,000 from Original-IT Investments Pty Ltd for equity in the company.

The firm has a Board of three directors, all of whom are employees. Up until earlier in 2004, Original IT Investments also had a seat on the Board.

SaltSAR product

GecOz's main product is a computer program called SaltSAR, which the firm uses to support provision of consulting services to government agencies for salinity mapping. The SaltSAR program was based on software and procedures written by Dr Bell for his PhD at the Charles Darwin University. The University has set aside any claims to

the intellectual property on which the work was based. This is partly because the University has equity in Original IT Investments which invested in GecOz.

SaltSAR analyses data collected from airborne synthetic aperture radar instruments which can penetrate cloud and smoke and hence can image the earth in all weather conditions. SAR is better than traditional forms of remote sensing such as Landsat or aerial photography (particularly for this application) because it can be used day or night, in cloud or smoke and is sensitive to electrical conductivity of the target. Examples of SAR use include salinity mapping, biomass mapping, dead tree mapping and waterline mapping.

GecOz took the unusual step of seeking patent protection on its SaltSAR program and has applied for patents in Australia, the US and Europe (having passed international assessment). The decision to do so can be traced back to the role of Original IT Investments which, as a venture capital investor, was keen to see its investment protected as much as possible.

Use of Knowledge-intensive services

Dr Bell estimates that 35% of the firm's expenditure goes on outsourced services.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning	H			H	M	Tailored
Legal services	H			M		Tailored and compliance
Acctg/Financial services	H			H		Compliance & Tailored (tax concession)
Capital Raising				H	M	
Technology awareness	H			H		Tailored
Technology trends				H		
Formal R&D		M		H		R&D project
Market research	H					Tailored
Product/service development services				H		
Project management				H		
Outsourced operations	M					Routine
Marketing/promotion*				H		
Sales & distribution				H		
Export strategy			M	H		Tailored
Establishing o/s offices						Not applicable
Performance benchmarking				H		
Networking services			H			Tailored
Recruitment services				H		
Accreditation/quality management				H		
Standards			M	M		Tailored
Training services	M			M		Compliance

H = High, M = Medium; remainder are low.

The main services outsourced are legal services, business planning, accounting and financial services, technology awareness, market research and training. The majority of these are linked to the firm's successful application for a COMET grant. This provided funding to contract an adviser to write a business plan and complete market research (including technology awareness).

The firm first met its business adviser at a networking function organised by the Australian Information Industry Association (AIIA), of which it is a member. This person has excellent technical as well as business skills and has been able to provide GecOz with ongoing support.

Financial and legal advisory services are provided by local services firms. The directors of GecOz took great care in selecting these people and tried to ensure that they were capable of supporting the company to achieve its broader vision. In general, the external providers of knowledge-intensive services have been chosen for their networks and for their capacity to introduce the company to other organisations that may be of use – either customers or providers of funds.

The firm also outsources operational data processing services if it has a project that requires a large amount of data processing. These people are generally recruited from the Charles Darwin University, with which the firm still has close ties. GecOz is careful not to allow these people to get too close to company operations and always ensure non-disclosure agreements are entered into as it does not want to lose confidential information to people who may be competitors in the longer term.

One of the firm's directors is also supervising an Honours student from the University. This person is working on the processes developed by Ms Bartolo and is extending them into new applications.

In general, industry associations play an important role. In addition to the AIIA (which is an important avenue for finding collaborative business partners), the firm is a founding member of the Spatial Sciences Institute (SSI), a fledgling organisation which aims to bring the service providers in this area together for development of standards and best practice, professional development and certification. It is also a member of the Australian Spatial Information Business Association which has a similar role with a business matching, community awareness and industry promotion emphasis. All the company's directors have completed the training program offered by the Australian Institute of Company Directors (this training was also paid for by the COMET grant). These have been important in equipping the directors for the effective management and governance of their firm.

GecOz has used a number of government funding programs to support its development. In addition to the COMET grant it has applied for the Australian government's R&D tax concession and also a range of assistance available through Austrade. Austrade helped the firm in its first market assessment visit to China, and it also received funding through the Northern Territory government's trade support scheme for a recent visit to Singapore.

"We would not have been able to develop our basic package of product and company information without COMET. We have to be able to convince investors that, as a company, we have a long-term plan and can manage our business in order to get there. The COMET funding enabled us to get valuable independent assessments of our market and our strategy that investors need in order to satisfy themselves that there is something worth supporting."

Darren Bell, MD

Original IT Investments, as providers of the first tranche of funding, had a significant role on the Board in the early stages of the company. It was they who insisted that the company patent its software and they also brought in a business manager and a CEO whose skills helped the firm initially cope with the requirements of being in business – issues such as setting up accounting procedures, project management

systems, protecting IP and the like. These people have now moved on but the skills have been transferred to the Directors.

Dr Bell has taken over the role of the CEO (as Managing Director) and the firm has an office manager who is continuing the application of internal systems to the firm. The investors also were very influential in the development of a suite of business information which GecOz is now using to seek a second round of investment funding.

"The CEO appointed in conjunction with Original IT initially freed up my time to complete product development on SaltSAR. Now I am MD myself I have almost no time to spend on product development. I spend all my time supervising people and networking, trying to raise funds and find clients."

Darren Bell, MD

Drivers for Innovation

Drivers of innovation have changed markedly over time. When GecOz was set up its initial plan was to develop a generic geospatial company, but the investors associated with the incubator identified the uniqueness of the radar processing capacity (GecOz is the only company in the world to have developed technology that enable the interpretation of raw radar data into salinity maps). It was the investors that then steered the company towards development of its RADARMAP range of products and the launch of SaltSAR as the first product in this range.

SaltSAR is technically complete as a software package and can be applied to many different problems. Now that it has been launched the main task is to find buyers, not for the software per se but for GecOz's services, using the software as a central platform.

GecOz's natural market is government agencies and catchment management groups, but most of its clients are currently in the Northern Territory. Projects have included development of stormwater maps, inundation maps, asset and infrastructure maps, and mapping of potential environmental impacts from oil spills. These clients, however, are not major drivers for innovation in relation to the software because their needs are relatively straightforward and the land use planners who work in most local councils have relatively limited understanding of the remote sensing technologies. They do drive the way the service is offered and packaged, however. In this regard the firm's business adviser has been crucial as he has helped the firm identify those advanced customers who will take on innovations quickly and will act as "demonstrators" of the value of the product. The firm is a member of the Australian Salinity Action Network which helps it to identify these groups. GecOz is also working closely with larger firms that have already established a track record with government clients and which are interested in adding the GecOz capability into their existing service offerings.

The Department of Defence has emerged as a major partner in recent times. GecOz was approached by the Defence Science and Technology Organisation in 2002 after an article about the company appeared in a national newspaper. The Defence department was interested in enhancing its own radar data collection and analysis and found that GecOz had the technical skill to develop further applications for the data. In exchange, GecOz negotiated to acquire sole rights to the data for commercial non-defence applications. On 12 February 2004, GecOz signed a formal Memorandum of Agreement with DSTO to work together to develop new Australian radar mapping capability following GecOz's next round of funding. This will provide the "pull" for a new phase of software development.

Knowledge Acquisition

The three founder/directors and key business advisers continually seek out new ideas and business improvement information, either through the roles of key advisers or through the industry associations in which the firm is involved. As a technology developer the firm relies on off-the-shelf equipment and software which it then uses to develop its own IP.

GecOz is small and it finds targeting customers outside the NT difficult because of the need to build trust with new customers. The MD is currently setting up an additional office in Brisbane, capital of Queensland (another Australian State that is a 3.5 hour plane trip away from Darwin) to tap into networks in that area. The aim is to contact investors as well as key customers in Queensland.

Transforming Internal Processes

As a small company with now two offices communication between key staff is not an issue. To date, the founding management team has been able to learn from the early appointment of key business staff. The firm has also secured a "rock star" advisory board. Together this process has established business practices which support innovation and assists in the maintenance of a focus on key strategic goals (particularly relating to IP, customer identification and ongoing service provision).

The existing personal networks of the founders have been crucial in finding new contacts and identifying new paths for the firm. The current MD, Dr Bell, has extensive personal networks with local industry and the other Directors have maintained their own networks with the local research institutions. These networks are complemented by those of their key business advisers who are able to refer the MD on to new contacts when required.

While the firm relies on a small number of external service providers, they ensure that knowledge from these people is captured through provision of written reports and adoption of procedures as recommended.

GecOz also benchmarks itself against outsiders by entering business award programs. In November 2002 it was awarded the Research and Development award of the annual Asia-Pacific ICT Awards for its salinity mapping product, SaltSAR. It had earlier won an AIIA iAward for IT services.

The firm's business practices have also been recognised. In 2002 its Chair, Ms Renee Bartolo's also won an award sponsored by AusIndustry in the Telstra Business Women's Awards.

Summary

- Providers of knowledge-intensive services have been chosen by the firm for their capacity to provide access to other networks and organisations that will help the firm achieve its goals.
- Government funding provided through COMET and the BITS programs have enabled the firm to establish its internal management systems, develop SAR products to market ready status, to understand what investors require and develop investor ready documentation.
- Initially, business skills were provided through recruitment of experienced business managers who set up internal systems, which are now followed by the new Managing Director (who was a technical founder of the firm).
- Drivers of innovation have changed over time – initially the Board played a major role but more recently DSTO, as a "leading edge partner", has emerged and assists in driving technical development.

Hatrix Pty Ltd

Background

Hatrix Pty Ltd was established in 2001 by a team of electronic decision support experts who were previously part of MIMS Data Systems, a company which supplied software that contains medicines data and decision support for use in prescribing in the GP sector.

MIMS Data Systems was part of MIMS Australia, itself a subsidiary of Vivendi Universal Health, a multinational corporation headquartered in France. Hatrix is located in Canberra, employs 11 staff and currently has two software products on the market.

Hatrix's focus is on developing leading edge Medication Management Systems and Decision Support Software to assist healthcare professionals in the hospital and community care sectors. While at MIMS Data Systems, the company's founders, Dr John Ainge and Mr Tony Firth, became alarmed by the statistics surrounding adverse drug events (ADEs) in hospitals. Mr Firth claims ADEs kill around 3,600 hospital patients per year in Australia, about double the national road toll. The team identified a need for hospital-based prescription support, as they had been asked by hospitals to modify their existing GP prescribing system, to help with medication management in the hospital. An in-house gap analysis by MIMS Data Systems identified a market for a product of this kind and the company began developing the software from scratch. The product was going to be another in the MIMS suite, however MIMS Data Systems was closed down when its parent company chose to move from the area of software development. The intellectual property (IP) for the partially developed hospital product was made available, which inspired a team from MIMS data Systems to purchase the IP and start their own company to further develop the software.

"Sure we want to made a quid but we want to make a difference. We wan to get information in front of doctor's pharmacists and nurses to help them do their jobs better."

Mr Tony Firth, Director Business Development

The original business plan was to partner with like minded software companies who were missing the 'medication management' component in their current products. This had lead to relationships with a number of software developers including Jade Software Corporation of New Zealand. Jade already had a community care software package but it contained no medication management component. Hatrix fully integrated MedChart with the JadeCare Community system, which allowed their product to be distributed through the collaboration.

According to Hatrix, ADEs can occur at any stage of the medicating process - *prescribing* (carried out by doctors), *reviewing* (pharmacists) and *administering the medication* (nurses). Their aim is to improve patient safety and reduce ADEs by providing doctors, pharmacists and nurses, who work together in the hospital setting, with information to better manage patient medication. Hatrix's main product MedChart offers decision support to each phase of the medication management process.

MedChart is an XML-based thin client application that can run stand-alone or be readily integrated into existing hospital systems. The software uses third party knowledge resources combined with Hatrix's decision support engine, which allows users to define the nature and level of the decision support rules that govern medication management within their hospital.

MedChart was first installed in the Otago Hospital in Dunedin, New Zealand. Initially, a six-month pilot was planned for one ward in the hospital. But demand for the software spread across the entire hospital, as clinicians from the pilot ward rotated to other wards and wanted to keep using the system.

The clinicians using MedChart found the Reference Viewer applications within MedChart particularly useful. The Reference Viewer combines local knowledge, data and guidelines with the latest reference material providing clinicians with easy access to these resources. This encouraged Hatrix to make the Reference Viewer a stand-alone product. The Reference Viewer is now Hatrix's second product and acts as a companion product to MedChart.

Use of knowledge intensive business services

Hatrix obtains most of its services from internal sources and a lesser number from external sources. Mr Firth estimates that 5% of the firm's expenditure is spent on external services.

