3.0 Software

Software comprises four broad areas—Systems Infrastructure; Applications Development; Mobile and Embedded Software; and Applications Solutions.

Within these four areas there are nine sub-sectors. These sub-sectors encompass a range of tools and activities, including client/server operating systems, application programs and programming languages, interoperability software, operating systems for mobile devices, enterprise resource planning and personal productivity tools.

Key Statistics

2001 Global revenue
US$182 billion—or 14% of the global ICT industry

2001 Australian revenue
Total: A$4.8 billion—or 1.3% of global revenue
Revenues recorded overseas: A$1.7 billion

Expected global growth rate to 2005
11%

Global market structure: varies
Top 3 companies in any sub-sector hold between 24% and 52% of each market
Except: Client/Server Operating Systems (where the top 3 operating environments hold 95%) and Mobile & Embedded Operating Systems (where they hold 93%)

Multinationals (MNCs) in Australian market
MNCs recorded approximately A$1.5 billion revenues in 2002. Local companies recorded approx A$1.7 billion revenues in Australia and A$1.7 billion overseas

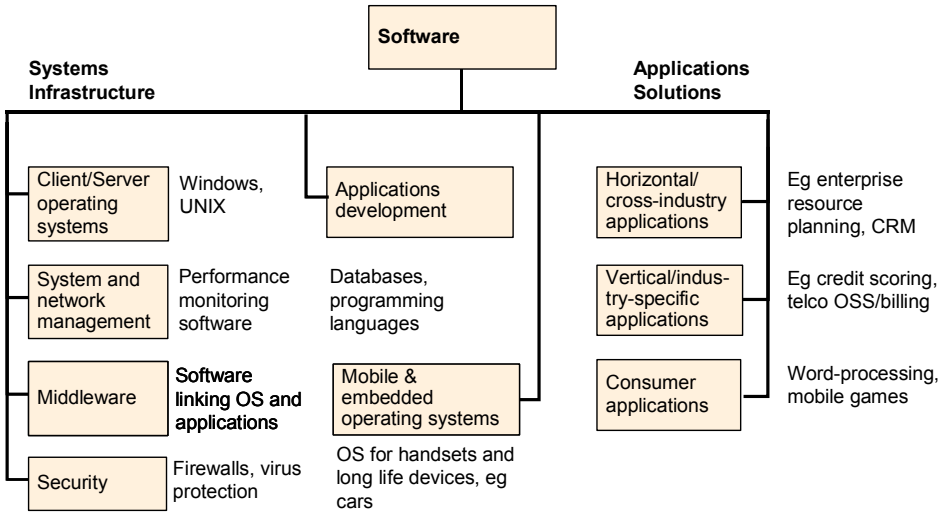
Structure of Software Sector

This section provides an overview of the sector as a whole, followed by more detailed profiles of each of the nine sub-sectors.

Exhibit 1

SOFTWARE SECTOR STRUCTURE

NOT EXHAUSTIVE

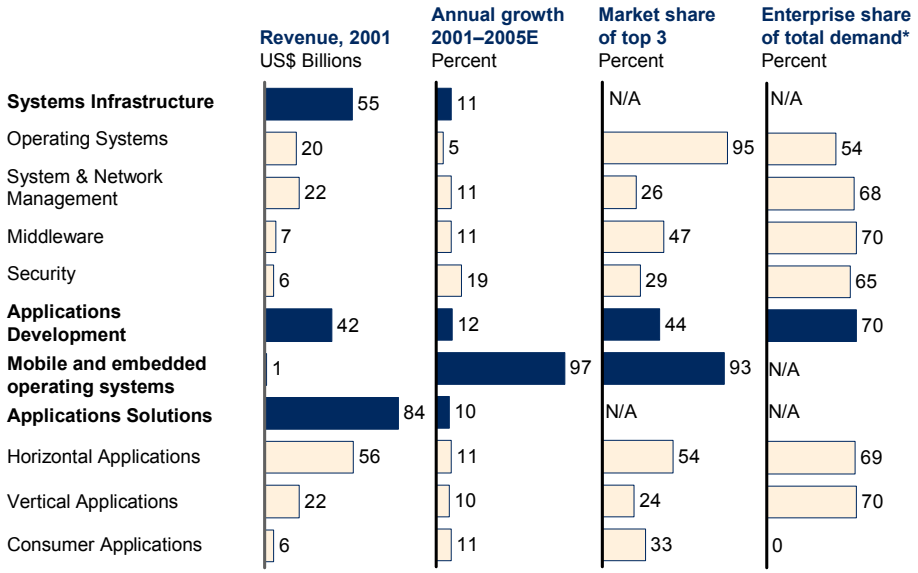


Current State—Worldwide Software Sector

The characteristics of the Software market vary by sub-sector and are set out below in Exhibit 2.