Activity	**External firm**	**R&D Instn**	**Other Extnl orgn**	**In-house (staff)**	**Board**	**Type of Service, if external**
Business planning	M			M		Tailored
Legal services	H					Tailored and compliance
Acctg/Financial services	H					Compliance
Capital Raising	M			M		Tailored
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research				H		
Product/service development services				H		
Project management				H		
Outsourced operations				H		
Marketing/promotion				H		
Sales & distribution	M			M		Routine
Export strategy	M			M		Tailored
Establishing o/s offices				H		
Performance benchmarking				H		
Networking services				H		
Recruitment services				H		
Accreditation/quality management	M			M		Tailored
Standards				H		
Training services				H		Tailored

H = high, M = Medium; remainder are low.

The main services outsourced are business planning, accounting and financial services, capital raising, export strategy and accreditation/quality.

The firm's accountants have been involved in business planning, financial services and capital raising. Hatrix co-founder Dr Ainge had an accountant for personal work

and it was natural to use the same firm when they started the company. The accountant soon merged with a larger accounting firm, which offered business advice and guidance as well as help with strategic planning.

Hatrix also raised capital through Epicorp, a local incubator funded through the Australian Government's Building on IT Strengths (BITS) program. Epicorp became known to the company through a meeting with a fellow colleague in the Canberra IT industry at an industry networking event. The company has also received two Knowledge Fund grants from the local Australian Capital Territory Government for product development.

Hatrix's lawyer also has provided strategic planning advice. Found by chance, in Canberra, the solicitor was once a software programmer himself and took an interest in the company.

Market research was kept in-house as the firm could not afford to pay a specialist to do it. Hatrix considered applying for a COMET grant, which would have funded such research, but at the time the program was being changed. The in-house market research focussed on attitudes in hospitals to adverse drug reactions.

Prior to becoming part of MIMS Australia, the original company went through the ISO9000 certification process. They took up a then offer from the ACT Government to pay for half the costs of certification. Hatrix now pays an external auditor to re-certify the firm annually. The company Directors wanted Hatrix retain the ISO9001 certification to both improve their internal processes and support their marketing, The company claims the process of becoming certified allowed them to create quality management processes they most likely would not have otherwise thought of when setting up the company.

Seventy percent of Hatrix's revenue is derived from exports to New Zealand. Through the support of Austrade's Tradestart program, the company has now gained knowledge of the US & Middle-Eastern markets and they are looking to start exporting there.

Hatrix is currently a member of Medical Software Industry Association (MSIA) but is not a member of any other industry associations as they do not feel they bring any added value to companies in start-up mode.

Drivers for Innovation

According to the firm, drivers for innovations will most likely be a natural evolutionary process based on feedback from customers (hospitals). Software like MedChart is always evolving as new needs arise and they get feedback from current users.

Hatrix aims to meet clients' needs, however often a number of clients can want different things. When this occurs, good ideas are identified and are usually passed on to the clinical director whose background as a medical practitioner helps him to prioritise requests and identify those most likely to be beneficial. Ideas which are unique to the needs of the particular client are also identified. Good ideas go into the development cycle and those ideas which are unique can be implemented for individual clients on demand.

The company's competitive advantage is based on its intense focus on a very clinically complex area of health. Hatrix has found that hospitals are comfortable working with a small company such as theirs, as they can listen to the hospital's needs and respond quickly.

"*There isn't another software product in Australia that provides the level of medication management that ours does. Our big competitors can't give the same sort of focus."*

Mr Tony Firth, Director Business Development

Knowledge acquisition

The firm relies heavily on internal systems and its staff, because of its historical links with MIMS Data Systems. Nearly all of the staff at Hatrix worked at MIMS Australia with the company's founders. They had been previously involved in the development of MedChart and therefore knew the background of the product and how to further develop it, which eliminated a lot of the need for training.

"We hired the original MedChart developers from MIMS when it closed. We wouldn't have been able to continue development if these people had said no. Too much training would have been required."

Mr Tony Firth, Director Business Development

As IT professionals, these staff have their own informal networks and skills in scanning the internet for new ideas. Hatrix does not have any formal links with universities for R&D. This is mainly to do with concerns about potential expectations to share IP. However the firm would be interested in external R&D if a good opportunity arose, particularly if it were in a broad area. This would mean that Hatrix would license the IP for one application and the research institution would have rights to other markets – it would be expected then that the cost of the R&D would be reduced if the institution had rights over some market sectors.

Hatrix has also gained knowledge through its partnerships with other firms. After meeting at a medical IT conference, Hatrix and New Zealand company i-Health worked together to submit a proposal to introduce Hatrix's software to Otago Hospital. i-Health already had a product in Otago and therefore had valuable experience in this market . Hatrix also works with Fujitsu to gain a better understanding of running Hatrix software on certain hardware. This partnership is currently hoping to demonstrate the potential of handheld PC technology.

Transforming Internal Processes and Impact on Staff

Hatrix has management quality processes in place through its ISO9001 certification. The company acquired the expertise necessary to introduce theses systems through its previous experience at MIMS Data Systems.

The company relies on its staff to keep up to speed with new technologies. At the moment the company can foresee a need to move to a new systems architecture so they have just hired a programmer who knows about this system and this person will train all the staff in the new format.

Hatrix currently works in a way where one team will build a product and each member of the team is responsible for working on one component of the product. In the future, Hatrix is looking to increase it staff numbers and expand the range of products.

"*As the company grows and product range expands we may have teams responsible for different components."*

Mr Tony Firth, Director Business Development

Hence, operational change has been generated internally. If staff find a quicker way of doing something then they just do it. In the past, programmers have generally looked for and found new ways of doing things through the internet.

Hatrix currently only has one team of five programmers and in the future may expand to have a few different teams of programmers working on different components. In a city like Canberra which has four universities there are lots of IT graduates therefore they are not concerned about ever being short of people who have the skills to further develop the software.

Summary

- Hatrix obtained a great deal from the founders' previous work with MIMS Data Systems. IP was purchased from MIMS Data Systems and the majority of Hatrix's staff also worked at MIMS Data Systems, which significantly eliminated the need for extensive training of staff.
- The firm obtains very few services from external sources. The main outsourced services are accounting and financial services from their accountants.
- Hatrix has received financial support from external sources such as Epicorp, the ACT Government, Austrade and some private investors.
- Staff are expected to keep up to speed with new ideas through scanning the internet and by suggestions from customers on how to improve. Customer suggestions are reviewed by the clinical director whose background as a medical practitioner helps him to prioritise requests and identify those most likely to be beneficial.

Maxamine Pty Ltd

Background

Maxamine was established in 1997. The founder, Stephen Kirkby, had studied IT and was completing a post-doctoral appointment in Japan, but was invited back to Australia by the University of Adelaide to set up a key research centre. After working in a specific area of spatial databases and artificial intelligence, Stephen left the University and started to apply the logic learned into a new area of website management. The firm has patented some aspects of its software but keeps a large amount of information as trade secrets.

Maxamine specialises in advanced website analysis. Its technology scans and captures the structure and content of websites and provides visibility on demand to every single object in the site. The software also identifies quality and structural issues that increase the cost of doing business on-line. Maxamine also offer a website analysis software and hosted solutions that are complementary to traffic analysis services, content management systems and performance monitoring solutions. Its main products are:

- Maxamine Knowledge Platform is a web business intelligence solution, enabling companies to combine web site structure and quality management with log file traffic analysis into one product. Maxamine Knowledge Platform can increase web site effectiveness, mitigate risk associated with web site brand and compliance for all web assets of an organization.
- Maxamine Process Analyst enables companies to review their own or others' internet business processes and address issues of concern. The product identify problems in websites (e.g. ineffective links and isolated pages), can protect the site's quality and can reduce the amount of labour required to manage the site. The software is a desktop version of the Maxamine Knowledge Platform.
- SE'O is the Maxamine search engine optimization product ensuring organizations are able to fully optimize their search engine strategies. It is an on-line self-service product.

Maxamine is headquartered in San Ramon California. The R&D Centre is based in Adelaide, the capital of South Australia. It received initial funding from the Playford Centre, an Australian government-funded organisation that promotes promising start-up IT companies (the Centre is the Building on IT Strengths-funded centre for South Australia). In 1999 the firm established an office in San Francisco and eventually moved its head office to San Ramon, California. It also has sales offices in Europe and Asia. R&D is retained in Adelaide and also provides 24-hour product support. It has about 30 staff.

Head Office was moved to the US to facilitate growth into the US market. In addition to its formal Board, Maxamine has a number of informal advisers who have become close mentors to Stephen Kirkby. This group, comprised largely of CEOs of major US IT companies, provides informal advice and important network contacts. Venture capital investors also have a position on the formal Board.

"A venture capital investment can accelerate growth.. A VC can bring a lot of business experience and resources to assist with growing a company. They can really help project the company into a different space very quickly."

Stephen Kirkby, CEO

The firm sells its products in the US through relationships with Tier 1 and Tier 2 suppliers. Examples of its Tier 1 suppliers are EDS and Dell, who both incorporate Maxamine software into services supplied to their own clients. The firm also has vendor partnerships with resellers in Europe, Asia and Australia. . Currently, 93% of its revenue comes from the US market. In Australia, it has sold to almost all Federal Government departments and several State departments. Its software can be operated to analyse website in any language so translation for different markets is not an issue.

Since its beginnings, Maxamine has won a number of prestigious awards:

- February 2001 – awarded '5 cows' (the highest rating possible) by Tucows for its Web Analyst product;
- October 2000 – selected by 200 top value-added resellers to receive the "Best Product: Internet/e-Commerce" award;
- July 2000 – Process Analyst product was voted "Best Product: Software" by more than 80 Systems Integrators at the Enterprise Vision Summer 2000 event in California; and
- February 2000 – finalist nomination for "Best Product: Software" at the EnterpriseVision tradeshow in Phoenix, Arizona.

Use of Knowledge-Intensive Services

Activity	**External firm**	**R&D Instn**	**Other Extnl orgn**	**In-house (staff)**	**Board/ Advisory Board**	**Type of Service, if external**
Business planning				H	H	
Legal services	H					Tailored and routine
Acctg/Financial services	H			M		Tailored
Capital Raising	H					Tailored
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research	M			M		Tailored
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion	M			H		Routine
Sales & distribution	H			M		Tailored
Export strategy				H		
Establishing o/s offices				H		
Performance benchmarking				H	H	
IT/Networking services	H			H		Tailored (establishment)
Recruitment services	M			H		Tailored (establishment)
Accreditation/quality management				H		
Standards						N/A
Training services	H					Tailored

H = high, M = medium; remainder are low.

The firm completes its own business planning in-house but relies heavily on external lawyers and financial/capital raising services because of its US operations. Most of the advice relates to US law and financial requirements, and auditing. A major accounting firm was also commissioned to support capital raising when the firm sought its first venture capital investment.

All services relating to technology awareness and R&D are provided in-house although there are informal relationships with universities maintained from the company's beginnings. The firm's Board has representatives of venture investors and these provide input in relation to benchmarking.

Market research is conducted in-house but again, because of the importance of the US market to the firm, they also use analysts based in the US. Austrade was used in 1999 for initial contacts, particularly when the firm was first trying to sell into the US market, and it was chosen as one of ten IT firms to participate in an Austrade-sponsored "Austrade Euro High Tech Tour" in 2002.

Sales and distribution relies on external relationships with partners – this is a close working relationship with Tier 1 companies, who use the Maxamine software products to deliver services to their own clients. Maxamine staff are embedded with these organisations (i.e. work inside their companies) and the Tier 1 firms then sell on Maxamine products.

Maxamine also used external providers for IT/networking when it was first established, but now has its own in-house skills for IT. Similarly, when the firm was first moving into the US market during the "beginnings of the internet bubble" it had to send its Australian-based staff to fly-in-fly-out to establish the first sales client beach head. Once they had their first US clients and could demonstrate that they were a solid company they then attracted staff. Nowadays, the increased staff and market presence in the US has facilitated easier staff recruitment– decreasing reliance on recruitment advisors.

Training is provided from outside the firm – primarily sales support training.

Drivers for Innovation

Customer feedback is an important part of innovation and change. Changes to the product are driven by users. The firm is conscious to avoid technology push – it has a number of areas where it knows it can improve the product but will not do so if there is not demand.

It pays particular attention to feedback from the US, its most sophisticated market. It has an internal communications structure that enables information coming in from outside the company to get to the management team. This is particularly important for the US market where the weekly sales meetings act as the formal conduit for customer feedback. Where the firm uses resellers it obtains feedback from weekly sales meetings.