Exhibit 2

SOFTWARE SECTOR: CHARACTERISTICS



* Concentration of demand typically means more bargaining power for customers, which may or may not result in the outcomes preferred by customers due to size of ICT players

Despite the technology market correction in 2001—in the first quarter there were more than 54 negative earnings announcements by major software companies—the Software market is expected to experience solid growth of 11% between 2002 and 2005.

The success of large players in these markets reflects the high fixed costs and low marginal cost of production in the Software industry. The high level of fixed costs in the Software sector leads to a 'winner takes all' dynamic. For example, in 2000, just 2% of software companies created 60% of industry value. This compares with the 10% of companies needed to create the same level of value in the Hardware industry.

The Client/Server Operating Systems market displays even further levels of concentration. The Top 3 operating environments enjoy 95% of market share. This is noteworthy because leaders of the Operating Systems market can seek to shape the outcomes in other markets—for example, they can influence Systems Infrastructure and Applications Solutions.

Despite the success of large software companies, there are still successful smaller specialty firms in the Software industry, particularly in the Vertical Applications subsector. The customisation requirements in this sub-sector created by fragmented end-user needs have led to small specialists achieving success and the Top 3 companies able to capture only 24% market share. Examples of highly specialised applications include thermal imaging for aeronautical engineering, medical diagnostic applications, and document management applications for the construction and pharmaceutical industries.

With the exception of the Consumer Applications and Client/Server Operating Systems markets, more than 65% of demand for Software comes from the large business or enterprise segment. This creates buyer bargaining power, especially in maturing markets like the Database Management market where high and low end products and services compete aggressively.

Australian Presence—Software Sector

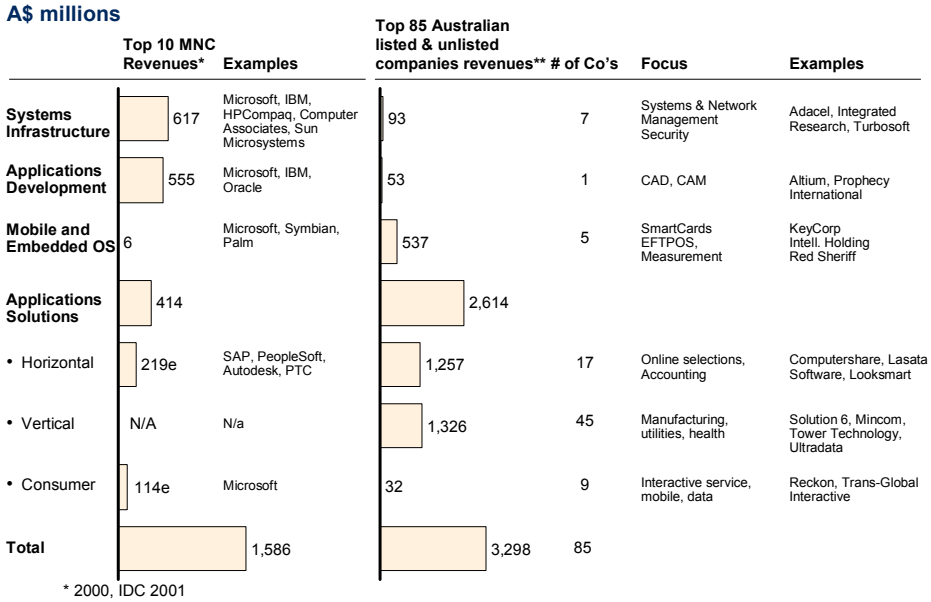
Overall, Australian Software sector revenues are expected to grow at 16% from 2002 until 2005.