> "*When we first launched the product we took a huge step. Only 0.0001% of the market understood it and we had to make it simpler and optimise it. We are now in a position where the market understands the simpler version and we can start to introduce more complicated components that were technically feasible much earlier. To do a big jump you need a lot of market mind share and you need a consistency of effort to build a bridge to the buyer. We've taken an incremental approach to grow in a manner that can be sustained and properly implemented to connect to our buyer."*
>
> Stephen Kirkby, CEO

Suppliers play no major role in innovation except for the relationship with its partners. It has a close relationship with its vendors and has staff embedded in Tier 1 suppliers – in this way the relationship with Maxamine is seen as a partnership and the firm's staff are in a position to obtain information through these relationships.

> *"These relationships take a long time to build. The larger the partner the more people we have embedded."*
>
> Stephen Kirkby, CEO

Industry associations play almost no role in external sources of information or advice.

Knowledge acquisition

Maxamine has formal processes for sales management and written procedures for rollout of sales management systems. It trains its partners and resellers on these systems.

Informal networks are important in the US, either through the informal advisory board, trade shows or one-on-one meetings with competitors. These are sometimes set up by the firm's US market analysts who also have excellent informal networks.

> *"It is quite acceptable in the US to take calls from your competitors. You can call people and they will talk to you. We are a known entity and people take my call now."*
>
> Stephen Kirkby

Transforming Internal Processes and Impact on Staff

Maxamine's team has been very stable and is part of a repository of knowledge that is being defended and protected. The firm expects the major growth in staff to occur in the US with additional sales staff, rather than in Australia where the IP is held. Sales staff are easier to add in to the team than R&D staff so ensuring that the latter are retained is important.

Each internal department has its own strategic plan and targets – monthly management meetings discuss what is achieved against these targets and determine resource allocation for new expenditure. Decisions about the relative value of purchasing new equipment vs people are made in this context.

There are major differences between the staff base in Australia and the US that need to be managed and taken account of in training. The Australian office conducts the R&D. The US staff is sales and marketing based. There are also cultural differences in the ways of doing business in the US that need to be managed.

Summary

- External service provides have been most important in the company's start up phase. Currently, the most important providers are market analysts and legal/financial advisers that help the firm in the US market.
- It embeds staff in Tier 1 suppliers and uses these collaborative relationships to further understand the market and increase sales.
- The CEO has an informal advisory board, largely US IT company leaders, who act as a sounding board and provide access to information through their own networks.
- It has a formal feedback system to track sales and ensure that new information reaches the right place in the company for action.

Prophecy International

Background

Prophecy International is an Australian-based company founded in 1980 and listed on the Australian Stock Exchange. The company's global headquarters are in Adelaide, Australia and there are also offices located in Brisbane, the US, Malaysia and the UK.

Prophecy International develops and sells enterprise-level software to large organisations with complex requirements. Products include:

- basis2 - a billing and customer information system for the world wide utilities industry. basis2 is an oracle-based billing system, based on the IP in Prophecy's original BASIS product, and was launched in 2004. The company has already reported a sale of the package in the UK and is in discussions with a number of other interested parties.
- e-Foundation – a product suite providing organisations with a tailored enterprise wide solution. e-Foundation combines Internet technologies for logistics, e-commerce and back office applications and it enables large and middle market organisations to build and deploy web software applications quickly. e-Foundation was launched in the mid 1990s. Modules in e-Foundation include:
  - Prophecy business applications – modules which provide financials, procurement, distribution and asset management to large organisations.
  - Prophecy Framework - rapid application assembly toolkit;
  - Prophecy e-Portal – enables organisation to deploy business to business and Business to Consumer over the internet.
- Velatte – a Java-based rapid application assembly tool. Velatte, due for launch in 2005, enabling business analysts to develop Java applications without the need for any writing any Java code.

While the firm develops all its software in Australia, it knew that it needed to sell product globally because the Australian market alone was not large enough for Prophecy to achieve its goals. It sells its software in other countries by working closely with a number of business partners which act as resellers. It chooses partners in key customer markets and aims to work closely with them and complement their existing product range. The firm also works closely with Oracle, because basis2 provides the latter with opportunities to expand its own product sales. Prophecy International's software is now used in more than 20 countries. Sales are usually managed through partner organisations active in the particular target markets, for example the firm is partnered with Infortige, a company which provides billing outsourcing services to utilities, in Malaysia.

Organisations internationally that use Prophecy software include UK transport company National Express; US power company Missouri River Energy Services; The State of Colorado; and South Australian Government agency Revenue SA.

Use of External Services

Most of the development and other planning is done in-house.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board	Type of Service, if external
Business planning				H	H	
Legal services	M			M		Routine
Acctg/Financial services	M			M		Routine/compliance
Capital Raising	H				H	Tailored
Technology awareness				H	H	
Technology trends				H		
Formal R&D				H		
Market research	H					Tailored
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion				H		
Sales & distribution	M			H		Routine and Tailored
Export strategy			M			Routine
Establishing o/s offices				M		
Performance benchmarking				M		
IT/Networking services	M			H		Tailored
Recruitment services				H		
Accreditation/quality management				H		
Standards				H		
Training services				H		

H = high, M = medium; remainder are low.

The bulk of services are provided in-house through either staff or the Board (which has a large proportion of IT professionals). Capital raising is arranged through an Adelaide-based stockbroker.

While market research is largely an internal function, the firm hires a specialist market research agency in the US to provide information on the utilities market. Industry bodies play little if any role in the firm although it is a member of the Australian Information Industries Association and a water industry group established by the South Australian government. It also attends industry trade shows (for example the CISWorld in Florida) to identify partners and systems integrators with which it can work to boost sales, and to keep abreast of industry trends.

The firm has a close relationship with its partners in established territories and utilises Austrade for initial leads in new markets. It has its own offices in key countries to provide ongoing support to business partners and customers in these markets

IT and networking are also provided in-house but the firm has hired advisers in specialist areas. There are no links with R&D institutions and this has not been a focus of the firm. However, the firm has received funding for an R&D Start grant for development of Velatte.

The decision to use external service providers is based largely on the need for specialised skills. Prophecy will consider outsourcing some other services in the future, where it is clear that they do not have skills available in-house to produce a top-quality result.

> *"Historically we have been very expense conscious so we tend to do everything ourselves. However at times we recognise that there is sometimes a better way to use internal time and it is more appropriate to bring in external providers."*
>
> Leanne Challans, General Manager, Software & Services

Drivers for Innovation

The firm is very aware of market trends and puts a lot of effort into analysis of its competitors and the market as a whole. Customers provide feedback directly or via the business partners. The firm also analyses reasons for its product failing to sell. If this is due to the absence of a feature when compared to competitors' offerings then the software will be changed. The main aim is to be market driven rather than technology driven.

> *"We want to be a bit ahead of the game but not so far out that we are in greenfields territory. We are keen on technology for the benefits it provides our customers, rather than for its own sake."*
>
> Leanne Challans, General Manager, Software & Services

Each product has an advisory team which seeks input from, marketing, sales teams, business partners, customers and product development. This advisory team meets regularly to determine the next development steps for the software. When a list of priorities has been agreed then a product plan is developed and submitted to the Board for approval. The list of priorities will also take into account emerging technology trends and other influences such as market deregulation.

> *"Customers tend to focus on what affects them directly, while business partners think bigger as they are also considering how widely the product sells in the market. However, we find there is very little conflict between what the customers tell us direct and what is fed back to us through our business partners."*
>
> Leanne Challans, General Manager, Software & Services

Suppliers influence innovation in the area of management and corporate governance. Prophecy is a publicly listed company and as such has a number of obligations under Australia's Corporations law. Several of the firm's management innovations have been put in place in direct response to advice from its accountants and lawyers in this area.

Knowledge acquisition

The Board and senior staff are an important source of new ideas and new directions for software development. About 80% of staff are IT professionals who keep abreast of professional developments in their field.

Recruitment of staff has been an important method of acquiring new programming skills, although the firm also ensures that its existing staff are trained in new

languages and systems. The firm is proud of its capacity to keep staff for a long time and ensure low turnover. It keeps its professional staff fresh and motivated by moving them through product development teams.

Partner networks are an important source of new ideas and market information. The product advisory teams provide an avenue for new ideas to enter the firm and be incorporated into software in a controlled manner. Business partners are selected for their local knowledge, reputation and size – the latter being an important consideration for being noticed in major markets. Partners are set targets for sales and sales processes and these are reviewed regularly.

When new versions of software are released the firm issues a comprehensive document which business partners use to familiarise themselves with new features. The manual concentrates on what is new and this can be reinforced in a series of web-conferences where the partners can watch Prophecy trainers use the new version of the software and can ask questions. It is then expected that partners will train customers on site.

Transforming Internal Processes and Impact on Staff

The firm has tried a number of staff suggestion schemes over the years but is currently running a fairly informal process of seeking ideas from staff. The main method is a monthly staff meeting where suggestions are made.

Training is performed largely in-house and there are a number of standard operating procedures covering development methodologies, technical processes and checklists. There are also guidelines and targets for managing customer support calls and other customer interactions. All new staff are introduced to these procedures through an induction process and are then mentored by a more senior staff member. Training programs are based around career development.

Summary

- Prophecy has three major products which are amended and upgraded according to input from customers and business partners;
- The most important external service providers are market research (covering the specialised US utilities market) and sales and distribution (business partners – selected for their industry knowledge and capability);
- The firm has a number of systems in place to maintain awareness and respond to market trends, and has product based advisory teams to assess incoming information and respond appropriately;
- The main influence from suppliers relates to the requirements for corporate governance as a listed public company.

YourAmigo

Background

YourAmigo is a South Australian software company specialising in information search and retrieval products and search engine marketing services. The original technology concepts were developed at Flinders University and were assigned to the company by the University's commercialisation company, Flinders Technologies Pty Ltd. It has patented key aspects of its intellectual property around the world but certain aspects remain trade secrets. The company has private investors.

Its search products out-perform traditional search technologies because it can access information unable to be discovered by traditional search engines. Based on unique technology and architecture, the products provide organisations with a vastly improved ability to search their intranets, extranets and web sites. YourAmigo has also established technology for searching the Invisible Web, a huge part of the internet which is currently invisible to search engines.

YourAmigo's main product is Spider Linker, which uses a novel search architecture to make all of a website's information searchable by and rank highly in the internet search engines. Spider Linker is run as a service by YourAmigo so the client doesn't have to have technical expertise to be successful. YourAmigo also helps companies market themselves into the paid search results of internet search engines. It has also just launched a Search and Alert product which is a business intelligence service that allows organisations to monitor selected websites, including information that cannot be searched by Google or Yahoo. When changes that match particular user-defined parameters are detected the program will automatically alert the organisation by email. The majority of the technical support for these products is provided out of Australia.

The Adelaide City Council was the first to utilise YourAmigo's new search engine on its website because it helps the public find the information they need to do business quickly, easily and efficiently. Melbourne-based e-business solutions company i-Focus Pty Ltd and KPMG Consulting (Singapore) have since joined the YourAmigo Certified Integration Partner program and act as partner-resellers. YourAmigo now has more than forty distribution partners in the USA, Europe and Asia, and is continuing to grow channels and customers in all of these markets.

The firm's main customers are large organisations and e-commerce companies and it has a number of significant government clients at the local, State and Federal level in Australia. Overseas, its customers include the Home Shopping Network (US), McGraw-Hill (US), Honolulu Police Department, Sony Europe, Suzuki (UK), Interflora (UK), Thales (UK) and Staples (Germany) to name a few. Ninety percent of its customers are now overseas.

"It has been a challenge reaching overseas markets. We have tackled these through two strategies – one by establishing a distribution network of overseas resellers who are trained and certified by our staff, through overseas integration partners, who are not only trained by us but can also provide technical support and integrate our product into a wider range of solutions, and through the establishment of our own overseas offices which both support distributors and make direct sales to end clients. These overseas relationships were identified as the highest risk for us – we have mitigated this through working closely with them including constant travel, knowledge of the market and developing a growing network of contacts with people over time."

Rahmon Coupe, Chief Executive Officer

US Knowledge Management publication, *KMWorld*, named YourAmigo in its 'Top 100 Companies that Matter in Knowledge Management' in both March 2003 and 2004. In May 2003, YourAmigo won the Australian Innovation Industry Award (AIIA) for its Spider Linker product.

The firm has about 30 staff of which the majority are in Australia, with offices also in the USA and UK.

Use of Knowledge-Intensive Services

The firm uses few external service providers.

Activity	External firm	R&D Instn	Other Extnl orgn	In-house (staff)	Board/ Advisory Board	Type of Service, if external
Business planning				H	H	
Legal services	H			M	M	Legal routine & compliance, Patents Knowledge Intensive
Acctg/Financial services				H		
Capital Raising	H			H	M	KI
Technology awareness				H		
Technology trends				H	M	
Formal R&D		M		H	M	KI
Market research				H		
Product/service development services				H		
Project management				H		
Operations				H		
Marketing/promotion	M			H		KI
Sales & distribution	H			H		KI
Export strategy			M	H	H	
Establishing o/s offices				H	M	
Performance benchmarking				M		
IT/Networking services				H		
Recruitment services				H	H	
Accreditation/quality management						N/A
Standards				M		
Training services				M		

H = high, M = Medium; remainder are low.

Routine legal services are provided by external lawyers but a separate office of patent attorneys advises on patent drafting and this is knowledge intensive. Capital raising advice is also provided externally and relates to both Australian and US sources.

All market research was conducted in-house using the internet and by travelling to potential markets. The Chief Technology Officer has a role in identifying and tracking research trends.

"We were offered access to (subscription-based) overseas market research but we were smart enough not follow this and that is why we are still here. If we had blindly followed these predicted trends we would be in serious trouble now. The advantage of being in Australia is that we are not caught up with fads and trends – we could have spent lots of money on poor business plans and bad ideas, however we always knew what we had was very valuable, we understood it and focussed very hard on developing products and services that the market wanted and needed."

Rahmon Coupe, Chief Executive Officer

The company does its own formal R&D but also maintains links with Flinders University. It had a Federal government R&D Start grant of $725,000 from 2001-2003 and has recently been awarded another smaller grant for R&D. It claims the R&D tax concession.

Marketing is largely managed from in-house but the firm outsources graphic design. Whilst YourAmigo staff do direct sell to clients, its impressive client list has helped to grow its distribution network of resellers and integration partners. Export strategy has also been managed in-house but the firm uses the Export Market Development Grants scheme to defray costs.

The main barrier to using outsourced service providers is the firm's belief that important functions should be provided in-house and the cost of hiring consultants in start-up phase. If the firm uses its own staff for most things then the knowledge gained stays with the company. YourAmigo has only used external providers of knowledge-intensive services for discrete functions which they couldn't source in-house (e.g. patents and raising US capital).

"Government programs often want you to use consultants, but I feel that if a company does not have people that are able to fulfil key business functions then god help that company. One of Australia's problems is getting enough talented younger people who want to run companies. When we go to networking events in Australia almost everyone has grey hair like us - this is the complete opposite to Silicon Valley. In the US Google has just listed on the US stock exchange and the average age of its staff is 29 years."

Rahmon Coupe, Chief Executive Officer

Drivers for Innovation

Many ideas for modifications to the firm's products come from the market. This is watched closely, and the CEO gets direct feedback from travelling and talking to people overseas.

The Advisory Board has a strong US influence. The firm's US-born financial controller, Stuart Snyder, has extensive personal networks in Silicon Valley. Rahmon Coupe's own background is in the electronics industry in South Australia, including with start-up companies. This has given both of them good personal networks and an understanding of what will work in the market they are targeting.

"My initial experience was with a company called MRAD, a spin-off from the Australian Government's Defence Science and Technology Organisation. MRAD was owned by the State Government of South Australia through a wholly government-owned parent company. MRAD's main market was government defence organisations but the performance guarantees that these departments put onto the company were so onerous that the State Government refused to take the risk and sold the company. It taught me a lot about how to structure a company so that it could handle this level of risk."

Rahmon Coupe, Chief Executive Officer

All product development is in-house. While the software concepts were obtained from Flinders University all of the code was rewritten, so that it could be supported after it had been licensed to customers. Much of the support software used for product development is open-source (linux is the development platform), both to contain development costs and for its versatility and transparency when debugging and testing.

"If you are going to take on the world in a particular area you need the best people in your company. As a start-up it is more cost effective to do it in-house – our software engineering people are world class. It is important to get the best people who can perform and get results. We are working in a very fluid environment, requirements can and do change. A lot of people are amazed at the breadth of our products – it reflects the quality of our talent. You could hire a much larger team of average people and not get that good a result."

Rahmon Coupe, Chief Executive Officer

Industry associations play a minor role. However in the early days of the company the then SA Centre for Innovation, Business and Manufacturing (CIBM) was an important source of industry knowledge and networking. This Centre had an IT specialist who knew all the local companies and could help find the right supplier and also staff (e.g. CIBM alerted YourAmigo to a potential group of IT staff who had just been laid off from another local company). CIBM also provided training courses, small grants and information on exports. It would also sponsor presentations about financing, marketing and export strategy. While it was very valuable, it has been closed down and the firm does not know if similar services are available for start-ups under other programs in the State.

Knowledge acquisition

The firm has a formal Board and an informal advisory group that is made up of key industry people. The advisory group has been built up gradually from advisers, friends, customers and other contacts including people met at trade shows. These people put in a small amount of time in exchange for stock options and their skills are accessed on an ad hoc basis. The advisory board includes people who are US lawyers, experts in capital raising and people who run IT companies in the US. The Chief Executive Officer can phone people within this group and ask advice on particular issues as required.

Every customer has an account manager and the Chief Technology Officer also talks directly to customers to enhance the company's understanding of the market. There is an informal process of feedback from customers and the distribution partners also provide feedback. The firm will conduct three-way phone calls with customers and distribution partners to ensure that it gets direct feedback from customers rather than

filtered feedback from partners. Distribution and integration partners are closely managed and there are systems in place to monitor the information that comes into the firm from these sources.

In May 2001, YourAmigo signed an Industry Alliance agreement with the Australian Government's Defence Science and Technology Organisation (DSTO), the largest defence research establishment in the southern hemisphere. DSTO has a limited number of these agreements, which it seeks to form with companies that it believes can make a significant impact on defence in the longer term. The agreement set the conditions for future collaboration in intranet information search and retrieval, and has been helpful in assisting YourAmigo to understand defence's requirements and the impact that its technologies can have on defence in the next decade and beyond.

Transforming Internal Processes and Impact on Staff

Changes introduced by the firm have enabled it to meet the needs of its market and also continue to support existing customers.

About 25% of the firm's staff have IT qualifications and the firm aims to attract the best software engineers and then train them in sales support, rather than the other way around. Most training is on-the-job and some staff members have attended sales and marketing courses. Several useful courses (e.g. presentation skills) are supported by the State Government. New staff have a mentor who works with them until they are sufficiently up-to-speed.

"This is the leading search engine technology in the world. It is more innovative than its competitors and uses unique technology that Google, Yahoo and the like don't have. The challenge of working with this technology is very exciting to technology-savvy staff, and this helps us to attract the best people."

Rahmon Coupe, Chief Executive Officer

Summary

- The firm believes that important functions should be provided in-house and the cost of hiring consultants in start-up phase. If the firm uses its own staff for most things then the knowledge gained stays with the company;
- The firm has only used external providers of knowledge-intensive services for discrete functions which they couldn't source in-house;
- The company does its own formal R&D but also maintains links with Flinders University. It has had a Federal government R&D Start grant and has recently been awarded another smaller grant for R&D. It claims the R&D tax concession;
- Many ideas for modifications to the firm's products come from the market which is watched closely, and the CEO gets direct feedback from travelling and talking to people overseas;
- The firm has a number of systems in place to maintain knowledge acquisition, these include use of an informal advisory board made up of key industry people, talking directly with customers and through collaboration agreements.

Mining Technology Firms

Advitech Pty Ltd

Background

Advitech is a NSW-based firm which uses engineering, environmental science, IT and risk management skills to deliver services to a range of clients, including those in mining, mineral processing and defence. The firm has been based in the Hunter Valley since its formation in 1987. It now has 40 staff, the majority of which have tertiary qualifications in engineering, environmental science or information technology.

Advitech's services are broad and encompass engineering design and drafting, process and chemical engineering, environmental engineering and management, risk assessment, technical investigations, project development, procedure documentation and development of information systems. The firm's clients include major miners such as Oceanic Coal, Mt Isa Mines and Xstrata. The firm also has major contracts with firms in mineral processing, defence, rail, chemical manufacture, utilities, health and aged care, emergency services and government.

The main services for mining companies can be grouped into three areas – environmental noise monitoring and assessment, risk management, and storage of hazardous goods/hazardous substances. Most of these services are delivered to clients on a project basis but the firm now has a long list of returning customers with whom it has an ongoing relationship.

The firm is structured in four business units – Advitech Projects, Advitech Engineering, Advitech Process and Environment and Advitech IT. This structure has been stable over time. However, there is considerable interaction across the company, between the business units. Any business unit in the company can provide a quote for a project, but only the directors can formally accept the project and commit the company.

Most of the firm's customers are located in the Hunter Valley. It has some contracts with mining firms in the Illawarra. It has also had one export contract to Malaysia and, through another Hunter Valley based company, is involved in scoping a potential project in China.

"*Locally, we are seen as an innovative company. Some of the work we have secured is because clients have that perception of us. They have a need, and they have approached us because of our reputation. Our introduction to defence work was quite opportunistic, however once our client knew of us, and knew that we could deliver, we were asked to quote for other projects. We are particularly valuable to defence because we can see better value ways of doing things and can save them money. This led to a major infrastructure project for defence in Sydney."*

Steven Smith, Manager – Projects, Defence and IT

The firm believes that its skills base give it a unique edge. While there are many competitors in each of the disciplines dominant in each business unit, there are no local firms which can package these skills together the way that Advitech can. Thus, the firm's competitive advantage relies on its skills base and its approach to "one-off", rather complex, projects for customers.

Recent Innovations

The main innovation in environmental noise services has been a system called Sentinex, which began development in early 2004. Sentinex is built from off-the-shelf technologies, supported by software and data processing developed in-house. The system improves the method by which mining companies track noise caused by their operations, using remote data loggers, and speeds the identification of noise so that it can be controlled and kept within the levels demanded by the regulators. Previous systems relied on personnel to monitor the data loggers and download the data onto a laptop at weekly intervals, and then take it away for processing. This meant that the data were up to a week old by the time they were reviewed and it was hard to identify sources of new noise.

With Sentinex, the site environment officer receives an email at 7a.m. each morning, with an automatically generated report which provides data on noise for the previous 24 hours, plus weather data. If there is excess noise, sound files can then be downloaded in 5 minute increments. The officer can then listen to the files and determine whether the noise was caused by the mine operations or by some other factor (e.g. a noisy helicopter going overhead). Sentinex has been designed to operate in areas which do not have fixed line telephony. The system has been developed further so that later versions also enable web-access and hence close to real-time noise analysis, and can also run on solar power. This system has been developed in conjunction with an industry partner.

The second area of innovation is risk management. Advitech has a long history in helping clients analyse risk. In 2002, an internal review identified that the company had a lot of intellectual property (in the form of know-how) in this area. This has been packaged into software, known as Criteria, which is a software package offering integrated risk analysis and management across all aspects of company operations including financial, business, and occupational health and safety. Criteria is at the beta-test stage and the firm is in negotiations with potential distributors. It is already being used by clients. Advitech either uses the package in-house to support risk analyses completed for clients, or sells individual or site licences to others.

Over time Advitech has developed a formal project assessment system designed to minimise its own risk in taking on new customers. This has now been captured in a computer-based assessment system which incorporates consideration of the project's scope and methodology, the customer's financial capacity and stability and the likely benefit to the company of the project.

Advitech has also an extensive quality management system. It was first accredited for ISO 9001 in 1998 and has since upgraded its accreditation to the more recent version of that standard. New employees are inducted into the company via a formal induction manual which outlines the quality management system as well as company's philosophy, OH&S practices and the like.

The firm is heavily reliant on email and the internet. It now operates a number of file servers and has a preference of sending letters and reports by email (in un-editable form).

"*Email and the internet have had a significant impact on how we do our business. We were using fax machines in the early 1990s but we switched to email as soon as it became available. It has improved our ability to respond more quickly to clients."*

Steven Smith, Manager – Projects, Defence and IT

Any barriers the firm has in introducing change are because of resources – all new development is done by staff who may also have responsibility for delivering projects

to clients. This means that client needs come first and progress in implementation of new developments can be reliant on spare time availability.

Use of Knowledge-intensive services

The firm estimates that less than 5% of turnover is spent on external service providers.

Activity	External firm	R&D Instn	Other Extnl orgn (F/I)**	In-house (staff)	Board	Is service tailored, routine, compliance or other?
Business planning	M			M	H	Tailored
Legal services	H					Routine
Acctg/Financial services	M			M		Compliance
Capital Raising						N/A
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research				H		
Product/service development services				H		
Project management				H		
Outsourced operations	M					Tailored
Marketing/promotion*	M			M		Routine
Sales & distribution				H		
Export strategy				H		
Establishing offices overseas						N/A
Performance benchmarking		M				Routine
Networking services				H		
Recruitment services	M			M		Routine
Accreditation/quality management	M			M		Compliance
Standards				H		
Training services	M			M		Routine

* incl. e-commerce

** incl. government organisations such as business enterprise centres, government grants

Advitech keeps most of its services in-house. It only outsources when it lacks the specific skills internally.