In our analysis of the Australian sub-sectors, we looked at the major MNCs and the 60 listed and the 25 largest unlisted Australian vendors. In 2000/01, the Australian companies recorded approximately A$1.7 billion from Australian operations and A$1.7 billion of revenues from their overseas activities. The MNCs recorded approximately A$1.6 billion in revenues in the same period (Exhibit 3).

Exhibit 3

AUSTRALIAN SOFTWARE SECTOR: CHARACTERISTICS

A$ millions



* 2000, IDC 2001

** 2001

Source: IDC reports, McKinsey analysis

The findings from our analyses show that MNCs focus more on Systems Infrastructure and Applications Development products, and local companies tend to focus on Applications Solutions.

Australian spend in Systems Infrastructure totalled approximately A$1.6 billion in 2001, which represents 1.5% of the global market, and is expected to grow at 16% to 2005. Leading MNCs such as Microsoft, IBM and HP Compaq recorded A$617 million revenue in 2000.

There are relatively few Australian-owned companies in Systems Infrastructure and they tend to focus on fragmented areas in Systems and Network Management (for example, Integrated Research, Adacel Technology and Managesoft) and Security (for example, SecureNet and Citect). In 2001, the revenues of these companies amounted to just under A$140 million.

Australian-owned companies also have only a limited presence in the Applications Development market. Australian spend in this market is estimated to be A$1.2 billion, representing 1.4% of the global market, and growing at 22% to 2005. In 2000, the Top 3 multinationals—Microsoft, IBM and Oracle—recorded A$509 million revenues.

In 2001, the Australian Applications Solutions spend totalled approximately A$2.1 billion, or 1.3% of the global market, and it is expected to grow at 13% to 2005. In 2000, the Top 10

multinational vendors in Australia recorded revenues of A$414 million revenues. SAP, PeopleSoft, PTC and Autodesk lead the Horizontal Applications sub-sector. Microsoft leads the Consumer Applications sub-sector.

Most Australian Software vendors are Applications Solutions vendors. Australian Applications Solutions vendors recorded approximately A$3.3 billion in revenues in 2001. About half of the local providers develop Vertical Applications (for example, in the mining, manufacturing, health and telecommunications industries), and another quarter develops Horizontal Applications that are specialised by function or segment (for example, HR, management reporting and accounting software).

The focus of activity of Australian-based companies on more fragmented software markets and on specialised applications is natural given the scale advantages of competitors in more concentrated markets such as Systems Management and Applications Development. This focus is also likely to provide the basis for the future opportunities for the Australian-based companies.

Trends—Software Sector

Four trends are common across the Software sector:

- **Movement into adjacent markets.** This is leading to large software vendors increasingly entering specialty areas such as Vertical Applications.
- **Slowing demand in maturing markets and a greater focus on performance by end-users.** This is putting added pressure on vendors to customise their applications to meet specific customer needs and to improve the integration of business processes.
- **Software firms are moving into IT Services.** Vendors are cross-selling IT Services off the base of software sales and so improving application integration.
- **Increase in offshore software development.** The emergence of low cost and high scale offshore development centres of excellence is putting pressure on onshore developers to reduce costs.

Uncertainty—Software Sector

The areas of uncertainty within this sector, with the potential to affect industry evolution, centre on the evolution of proprietary or open source standards and government regulation:

- **Evolution of proprietary or open source standards.** These standards include Web Services, Client/Server Operating Systems, Embedded Operating Systems and Global Sign-On. Web Services are those services, standards or protocols that enable systems and applications to interact—or 'interoperate'. The evolution of such standards has implications for the viability of specialists and the benefits to vertical and horizontal integration.

- **Government regulation**, as it relates, for example, to privacy and competition, is likely to influence the emergence of standards. For example, after privacy groups raised their concerns, the American Federal Trade Commission forced an ongoing audit of Microsoft's security activities.

Opportunities for Australia

The Software sector could present opportunities for both Australian-owned companies and multinationals.

There are opportunities for Australian product specialists to be successful in emerging software sub-sectors, where the scale gap to the existing global or regional competitors is relatively small. The most attractive emerging areas are likely to be in niches in Vertical Applications (for example, retail, financial services), Consumer Applications (for example, gaming, mobile data and digital media), Embedded Operating Systems (for example, smart cards) and Security.