Business planning services have been outsourced once only. Legal, accounting and audit (for ISO9001) are outsourced for compliance reasons.

The only other tailored outsourced service are some aspects of project operations – for example, a specialist fauna/flora survey may be required for an environmental project, or particular engineering skills.

Routine training and recruitment services are used when required. The firm used to subscribe to reports which enabled it to benchmark its expenditure, salaries etc against firms of a similar type (it bought reports from a university group).

Drivers for Innovation

The main drivers for innovation are staff and regulation, but customers' needs will provide the background for implementation of ideas.

A major driver is regulation – changes in the dangerous goods regulations some years ago provided the main impetus for the company's move into consulting in this area. Similarly, the move into risk management was strengthened in the early 1990s when the NSW government regulator mandated that any new capital equipment had to be assessed for risk before it was installed in a mine. The move to package this knowledge into software then came from an internal review.

Several innovations have come from the firm's close working relationship with the regulatory agencies in NSW. In 2001, the NSW government launched a Cleaner Production initiative and Advitech was accredited to run subsidised projects to help companies analyse their use of resources and energy and to minimise waste. This led to a number of projects in the aged care, poultry and chemical production sectors field and the firm's work was recognised by a local government award at the end of that year.

Staff are all in contact with customers and many of the innovations they suggest are based on a combination of their own expertise and knowledge of what the customer wants.

"*The idea for Sentinex came from the manager of the Process and Environment group, who used to sit out there at night and occasionally sleep in his car while the old data loggers were collecting information. He knew that the customer really needed real time information and he also knew that the community wanted mining operations to have minimal impact on the environment, especially in the Hunter where the coal were discovered amongst an existing farming community. There is a lot of pressure on mining companies to minimise their impact and there was a demand for real time monitoring systems which would not only meet their regulatory obligations, but would demonstrate they were serious about environmental management. Management jumped at the idea because we could see that it would give us an opportunity to be seen as leading the pack, and that is also important for our general standing with customers and the regulator."*

Steven Smith, Manager – Projects, Defence and IT

The driver for development of Criteria was largely internal and stemmed from a sudden drop in external contracts following the excessive Y2K expenditures across the world. The firm didn't want to lose its skilled IT staff so it took the opportunity to move them into product development. Now that Criteria has been launched, the firm will claim the tax concession and is now in a position to recoup its development costs.

Knowledge Acquisition

Technical staff play a major role in scanning the environment for technical information. The firm also values technical staff who can see opportunities for non-technical innovations and development. Staff who attend conferences or training must brief other staff on their return. Ideas can also be raised at weekly management meetings, which have a broad agenda and include a specific item on innovation.

The Managing Director plays a major role in broader knowledge acquisition. He and other senior staff are very active in a range of local Hunter Valley industry groups. These include HunterNet, HunterTech and the Hunter Business Chamber. The

opportunity to work in China has come through the informal regional networking offered by these membership-based organisations.

> "*Part of our psyche is that you can't develop sitting inside your own little shell. You have to interact with your local community. The dividend for us has been the relationships we have formed, the contacts we have developed. These have enhanced our reputation and have led to business opportunities, through interaction with other network members, that we would not have been able to take on ourselves*."
>
> Steven Smith, Manager – Projects, Defence and IT

Most staff's personal networks would be Hunter Valley based but the Managing Director has extensive networks in Sydney and elsewhere. The firm is being assisted in Malaysia and Singapore by Austrade.

Transforming Internal Processes and Impact on Staff

The firm relies on its staff for their technical skills but their ability to work with customers is crucial as all its staff have contact with customers. Good employees are very hard to find, despite the availability of excellent graduates from Newcastle University's engineering school (senior staff from Advitech are on two of the course development advisory boards for the university (chemical and mechanical disciplines)). Advitech's staff need to have had experience working for industry before they work for Advitech and hence the opportunities for new graduates are limited.

> *"We actively look for people who can see opportunities across the company when we recruit. When we interview, we look for people with a particular set of technical skills as a minimum, but that isn't the deciding factor. The deciding factor is how they can add value to the business and whether we would be happy to send them out to deal with a customer. Everybody markets the company, we are very strong on that*."
>
> Steven Smith, Manager – Projects, Defence and IT

All the firm's staff are comfortable with doing things they haven't been done before – they have a base of skills which can be put to use in a range of projects. Comfort with change and innovation is an important component of the staff culture.

When the firm launches a new product, all staff have some background training on what it is and what it does. The main aim is to enable them to see opportunities for product/service sales and to be able to refer the customer back to the right person elsewhere in the company.

Some of the changes in the firm have the potential to impact on staff, who traditionally have been able to go home at night after work. The opportunities in China and with firms outside the region mean that the company's work structures and policies may need to change. This may present a more attractive work opportunity to some potential staff and the firm is hoping that, if the China project goes ahead, it will be easier to attract the staff they need.

There is no formal policy on recognition or reward of staff who bring in new ideas to the firm, but the manager of each unit has the discretion to award staff in their unit, for example, with a dinner for family or a weekend away. This can be for improvements to service, sharing of information or new product/service ideas. Discussion in the company is encouraged and management make a point of lunching in the main staffroom to encourage interaction.

Summary

- Advitech sells a range of engineering, environmental, IT and risk management services to clients in mining, defence, manufacturing and service industries.
- The firm has developed a number of new products which have emerged from a combination of regulatory changes, internal suggestions and customer requirements.
- All staff have to work with customers so their ability to be comfortable with change, to focus on customer needs and to identify opportunities is very important. These skills are hard to find.
- The firm believes in working closely with other local businesses and this has led to a number of business opportunities.
- The firm has developed a number of internal management systems to enable it to respond to new opportunities while minimising its own risk.

Ausenco Limited

Background

Formed in Brisbane in 1991, Ausenco Limited is a multi-disciplinary, public, unlisted company that provides engineering and project management services to the mining and mineral processing industries. Ausenco's projects are not limited to Australia alone, but span all the 4 major continents including countries such as Canada, Panama, Argentina (Americas), Laos, Thailand, Malaysia, India (Asia), Italy, Romania, Cyprus (Europe), Kenya, Tanzania, and South Africa (Africa).

Ausenco's client list varies from the major resource companies such as BHP Billiton and Rio Tinto, to the industry's smaller players. The firm has 300 staff and an annual turnover of approximately $100m.

Ausenco's activities can be broadly classified along the following lines:

- plant design, equipment specifications and materials selection;
- engineering design to cover the following disciplines – process, mechanical, earthworks, civil, structural, electrical, instrumentation and control;
- project management of projects for cost, schedule and quality;
- construction management of projects; and
- Cover the process plant and associated infrastructure of mining projects.

The firm's services encompass all the major disciplines of the mining industry such as:

- chemical and metallurgical engineering;
- mechanical, civil and structural engineering;
- electrical engineering and instrumentation; and
- project and construction management.

The company also provides solutions in all aspects involved in managing the project such as engineering control, budgeting, scheduling and construction management. In addition to this, Ausenco provides plant start-up assistance, troubleshooting and machine operator training.

The firm has formed alliances with a number of firms around the globe to execute works. One of these is with GRINAKER LTA: A global construction group which operates through 3 companies focusing on different aspects. The alliance allows Ausenco to have a major presence in southern Africa and has given it access to new process technologies in the area of acid handling and sulphuric acid production plant design and construction.

Ausenco was awarded Queensland Exporter of the Year in 2004 and won the National Exporter of the Year for services in 2002 and 2004. It has also won awards as a supplier to the mining industry and for engineering excellence.

Recent Innovations

Ausenco is a very technology-intensive firm. It has a group of people that examine technological processes and a Technical Manager whose role is to develop relationships with external organisations such as CSIRO, JKTech and other

companies which may approach them with particular technologies of interest. The Managing Director of the firm is also on the board of JKTech.

The firm develops a range of its own technologies in-house and through contract research with external research organisations. It also has a strong relationship with equipment suppliers, who help it develop technology-based innovations for its customers.

The company has been growing strongly and has doubled in size in the last 18 months. It has always been structured as a matrix, with business units concentrated around services to clients and a corporate support group. The major business involves completion of feasibility studies and construction of mining projects. The firm has recently appointed a General Manager (Projects) and a General Manager (Studies) to operate these two divisions. These are supported by staff under a General Manager (Engineering and Processes). In addition, a support group manages project control and quality assurance. Within the Studies Division, study managers run individual projects.

The firm has also changed its human resource management and staff selection practices. This is partly to ensure that these processes are obvious within the firm – it has recruited a Talent Manager and a Health, Safety and Environment Manager to work alongside the Chief Finance Officer, Business Development Manager and General Manager (Commercial) who manages contracts. While the company has always had the people with these responsibilities, it is important to make these roles obvious from the outside. It has found a need to formalise these roles but is trying to avoid being overly bureaucratic. The company spends a lot of time recruiting people and the expectation is the Talent Manager will take the load off some of the other General Managers in this area.

There are also continuous changes in IP and equipment/facilities. The IT Department is responsible for upgrading equipment but is also in charge of document management and control. The firm has implemented a number of changes to improve IT services for clients in recent years, including allowing clients to track the progress of projects live on their website. The firm is also active in videoconferencing and internet-based presentations to clients around the world.

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl orgn (F/I)**	In-house (staff)	Board	Is service tailored, simple, compliance or other?
Business planning	M			M	M	Tailored
Legal services	M			M		Simple
Acctg/Financial services	M			M		Compliance
Capital Raising	H					Tailored
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research	M			M		Tailored
Product/service development services				H		
Project management				H		
Outsourced operations	M			H		Tailored
Marketing/promotion*				H		
Sales & distribution				H		
Export strategy		M		H		Tailored
Establishing offices overseas	M			M		Simple
Performance benchmarking				H		
Networking services				H		
Recruitment services	M			M		Tailored
Accreditation/quality management Standards						
Training services	M			M		Simple

H = High, M = medium, remainder are low

Ausenco outsources a number of services including legal, financial capital raising, R&D operations, marketing, IT networking, recruitment and quality auditing. It spends about 1-2% of turnover on these services. It uses external legal services for straightforward work and external accountants for tax compliance.

IT locates these firms by word of mouth, often through government agencies such as the Department of State Development and Austrade. The firm has also always had good professional development programs, but these have been informal. It is now moving to formalise these and is expanding the role of its existing recruitment agency to ensure that it delivers these services appropriately.

The Board and senior staff play an important role in national and international networking, finding new clients and change management. The firm has recently appointed two new Board members for the express purpose of expanding Board skills in change management.

Drivers for Innovation

The firm prides itself on its innovation but much of this is driven internally.

"In Australia, engineering in the mining industry has always been very innovative. We come from a "lump sum" background and we do a lot of projects. There is always a drive to keep costs down. Our overseas competitors don't necessarily have this approach. We always analyse our feasibility study to see how a construction project can be competitive."

Wayne Anderson, Business Development Manager

The main customer base for the firm are Australian, Canadian and US-owned mines. These mines, however, may be in less developed nations including Tanzania, Laos, Papua New Guinea and Bulgaria.

While the firm has mostly been making incremental changes, in the last couple of years there have been large step changes which have lead to a doubling in size in 18 months or thereabouts. This has driven a lot of internal change in the way the company manages people and this has led to a complete strategic review and development of the new structure.

Knowledge Acquisition

The strategic review which has just been completed has found that internal cultural change was still required in order to align the messages of the Executive and approaches by staff. The company wants to encourage innovation and recognises that one of the key things in this is cultural change across the company.

Ausenco has worked hard at being able to learn about the cultures in which its projects are located. It was the first Western construction company to build a greenfields mine site in China. Its ability to work with people of other cultures was crucial in succeeding in this tender. The firm is working with a Chinese Design Institute, and an important part of the project is to bring the Chinese employees into Australia and the firm's ability to work with them was based on being able to welcome them in culturally appropriate ways. Ausenco's staff are also learning Mandarin, helped by a person on staff who speaks fluent Mandarin.

Ausenco has also worked on a number of projects where it doesn't speak the language but creates a project team using locals who speak English and have a role in logistics and field supervision. In Tanzania it is the first time that an Australian engineering team has employed locals to develop the site. The company put in a lot of effort to find out about local policies and rules, such as industrial relations, and it will employ a country manager to manage the whole project. In areas such as environmental standards, where Australian standards are better, it will abide with the Australian laws. It also has to comply with the "equatorial principle" – this is a safety and environmental policy that is enforced by a consortium of leading global banks providing project finance.

Transforming Internal Processes

When staff have ideas, they generally talk with their immediate manager and these ideas are then brought up to the management committee, which examines the risks and the opportunities and decides whether or not to take up the idea. It has been quite difficult to find the right people to manage these changes.

The firm is currently addressing similar changes at the Board level and has appointed an independent Chair and independent non-Executive Director to help support change management. The informal networks employed by both Board members and senior managers are completely international in character.

The firm has found local state development staff to be extremely supportive, as well as Austrade. Ideas come from all places and the State Government is very strong in connecting Ausenco with other companies that may be of assistance to it.

The firm has a lot of internal know-how but has not formally patented its intellectual property. There are a number of reasons why the firm has not taken this step and each potential opportunity is assessed on its own merits.

> *"The intellectual property is in the people."*
>
> Wayne Anderson, Business Development Manager

The firm believes that a large amount of the innovation comes from the culture of being an Australian firm. The culture of the people is innovative – because Australians always ask if something is the best way of doing it. Australians always question things.

Summary

- Ausenco is a resource-based construction and project management firm that establishes processing operations for firms in Australia and overseas.
- The firm is formalising its operations as it grows. Recent changes to internal roles and responsibilities not only streamline internal operations, but enable external customers to identify particular roles within the firm.
- The main roles are internal, supported by outsourced service providers who have relatively limited roles.
- The internal culture is an important driver of innovation.
- The ability of the firm to work in different cultures is important and its skills in this area have been boosted by recruitment of local staff in key management positions on overseas sites.

Lakefield Oretest Pty Ltd

Background

Lakefield Oretest is based in Perth, Western Australia and is a leader in providing major metallurgical testing services to the mining industry. In 2000, its original founder firm, Oretest Pty Ltd, merged with Lakefield Research Ltd to form Lakefield Oretest Pty Ltd. The firm is now part of the global SGS group of companies. Since its foundation in 1993 the firm has completed 3,000 projects for over 300 clients.

Lakefield Oretest's core business is hydrometallurgical (i.e. water-based) testing and mineral processing. This helps mining firms plan the process by which the ore will be extracted to maximise the yield of valuable metal from complex ores. The firm develops flow sheets of the extraction process based on bench and pilot scale programs. The firm is also mindful of potential environmental impact from the extraction process and its flow sheets will aim to minimise negative effects. Lakefield Oretest also offers its services in the area of environmental management. These services range from consulting, management and training to laboratory test work.

Lakefield Oretest is one of the few commercial testing companies in Australia to have its own fully functional purpose-built laboratory. The laboratory is dedicated to providing high quality metallurgical testing across the broad spectrum of the minerals industry, including gold ores, base metals, iron ore, industrial minerals, diamond ores etc. The testing programs cover the full range of processes involved in mining: crushing, ultrafine grinding, gravity separation, magnetic susceptibility, high tension electrostatic separation, flotation, bacterial leaching, carbon in-leach, solvent extraction, electrowinning and resin test work. The firm owns its own pilot plants that facilitate the continuous demonstration of most of the processing options that Lakefield offers. These pilot plants are fully computer controlled and can be used in the development of bankable feasibility studies. BHP has also chosen to construct a pilot plant on Oretest's site north of Perth and to contract operations to the company.

> "*You can count on two hands the number of companies world wide that do what we do. We have the most extensive hydrometallurgical plant in the world.*"
>
> John Angove, General Manager

Lakefield Oretest has about 70 permanent staff in Australia. These are mainly professional metallurgists, chemical engineers, chemists and a range of highly skilled and experienced laboratory technicians and assay chemists. These personnel have developed world-class expertise in hydrometallurgy, particularly pressure leaching, solvent extraction, flotation and mineral dressing.

Lakefield's client list includes all the Australian and many international-mining companies. The firm has a global reputation and has recently been contracted by a major Brazilian company to do their metallurgical testing. Export income fluctuates, however, as the firm does not market strongly overseas. Many engineering, as well as exploration firms, also seek the services of Lakefield Oretest. The merger with Lakefield Research in Canada further enhanced Lakefield's capabilities. This merger gave Lakefield a greater global presence in addition to enabling clients to access an increased depth and breadth of technical skills.

Recent Innovations

The firm's innovations are largely based around its skill in hydrometallurgy, and includes processes enabling the treatment of otherwise environmentally unacceptable ores and concentrates.

Development of new techniques is a continuous process, as each ore body is different and the flow sheet required for processing will be different. The chemical and mineralogical composition of the ore affects how finely it is crushed in the first instance, the reagents required, the method by which the metal is extracted and the ultimate yield of valuable metal. These innovations constitute the company's intellectual property, and enhance the know-how within the company.

In 1997, Lakefield Oretest commissioned the first continuous pilot plant autoclave in Australasia to process nickel laterites, refractory gold and base metal ores. In 2000, in conjunction with BHP Billiton, the firm installed a 70 litre, 5 chamber continuous submarine type autoclave. Novel technologies such as pulsed perforated plate Scheibel rotating and Karr reciprocating solvent extraction columns, and high current density electrowinning cells, are also offered.

The firm has developed a number of internal procedures to standardise technical testing. Most of the company's contracts are fixed price so it is important to deliver the service efficiently, as well as to achieve consistent and replicable results in testing.

The firm believes it is a forerunner in the use of software and the internet within its sector. The pilot plants generate thousands of pieces of data and a database has been developed to store and analyse these data. The information is used in-house and can be exported into spreadsheets for clients. Its clients can also get access to this information live through a special passworded section of the website.

Use of Knowledge-intensive services

The firm keeps nearly all its services in-house. About 5% of turnover is expended on the services in the table below together with electrical and other trade sub-contractors.

Activity	External firm	R&D Instn	Other Extnl orgn**	In-house (staff)	Board	Is service tailored, simple, compliance or other?
Business planning				H	H	
Legal services	M			H		Tailored
Acctg/Financial services				H		
Capital Raising						
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research				H		
Product/service development services				H		
Project management				H		
Outsourced operations				H		
Marketing/promotion*				H		
Sales & distribution				H		
Export strategy			M	H		
Establishing offices overseas						
Performance benchmarking				M		
Networking services	M			M		Routine
Recruitment services	M			M		Routine

Accreditation/quality management	H		Compliance
Standards		H	Compliance
Training services	M	M	Routine

* incl. e-commerce
** incl. government organisations such as business enterprise centres, government grants
H = high, m = medium, blanks = low importance

IT and some recruitment services are provided on contract but the latter have had limited success. External service providers audit compliance with quality systems, and the firm also complies with international standards for technical testing. It outsources electrical installation work as it does not have qualified electricians on staff. External service providers also train staff on safety and office-related skills.

There is no formal market research or benchmarking – this is done informally at present but the firm is appointing a business development manager to formalise this aspect of business operations. Austrade has been used to some extent for export assistance.

The firm also has access to the world-wide network of the Lakefield Group. This gives them access to additional technical expertise on a formal and informal basis and also to some legal services when required.

Drivers for Innovation

The main driver for innovation is the need to continue to improve processes for mineral separation. Australia is now developing ore bodies that are more difficult to process and this is a major driver of change. The company's clients aren't always aware of this and so aren't specific in their requests, but the underlying need is to develop the ore body as efficiently as possible and for expenditure of as little money as possible. The price pressure is particularly acute with the junior mining firms, who generally want results very quickly, and the firm has had to make some adjustments to the way projects are delivered for some of these customers. With larger customers, the focus is on making sure the project works and the approach is more structured. While the firm has made attempts in the past to obtain specific client feedback, staff turnover in client firms has made this difficult.

"*In Australia, the need to reduce environmental impact should also be a major driver. However, the environmental push hasn't been as strong here as it is in other major mining countries*."

John Angove, General Manager

Equipment suppliers are a major source of new equipment, which supports development of new technical procedures. This equipment is purchased or loaned from external suppliers, who benefit from the exposure that they receive from Lakefield's clients. Some equipment is modified by the firm for its own use in testing processes.

Although the firm has overseas-based customers, it has not found that there are any particular cultural issues it needs to address in dealing with these firms, as the service is delivered within Australia (i.e. samples are sent to Oretest and the results and sent back to the client).

Knowledge Acquisition

The firm is loosely divided into 5 groups, each headed by a senior metallurgist with particular experience in a technical field (e.g. comminution, flotation or pressure acid

leaching), or a particular metal (e.g. gold or iron ore). These professional staff have the main contact with clients and are the gatekeepers for information coming into the firm. Information also comes in on daily email wire services. Professional staff are expected to keep up-to-date with new technical developments.

The metallurgists and other staff in the company attend technical conferences and trade shows. Staff that attend conferences are encouraged to give a paper and/or write a report. The firm also runs its own technical seminars. The company's and staff's networks operate on a national and international scale and most new projects come through this route. New staff may be able to provide new network links to help expand the company's client base.

Lakefield Oretest is a Registered Research Agency, which means it can be contracted by government and other research-funding groups, such as the Australian Minerals Industry Research Association, to do contract research. Organisations such as CSIRO and AJ Parker CRC for Hydrometallurgy are, therefore, competitors and the firm has no formal links with external R&D organisations.

The company finds it difficult to recruit people who have the necessary technical skills but can also see the big picture well enough to contribute to development of new processes. It is always on the lookout for new staff. It is not a choice between staff or equipment – equipment is used for measuring and automated processing, whereas the staff will need to contribute ideas and expertise in relation to unique problems.

"*A lot of experienced people have left the industry or retired, and the new graduates coming through the university system get snapped up by the big companies and are generally sent out to operations. We could offer these people very broad-ranging training in their field but we can't compete with the salaries the large companies pay them."*

John Angove, General Manager

Transforming Internal Processes

The firm formalises knowledge transfer on technical matters through development of technical procedures and guidelines, which are then promulgated to staff, sometimes after formal training (if required).

Managers and senior technical staff will raise new ideas and will share new information at monthly management meetings. Those ideas that need investment will need to be accompanied by a business case.

Each group within the firm is a separate profit centre and has its own budget. Costs are carefully controlled and senior staff can qualify for incentive payments if they identify efficiencies and improvements that improve the bottom line within their group. SGS, the new parent organisation, has a more formal formula-based bonus system that will be implemented in the future.

"*Each professional staff member brings tacit technical knowledge to the job, but the important thing is the way we train people to interact with clients and put proposals together. The relative level of personal skills and interest will influence the speed with which individuals come to grips with the procedures*."

John Angove, General Manager

Summary

- Lakefield Oretest offers hydrometallurgical and mineral processing services to mining and engineering firms.
- Its main innovations are development of new technical processes and documentation of these for adoption by the firm. The firm also offers clients internet based access to the data from tests conducted on ore samples.
- Informal networks and external scanning by technical staff are the main mechanism by which the firm accesses new knowledge.
- Finding new staff with the required mix of technical and big picture strategic skills is difficult.
- External service providers are used rarely and only for routine work or to fulfil the requirements of standards and quality accreditations.

RSG Global Pty Ltd

Background

RSG Global is based in Perth, Western Australia and was formed in 2001 by the merger of two established mining services firms – Resource Service Group and Global Mining Services. The firm is a private company but is structured more like a partnership with 6 Directors, with the General Manager acting as the notional chairman. Each Partner also takes responsibility for particular geographic and technical/administrative areas of the business.

RSG Global offers a range of mineral exploration, mine planning, engineering, metallurgical and resource consulting services. The firm's services include project management, specialised geological studies and mapping projects, database validation, geological modelling, resource estimation, mine optimisation and design, production costing and scheduling, and metallurgical studies relating to ore characterisation and processing. The firm also undertakes technical audits and due diligence studies for financial institutions which may provide debt finance to companies for project development or expansion. It is accredited with the majority of international resource financing institutions for this work.

The firm sells its services primarily on a project basis. Every project is different and the firm will build a team with the required skills, using its own staff or outsourced technical sub contractors. It has a pool of up to 40 such subcontractors who provide skills in hydrology, geotechnical engineering, environmental services and related skills. As the firm grows, it expects to bring more of these skills in-house.

The company believes that its competitive advantage comes from its philosophy of working collaboratively with clients, applying leading edge technology, innovation, being accredited with international financial institutions, resource funds and stock exchanges, and ensuring a strong emphasis on practical expertise in all consultants.

> *"Most Australian mining services companies tend to be practical. Internationally, many similar companies have a research base without the coalface experience. We feel that if you haven't been at the coalface, you don't understand where the data comes from and where it fits into context."*
>
> Rick Yeates, Principal

A high proportion of turnover (approximately 60% to 70%) comes from exports – the firm has a range of international clients and maintains fully operational offices in Johannesburg (South Africa), Accra (Ghana) and Lima (Peru). In 2004, the firm won the West Australian Industry and Export Award for service exports. Since 1995 (operating as RSG), the firm has increased its proportion of export revenue from less than 1% to approximately 63% of turn-over, growing total revenue four-fold during the same period.