There are also likely to be opportunities for Australian product specialists in more mature markets. More mature markets like Horizontal Applications could also present continued opportunities for existing players to focus on specialist niches.

Australian companies could also find attractive opportunities to develop products that complement MNC product portfolios—for example, in Systems Management.

Australian software companies find scale to be their biggest disadvantage against global and regional competitors. To

succeed regionally and globally, therefore, Australian companies will need to gain access to global distribution—through partnerships with multinationals—and focus R&D on areas where they have a sustainable competitive advantage.

There are opportunities for Australia to enhance MNCs' local R&D presence and capabilities. A number of MNCs have located their R&D in Australia, notably in the areas of Systems Infrastructure and Mobile Applications. MNCs with R&D presence in Australia are overall very complimentary about the capacity of their Australian base to generate high quality intellectual property. However, there are a number of challenges that Australia might face in an attempt to attract additional R&D—for example, the international competition for such investments.

Further, a number of Australian companies have successfully pursued cutting edge R&D, which they have sold to or distributed via MNCs. A number of MNCs have acquired Australian companies—for example, Cisco acquired Radiata—or have partnered with them to distribute their products, as IBM has with KAZ Group. Australian companies seeking such acquisitions or partnerships would need to target multinational acquirers or partners at an early stage in their product development efforts.

With this as a backdrop, the rest of this section details the global position and outlook of each of the nine sub-sectors, and assesses the opportunities and challenges for Australia.

3.1 Client/Server Operating Systems

3.2 Systems and Network Management

3.3 Middleware

3.4 Security Applications

3.5 Applications Development

3.6 Mobile and Embedded Operating Systems

3.7 Horizontal Applications

3.8 Vertical Applications

3.9 Consumer Applications

3.1 Client/Server Operating Systems

The Client/Server Operating Systems sub-sector consists of Server, Desktop and Mainframe Operating Systems.

The operating system (OS) is the master control program that runs on a computer and sets the standards for all application programs.

Key Statistics

2001 Global revenue
US$20 billion

2001 Australian revenue
Total: less than A$500 million
Revenues from overseas activity: n/a

Expected global growth rate to 2005
5%

Global market structure: concentrated
Top 3 market share—95%

Multinationals (MNCs) in Australian market
Close to 100%
No significant Australian players

Snapshot

Operating Systems vendors tend to be major global software companies. For this reason, the developments in, and practices of, this sub-sector affect outcomes in other Software sub-sectors.

Growth in the Operating Systems market is primarily driven by demand for hardware. Therefore, overall market growth is expected to be lower than in other Software sub-sectors, reflecting slowing hardware sales.

The longer-term outlook for market growth is linked to possible changes in the Software industry, such as the adoption, or not, of Web Services and the winning standard. Web Services are those services, standards or protocols that enable systems and applications to interact—or 'interoperate'. High take-up of Web Services would lead to greater ease of software integration. Low take-up would mean that software integration would continue to be costly and time-consuming. Open source standard of Web Services would drive greater industry fragmentation and greater opportunities for specialists. The reverse is likely if a proprietary standard dominates.

Currently there are no significant Australian vendors in Operating Systems software—and given the high barriers to entry, new entry is likely to be difficult. However, a number of

MNCs have located their R&D in Australia—for example, IBM's OzLabs in Canberra, which is one of the two largest Linux research centres run by IBM outside the US.

Current state—Client/Server Operating Systems

The Top 3 Operating Systems environments—Microsoft (50%), IBM (24%) and Unix/Linux (21%)—hold 95% of the Client/Server Operating Systems market.

Linux represents an open source system, while Unix and Microsoft Windows are two proprietary systems. Linux open source system is provided by multiple vendors, such as Red Hat and Turbolinux, and allows greater customisation by end-users—for example, 'kernel customisation'. Solaris (Unix) and Microsoft Windows provide a proprietary system, which allows less customisation, but offers easier options for installation and maintenance.

Operating Systems vendors occupy an attractive position—through Operating Systems design they can facilitate the integration of other products and services, easing the challenge for customers and creating a competitive advantage. As a result, these vendors have entered many other Software sub-sectors. For example, IBM and Microsoft entered System and Network Management sub-sectors through acquisitions—for example, IBM bought Tivoli—and partnerships—for example, Microsoft partnered with Infovista. Operating systems vendors have also entered the security sub-sector, for example MS Passport is integrated with Windows.

Moreover, the position of the existing three Operating Systems vendors in the sub-sector is protected by high barriers to entry. As a result, they share a US$20 billion market with limited threat of new entry.

Demand for Operating Systems is linked to hardware sales. The market fell by 26% in the fourth quarter of 2001, for example, reflecting lower hardware purchases.

The migration of enterprises to a client/server environment over the past decade has reduced the market for mainframes to a specialised niche. Although there are attempts to migrate enterprise 'server farms' to new generation mainframes, the existing server installed base is likely to act as a barrier to these

efforts, and therefore they are unlikely to affect the market significantly.

A smaller market in the Operating Systems sub-sector—Mainframe Operating Systems—accounts for 14% of the total Operating Systems revenues in 2001; however, in installed base terms, the share of mainframe Operating Systems is negligible (0.01%).

The Australian Operating Systems market is served by global vendors. In Australia, Microsoft recorded A$270 million revenue in 2000; IBM, A$193 million; and Sun Microsystems, A$34 million. No Australian vendors exist in the Operating Systems sub-sector.

Trends—Client/Server Operating Systems

There is one clear trend shaping this sub-sector.

Trend: Hardware sales are declining. As a result of this, the Operating Systems market is expected to grow at only 5% over the next 2 to 3 years, a lower rate than the expected 11% growth for Software overall. In particular, server sales are expected to decline by 10% annually to 2005, and PC revenue growth is expected to be limited to 1 to 2%.

Uncertainty—Client/Server Operating Systems

The main uncertainty in the Operating Systems sub-sector is around the adoption of Web Services and its implications for Operating Systems.

Web Services use standard protocols (SOAP, WSDL, UDDI) to enable applications and systems to interact regardless of platform or system.

The uncertainty around the adoption of Web Services is linked to the battle over standards between Microsoft's .NET and J2EE, which is supported by Sun Microsystems and IBM among others:

- .NET is Microsoft's proprietary technology (although API is open, the source code is not expected to be made public). It runs only on Windows and supports all languages except Java. Microsoft has implemented .NET solutions for Merrill Lynch and others, and has pre-installed .NET functionality onto Windows Operating Systems.

- J2EE is an open standard based on Java and is independent of hardware and Operating Systems. A number of companies have implemented J2EE solutions—including Ford Financial and Telekom Malaysia.

Exhibit 4 sets out a comparison of the two standards.

Exhibit 4

J2EE AND .NET: A COMPARISON

	J2EE	.NET
Single vendor solution	• Yes but tools often not interoperable	• Single vendor is Microsoft
Support for legacy systems	• Yes	• Yes
Platform maturity	• Platform relatively mature • Support for Web Services is new	• Only available in Beta version • Support for Web Services is new
Language support	• Java, but other languages can be bridged to the solution	• All major languages except Java
Migration from previous platform	• No significant problems	• Must rewrite some code
Portability	• Hardware and operating system agnostic • Vendor compatibility not guaranteed	• Runs only with Windows and supported hardware
Performance	• Offers tactics for caching and in-memory business process state	• No specific tactics for performance improvement
Scalability	• Offers load-balancing technology	• Offers load balancing technology

Source: Expert interviews; Industry reports; McKinsey analysis

In addition, progress around the take-up of Web Services might be slowed (or alternatively progressed) by two standard-setting bodies:

- Web Services Interoperability Forum (including Microsoft, Oracle, SAP, IBM and 56 other members) regulates the development and deployment of Web Services.

- Worldwide Web Consortium (or W3C), which has 490 members, regulates planning the technology for designing Web Services.

Further, the take-up of Web Services will likely be affected by the outcomes of recent litigation. For example, Sun has sued Microsoft in an attempt to remove pre-installed .NET functionality from Windows systems.

The adoption of a Web Services standard also influences the level of success of Operating Systems providers. Some redistribution of share between Unix, Microsoft and Linux is possible.

Against this background, we consider that the uncertainty gives rise to three possible scenarios.