The firm uses its website as a marketing tool, however most of its work comes from the informal networks of its directors and from word of mouth.

Recent Innovations

The main product changes in the firm centre on its software. The firm has developed a lot of IT "fixes" for problems using its in-house IT skills. Over time, some of these have evolved into fully fledged software programs which are sold to clients, either as part of the service on a project, or as standalone packages. These include:

- MINEbase, for the storage and retrieval of mine production data for underground as well as surface operations including financial data, extrapolation of data for viewing and reporting and monthly reconciliations;
- DIRT, for reporting of geological or geochemical data for surface or drill-hole data;
- QCAssure, for analysis of quality control data derived from ore sampling;
- TIMEbase, for employees entering time data;
- RINGking, for designing pit configurations; and
- Mineworks Planner, for mining industry production and cost scheduling.

The firm also develops and sells specialised Geographic Information System software for geologists exploring some specific regions where mining is being established. These are sold to other firms conducting the exploration. At present GIS packages for South West Ghana and Romania are available.

These software packages are upgraded regularly and many are internet based. The firm offers a full support service for its software products and allows potential customers to download a demonstration version which will run for 1 month. Customers can then purchase the software by contacting the company direct. The packages sell from a few hundred dollars to up to $15,000 per licence.

Many management and structural changes in the firm have been driven by the merger. The best components of both founder firms' practices have been selected for application in the new company.

The merger generated an overall change in the Divisional structure, as the two founding firms had outgrown their existing, rather informal, structure. RSG Global now has 4 technical divisions (geology, resources, mine engineering and metallurgy), a technical services division (this includes IT support) which supports the other four, and an audit division which draws resources from the four technical divisions to undertake technical reviews, audits and due diligence studies. Each is headed by a Divisional Manager, many of whom are also Partners.

The Metallurgical Division was only created in March 2004. This adds to the value of its work on estimation and management of ore deposits as the method by which the ore is processed also influences the manner in which it is mined and thus affects the ultimate value of the mine. This makes RSG Global unique as it is the only company in Australia to offer all these services from under one roof. The Division was set up by recruiting three people and by forming a joint venture company with Scott Dalley Francks, who specialise in this area.

The firm has also formalised its management processes in the past two years, with major changes in staff management (eg timesheets) and induction (manuals, procedures).

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl orgn (F/I)**	In-house (staff)	Board	Type of Service, if external
Business planning	M			M	M	Tailored
Legal services	H					Tailored
Acctg/Financial services	M			M		Compliance
Capital Raising				M		
Technology awareness				H		
Technology trends	H					Simple
Formal R&D				M		
Market research				M		
Product/service development services	H			H		Simple
Project management				H		
Outsourced operations	H					Tailored
Marketing/promotion*	H					Tailored
Sales & distribution				H		
Export strategy	M			M		Tailored
Establishing offices overseas	M			M		Simple
Performance benchmarking				H		
Networking services	H					
Recruitment services	M			M		Tailored
Accreditation/quality management				H		
Standards				H		
Training services	M			M		Simple

* incl. e-commerce

** incl. government organisations such as business enterprise centres, government grants

The firm estimates that 20% of turnover is spent on outsourced services, the main expense being the extensive group of subcontracting consultants employed in technical areas including hydrologists, hydrogeologists, geotechnical engineers and environmental scientists.

The firm undertakes a lot of planning work in-house but it often checks this information by reference to external service providers, particularly in business planning, export strategy and market strategy. It also outsources all its legal advice and has obtained advice from accountants and others in the context of establishing its overseas offices.

Much of its external environmental scanning is undertaken by its professional staff (IT people, engineers, geologists etc). These people attend conferences and read trade magazines, as well as technical magazines, relating to their area of expertise.

Drivers for Innovation

The main drivers for recent innovations in management have been internal changes required by the merger.

The main drivers for innovation in the product and service offering is comments and requests by customers and suggestions from staff regarding internal developments that can be turned into services and products, particularly software.

An example of customer driven change is represented by the Ghana geoscientific GIS package, whereby the product was developed out of RSG Global and client frustration at the poor quality of available government and documented industry data available in Ghana on which mineral exploration is based. The product has returned some 250% on the initial investment.

Staff with new ideas initially present them to their Divisional Manager. If the idea is thought to have merit, then they are asked to submit and present a more fully costed proposal with a business model and marketing plan. This is then considered at a management meeting (Divisional managers and country managers) and finally to the Board for approval if the managers support it.

An example of change driven by internal innovation is the QCAssure analytical data quality control software package. The concept was initially developed and enhanced internally as a macro to aid assessment of assay data quality when classifying resource estimates and undertaking technical audits. Following a lengthy period of proprietary advantage, a decision was made to commercialise the product in late 2003 prior to the release of potentially competing packages.

Knowledge Acquisition

The firm actively tries to capture knowledge from outside the company. Any staff attending conferences, seminars or training courses must write a report summarising key information, and this is then posted on a central server where it can be readily accessed by all staff.

The company actively encourages staff to suggest better ways of doing things and when new people are recruited, they are encouraged to bring their ideas from other workplaces and to introduce them for discussion.

> *"We find that people recruited from outside the company have different experiences and we actively draw out all of those in the first 6-12 months of their employment with us. We say to them that we don't claim to do things perfectly and we ask them to contribute any ideas that may be better than current practice. Some of the best ideas have come from a combination of external and internal experiences."*
>
> Rick Yeates, Principal

Transforming Internal Processes and Impact on Staff

A team approach is essential for successful delivery of projects as staff must work together in a range of teams depending on the client and the task. The firm actively guards against people competing against one another for clients or by holding information back. Team work is crucial to the success of all projects and information sharing is crucial to this in turn. While sharing information sometimes leads to differences of opinion, these discussions are valued highly as evidence of a robust internal culture that values technical excellence.

> *"A competitive attitude between consultants is completely alien to this group. A quick way to lose your job is to demonstrate an internally competitive or protective attitude towards the clients you service or the knowledge you hold. Everyone is respected for their individual expertise and contribution. This engenders a quality outcome and quality is number one as far as we are concerned."*
>
> Rick Yeates, Principal

Staff who have ideas adopted are rewarded through a bonus scheme which is part performance-based and part discretionary. The Directors host drinks after work on

Fridays, and these informal gatherings are used to verbally recognise staff who have contributed, and email is also used for this purpose.

The firm is also presently introducing an employee equity scheme to permit staff to participate directly in the collective success of the company.

Summary

- RSG Global is a mining services firm that delivers customised project solutions based on expertise within the firm and through a range of technical associates.
- The firm has a strong culture of team work and this leads to a culture of knowledge sharing and capture. This culture is actively supported through recognition and reward systems.
- External service providers supply a range of tailored inputs which the firm does its best to capture. In the main, however, the impetus for change comes from within in terms of management systems and structures.
- Customers influence the rate of change by prompting the firm to develop some of its internal ideas into software products, but the main service delivery system is traditional project management.

Runge Limited

Background

Runge Limited is a provider of engineering services and software products and services to the mining industry in Australia. For over 28 years, the firm has been involved in mine planning and mine business planning consulting services, development and sale of mining software and support for mine planning, operations optimisation, management decision support and financial analysis, and business and technical training courses.

Runge is headquartered in Brisbane and has offices in Perth and Singleton (Australia), Johannesburg (South Africa), Calgary (Canada), Santiago (Chile), Gillette (US) and Kuala Lumpur (Malaysia). Runge has a client base in coal as well as metalliferous mining throughout the world. Its customers are generally mines with turnover >US$100m and it places itself at the high quality end of the service spectrum. About 70% of its turnover is from Australia, but export turnover is growing at a faster rate.

Runge's consulting services cover a range of pre-feasibility and bankable feasibility studies to investigate the viability of a deposit and optimise the value while minimising the risk. These feasibility studies are also used by clients for negotiating project financing with financial institutions. Runge also engages in technical audits of operating mines, reserve estimates and investment reports etc to check for technical viability, offering investment guidelines and improve efficiency. It also assists its clients with the preparation of documentation for mining contracts and has also assisted contractors with their bid preparation.

The firm also plans mines and optimises equipment use in order to improve the economics of mine operations and potential projects. Runge provides the tools necessary for selection of the equipment, best suited to the mine plan, and creates models that assess factors affecting equipment efficiency. The ideal model can then be incorporated into the mine plan.

Runge's software covers a range of planning and scheduling systems:

- XPAC, designed for analysing, adapting and scheduling the most efficient way to allocate resources. XPAC has been developed into further modules to provide support for operational scheduling (XPAC Autoscheduler), underground coal mine scheduling (XPAC Underground Design); and improving management excavated material (XPAC Advanced Destination Scheduling);
- XERAS Financial Modelling, to monitor the cost flows of the mining operation as well as forecast future costs. The other tools provided along with this are XERAS Advanced Budgeting and XERAS Maintenance Forecasts; and
- TALPAC, used to determine the productivity and economics of truck and loader haulage systems.

Runge provides comprehensive support to its clients for all the software that it licenses. This includes installation of the software, corrections and upgrades, delivering any updated documentation and new release of databases.

Runge also provides broad training in Mining Economics, Dragline Mining Systems, Integrated Open Pit Design, Mining Strategies and Planning, Mining for Non Miners and Truck and Loader Systems.

Recent Innovations

Innovation is largely incremental. XPAC was first launched in 1982 and since then has been moved across a range of platforms, now running on Windows. In 1992, Runge added a capability to generate schedules automatically when given the main objectives and a range of constraints. In 1994, the firm extended the software to underground coal operations modelling. Within 3 years this software had 80% of the local market and market share is now close to 100%. In 2002, the firm added Destination Scheduler as an optional module.

In 2005, Runge Limited will launch XPAC Xact, a software program to support operational planning shift by shift. While uptake of the other versions of XPAC (other than for underground coal) were fairly slow, there has been huge interest in XPAC Xact and the firm expects sales to be brisk.

Change in training services has also been incremental. The firm sells training to companies that are working in remote locations and who do not have time to spare staff for training, but the staff in those companies value opportunities to travel elsewhere for training. Thus there is interest in remote delivery of training using online and videoconferencing techniques, but recognition that face-to-face delivery of part of the training course is also required. Runge has just hired a dedicated training manager to develop new mixes of course delivery. This person is also talking to universities regarding potential synergies between university courses and Runge's training program.

The third component of Runge's services, consulting, has not changed substantially since the firm started.

The firm has also made major changes to its in-house training and HR management. Several years ago, it commissioned some market research on customer perceptions. This revealed some dissatisfaction with project delivery and, as a result, the firm initiated an in-house training program in project management. This overcame these problems.

In 1997, Runge also introduced an employee share options program. Now, 40% of staff have shares in the company.

Company structure has also changed dramatically in the last 5 years. Prior to 1998 structure was very loose but the company had been growing at about 10% p.a. After the firm developed its first strategic plan in that year (working under the FastTrac structured program), a new 2nd tier of management was inserted below the Managing Director. Since then, the company has been growing at 30% per annum.

New equipment and facilities are also an important part of innovation.

> *"The Internet was a big thing for us. It gave us the ability to manage and co-ordinate our overseas operations."*
>
> Christian Larsen

The firm employs a large number of software engineers. It had tried several times in the past to outsource routine software development to cheaper locations, such as India, with limited success. It then set up an offshore office, led by 2 staff, in Malaysia. Now the routine code is done in Malaysia and Australian software engineers have been able to focus on innovation and new products. The off-shoring of routine coding and the revised focus on Australian based software engineers had lead to higher returns on the Australian-based software engineers. Consequently, the company has expanded Australian-based software staff by 30% in the last year. The company now believes it is leading-edge in software development

methodologies. This has become very important in the development of the new XPAC Xact, as it already has customers keen to buy it and the division of labour between Malaysia and Australia has sped the development.

Runge has many competitors in the different fields in which it works. These competitors vary according to the mode of delivery (projects, software, training) and the location.

> *"There has been a lot of (customer) industry consolidation. There are now fewer guys with chequebooks but these are massive, and there is less airtime in which to reach them – thus companies like ours are more likely to have a range of service offerings. Customers are also hard to get to physically, so while you are talking to them, you have to have a lot that you can sell."*
>
> Christian Larsen

Use of Knowledge-intensive services

Activity	External firm	R&D Instn	Other Extnl orgn (F/I)**	In-house (staff)	Board	Is service KI, simple, compliance or other?
Business planning	H			H		
Legal services	M			M		Tailored
Acctg/Financial services	M			M		Compliance
Capital Raising	H					
Technology awareness				H		
Technology trends				H		
Formal R&D				H		
Market research	M			M		
Product/service development services				H		
Project management				H		
Outsourced operations				H		
Marketing/promotion*				H		
Sales & distribution				H		
Export strategy				H		
Establishing offices overseas	M			H		
Performance benchmarking				H		
Networking services				H		
Recruitment services	M			M		
Accreditation/quality management Standards						
Training services	M			M		Simple

* incl. e-commerce

** incl. government organisations such as business enterprise centres, government grants

The most important outsourced services are business planning (the FastTrac system, which is licensed), capital raising and market research (sourced externally when the firm needs to test underlying assumptions in the context of business planning). External recruiters are also used for software developers.

All other knowledge-intensive services are supplied in-house, apart from straightforward legal work (outsourced at lower cost) and tax/corporations law compliance work. The new Corporations Law has had a big effect because of governance issues (Runge is a public unlisted company) and the firm will also be making changes at the Board level as part of its current strategic review.

Drivers for Innovation

Innovation is driven by a number of factors. Fundamentally, the customer expresses a need. Sometimes this is hard to read, but those in the company with direct customer contact are able to identify it. Thus, the professional staff are responsible for bringing customer suggestions to the attention of management and must be able to argue the case in favour of the change. The move into underground coal scheduling software, for example, was initiated by an engineer who had to work hard to convince management there was a market. However, the software that resulted has been one of the company's fastest growing products.

There is a very strong internal culture of planning and response to change, stemming from the 1998 FastTrac program. All the managers in the company have to be part of the strategy development team, but there are also several spaces available on this team for other non-management staff. These staff places are allotted annually in response to applications submitted, and enable staff to participate in management of the company if they have a particular initiative they want to pursue.

The main barriers to implementing change have been picking winners from the ideas presented to management. The process has evolved over time, but basically those within the company that have new business ideas have to prepare a business plan and pitch it to the management.

> *"It is hard to know what is a good idea. However, a great idea with a poor champion won't do much. A poorer idea with a good champion has more legs. The management wants commitment, and teams that demonstrate commitment by coming back again and again, having dealt with our queries, are more likely to be winners."*
>
> Christian Larsen

Knowledge Acquisition

The firm has a lot of professional engineers and software developers, who are responsible for obtaining new technical information, mainly by going to conferences. This is complemented by the formal strategy setting process, which is externally facilitated. Management also are aware of trends in management and strategy development and rely on the FastTrac program to structure the way this is incorporated into company practices.

Transforming Internal Processes

Within the firm there is generally a lot of autonomy. Managers have the discretion to reward initiative and this is seen as a significant cultural driver for innovation. It is the manager's job to determine how to reward people in ways that are meaningful for them – some people want public acknowledgement, some want money, some want to be able to take their family out to dinner.

The company values this aspect of its culture, but the 30% per annum growth rate has caused a rethink. The firm wants to keep the practices that reward people, but not let the relative autonomy inhibit growth and change.

Changes to the Corporations Law are important because of the firm's public company status. As the firm has staff as shareholders, it is important to keep them informed. The firm runs an "open book" – every month the accounts are fully disclosed to everyone – the theory is that to win a game you need to know the score. The Employee Share Options Scheme also means that staff are interested in the management of the firm and its key performance indicators.

Summary

- Runge provides engineering services and software products and services to the mining industry. Its services can be delivered in three ways – traditional consulting projects, software and training.
- The firm uses a structured strategic management program to regularly review its strategy and operations. Implementation of this program then drives change until the next review.
- Staff are closely involved at all levels and can participate in management committees.
- Incremental change in customer service is most important for the software side of the business but is also felt in delivery of training programs.
- Innovation by staff is rewarded in a number of ways that are relevant to the individuals concerned.

Softrock Solutions Pty Ltd

Background

Softrock Solutions is a WA-based company that develops and installs slope-monitoring software and systems, which enhance safety in open-cut mining operations. In these operations, the mine slopes can become unstable as a result of the mining process, with geological structure and rock mass strength also playing a significant role in the overall integrity of the slope stability. All these factors can combine and cause a slope to fail putting personnel, equipment and the resource at risk. In Australia, most states have laws and guidelines set down to ensure that some form of monitoring is in place at all open cut mining operations (however, not all do and some operations have experienced catastrophic mine wall failures). Softrock Solutions (formerly Surquik Software), is one of the few firms in Australia which produces slope monitoring software and systems.

Slope monitoring can be performed by a number of instrument types. The main types are multi-wire extensometers (which monitor the lateral stability and movement behaviour of soil and rock masses), seismographs (which detect low frequency sound waves caused by earth movement), piezometers (which measure bore-water pressure and ground water levels) and prisms (which are placed on mine berms and walls to detect shifts in 3D position using standard surveying equipment). Softrock, whose founders are all surveyors, uses the latter approach. Prisms are placed on the walls and berms of the mine, and their location is measured accurately with modified surveying equipment. The measurements are stored and processed and the data is analysed in near real time to detect movement in three dimensions.

The firm is essentially a systems integrator – it uses off-the-shelf robotic surveying equipment, telemetry, and develops hardware and software interfaces so that this equipment can detect and record slope wall movement and relay this information to a central location. The firm's Quikslope software is used to analyse this data and plot trends (e.g. scatter plots, multiple prism graphs, location plots, 2D and 3D stacked graphs). Autoslope, the instrument control software, also has alarming options that allow alarms to be sounded if nominated threshold values are exceeded. These threshold values will depend on the type of rock mass and other geological characteristics specific to the location, including structures that lie outside the actual mine pit. A typical configuration across such a pit would be two instruments around the pit edge monitoring several dozen prisms in and around the pit, plus a base computer located in the mine office or despatch hut. Communication between the instruments is via telemetry, with all electronic equipment housed in weatherproof enclosures.

A weather station is also used to record temperature and pressure. These parameters are uploaded to the survey instruments to ensure the correct adjustments are applied to the measured distances.(distance measurements are affected by temperature, pressure and humidity and a reference prism located at a known solid point is also used to validate data). Activated alarms can be sent as SMS messages to miners' mobile phones as emails, audible tones or flashing lights.

In 2003, Softrock released Autoslope, which fully automates the slope monitoring process, which incorporates a solar power supply, radiotelemetry for data transmission back to a base, and software that processes the data and initiates alarms according to a predetermined sequence and value. Autoslope has the ability to control multiple instruments and to monitor prisms over 24 hours.

"*We subscribe to the KISS ("keep it simple, stupid") principle – we want a simple practical system that produces results. We have had customers buy our competitors' products, dump it all because they found it too complex, and then come to us*."

Peter Taylor, Business Development Manager

Softrock was founded by three surveyors in 1989. It now has 5 staff, 18 sites where Autoslope has been installed (fully automated), and a further 50 sites where the Quikslope software supports manual operations. Customers can choose from basic entry level setups and can upgrade to robotic and automated sites using one of two basic hardware configurations. The firm installs all its own equipment and provides full one-site training and post-sales backup. The firm has recently begun exporting to Africa, South America and Papua New Guinea.

Softrock's system has been credited with providing warnings of a number of catastrophic failures, the most recent being a failure at a NSW site that enabled the firm to remove all staff and shut down the operation in time to avert loss. Data collected by the system can also be used by mine planners to help minimise extraction costs, by optimising the slope of the open cut wall. Word of mouth publicity on these successes is an important part of the firm's marketing.

Recent Innovations

Although the firm is 15 years old, it has only increased its rate of growth in the last 2 years. The main impetus for this was internal planning which formalised the three directors' - management, marketing, administrative - and other roles in the company. At the same time, the company created two new positions – a training manager, who co-ordinates on-site and off-site training for new and existing customers, and a technician whose role is to provide product and software development and manage customer support.

The software base for the two products is also undergoing substantial change. To date, there have been 4 releases of Quikslope (based on Microsoft Access and graphing tools) and 5 releases of Autoslope. These are written in Visual Basic with a Windows interface. The firm intends to release a new version in 2005 which will be modular (and hence easier to upgrade) and will be moved to a new platform. In 2004 the firm also introduced remote log in to several of its Autoslope users – from its office in Fremantle, Softrock can view the data and work with the clients to solve problems and also address training and other support issues that arise at these sites. It can also review the trend data from the measurements. However, geotechnical staff employed by the client at the sites are responsible for any changes in alarm settings relating to these measurements.

As noted above, the equipment components that make up Softrock's systems are off-the-shelf, with the exception of several of the alarms which are manufactured specifically for the company. The surveying instruments themselves are imported from Europe and the US. The surveying instruments have to be able to track targets at distance – some mines have pits that are 3 kilometres across, and finding a 65mm target at that distance is difficult. Changes to this equipment are outside the company's control as the suppliers are large firms and Softrock is a relatively small customer for them. However, it is expected that at least one of the equipment suppliers will be changing its latest range of instruments to include an instrument that will continue to achieve these long distances. Changes to the instrument firmware language has caused Softrock to write new interface code for later model instruments.

All the other components that make up the hardware are made in Australia. These include the solar panels, which are sourced from Perth, the radios (Queensland),

antennas (NSW), custom-made cables (Perth), weather stations (Perth) and equipment housing (Perth). These suppliers will respond to requests from Softrock for modifications to their design and performance specifications (the measuring equipment needs to be able to withstand rain and dust as it is in a harsh environment).

Use of Knowledge-intensive services

The firm obtains most of its expertise from in-house, as its staff all have wide experience in the mining and related industries and good knowledge of the technical aspects of surveying. Only 1-2% of turnover would be spent on outsourced services. However, the firm does spend a lot of resources on its equipment suppliers.

Activity	External firm	R&D Instn	Other Extnl orgn (F/I)**	In-house (staff)	Board	Type of Service, if external
Business planning	M			M	H	Tailored
Legal services	M			H		Tailored
Acctg/Financial services	M			H		Compliance
Capital Raising				H	H	
Technology awareness				H		
Technology trends	M			H		Simple
Formal R&D				H		
Market research				H		
Product/service development services	H			H		Tailored
Project management				H		
Outsourced operations						
Marketing/promotion*				H		
Sales & distribution				H		
Export strategy				H		
Establishing offices overseas						
Performance benchmarking				M		
Networking services				H		
Recruitment services				H		
Accreditation/quality management						
Standards						
Training services				H		

* incl. e-commerce

** incl. government organisations such as business enterprise centres, government grants

The firm has outsourced some services for its initial business planning and has sought advice on intellectual property protection from a patent attorney. It relies on relationships with other companies in geotechnical services, and on its suppliers, for leads to new and emerging technologies for immediate application and for general identification of trends. It does not have any links to R&D institutions and does all software development in-house. However, it has considered possibly outsourcing some software coding to organisations in lower cost locations.

Its main source of ongoing external advice is through its Australian equipment suppliers, who are able to modify their hardware and components as the company requires it. These are also a good source of information on emerging trends and new technologies that can be incorporated to help Softrock meet the needs of its customers.

Drivers for Innovation

The main drivers for innovation within the firm are customers, with whom the firm works closely. Delivery of training and the installation and calibration process (usually of about 5 days) gives the firm a good understanding of its customers' needs. The firm is particularly responsive when a number of customers make the same suggestion for improvement. The mining industry as a whole is very cost conscious and Softrock emphasises the payback period that can be obtained if a mine installs its equipment (generally about 10 months for a single system with 50 prisms monitored daily).

However, internal staff suggestions are also a major source of change and in fact the suggestion to automate the software system arose from one of the Directors rather than an external source. The system is fairly informal but is linked to regular management meetings.

> *"Mining is a process that is generic. There are a few different practices but the basics are the same world-wide. Within that framework, surveying and geotechnical engineering are well defined and have associated universal standards."*
>
> Peter Taylor, Business Development Manager

Knowledge Acquisition

Softrock has standardised the way in which it collects information from its customers in order to build up its own database of slope monitoring relating to the performance of its equipment and use of the technique in different types of mining operations.

Each of the Directors has his own personal network based on expertise and role in the company and these networks also keep the company abreast of new ideas. The firm can also see some opportunities arising in civil engineering and has been approached to bid on some such projects but has not made a concerted effort in this field as its mining market is not yet saturated. To date, conferences have been a relatively minor mechanism for knowledge acquisition

Transforming Internal Processes and Impact on Staff

The firm is small and the management systems in place are largely informal. All staff in the company are encouraged to make suggestions to improve operations and customer service. The firm's background in surveying is a strength in terms of ability to fit innovation in with the needs of mining customers.

Summary

- Softrock Solutions manufactures, installs and supports equipment for detecting potential catastrophic movement in open cut mines.
- The firm's initial manually based system and its associated software has, over time, been developed into a fully automated web-enabled system that can be operated remotely. The skills to do this have come from in-house.
- The main drivers for change are customers who seek additional functionality, and suppliers who respond to the firm's requests for changes in their components.