Scenario 1: A proprietary standard emerges giving the standard-setter a lead position. A proprietary standard, if successful, would lead buyers to the standard setter's operating system and, most likely, to the standard-setter's, or their partners', applications, applications development and security products. This scenario could see any or all of the following:

- An improved market position for the standard-setter's own operating system. Although, the Operating Systems share could lag the adoption of a standard due to long replacement cycles.
- The standard-setter's applications development tools perform well.
- Middleware functionality remains unchanged for legacy platforms, but newer applications are easier to integrate. Middleware vendors extend their focus into business process integration to maintain a compelling value proposition.
- Demand for Systems and Network Management increases as a result of increased networking.

Scenario 2: An open Web Services standard emerges. An open standard, if successful, would broaden the number of supported applications and refocus the Operating Systems' role around reliability and core technical functionality. As concerns about interoperability diminish, Linux could expand its customisation and grow its large enterprise share. This scenario could see any or all of the following:

- Share of Linux/Unix operating environments grows at the expense of proprietary offering. This gain, however, is likely to be slow and might, or might not, change historical leadership positions.
- In the Applications Development sub-sector, an open standard provides access to development specifications and leaves an opportunity for new development tools vendors.
- Middleware and Systems and Network Management functionality would be affected as for Scenario 1.

Scenario 3: Multiple Web Services and Operating Systems standards continue to co-exist. This is likely to slow down the take-up of Web Services and to support the existing bifurcation of the Operating Systems market between Unix/Linux and Microsoft. This scenario could see any or all of the following:

- Competition continues around the integration requirements for legacy environments.
- Continued bifurcation of the Operating Systems market and greater market share stability.
- The Middleware sub-sector maintains the status quo.
- Systems and Network Management also maintains the status quo—growth in networking is slower than in Scenarios 1 and 2.

Potential Business Models—Client/Server Operating Systems

Regardless of which scenario eventuates, there is likely to only be one sustainable business model in the Operating Systems sub-sector.

Incumbent large-scale vendor. Although a redistribution of market share among the existing players is possible, participation in this sub-sector is likely to be limited to the incumbents.

In this model, successful vendors will benefit from the following attributes and capabilities:

- Scale that supports ongoing R&D and marketing and distribution investments.
- Economies of scope in distribution.
- Presence in other software sub-sectors—for example, in Applications and Systems software.
- Relationships with hardware manufacturers.
- Strong relationships with the development community and standards boards.

Opportunities for Australia—Client/Server Operating Systems

There are no significant Australian companies in the sub-sector. This, together with the high barriers to entry and challenging requirements of the existing scale and incumbency, suggests that there are unlikely to be opportunities for independent commercialisation.

However, a number of MNCs have located R&D in Australia—for example, IBM's OzLabs research centre. Australia might be able to encourage other MNCs to establish their R&D bases locally as well.

3.2 Systems and Network Management

Systems and Network Management software covers those tools and solutions required to manage systems and network performance and availability.

Systems Management provides solutions that include job and event scheduling and problem management. Network Management includes the solutions and tools for managing the network components of the IT infrastructure and supporting services. Storage software includes solutions for the back-up, archive and recovery of data to minimise potential loss from network or system outages.

Key Statistics

2001 Global revenue
US$22 billion

2001 Australian revenue
Total: A$95 million—or 0.2% of global revenue
Revenues from overseas activity: estimated A$50 million

Expected global growth rate to 2005
14%

Global market structure: relatively fragmented
Top 3 companies hold 26% of the market

Multinationals (MNCs) in Australian market
Leading sub-sector MNCs are present—
6 to 10 Australian companies

Snapshot

Companies typically use Systems and Network Management software for mission-critical applications. These companies are usually risk-averse. A reputation for reliability and a proven track record are vital, therefore, for the success of Software vendors in this sub-sector.

Market leaders have a global position and are present in Australia. There are also a number of successful Australian companies, some of them recognised globally—for example, KAZ Group in Mainframe Systems Management, Integrated Research with the PROGNOSIS family of products in performance optimisation; and Turbosoft, assisting organisations to gain access to a wide variety of legacy host systems.

Demand for Network Management is driven by companies in the Telecommunications industry. As a result, the investment profile and performance of the telecommunications sector affect the Network Management market.

There are currently three main types of industry participants in this sub-sector—integrated Hardware vendor, integrated IT Services vendor and supplier-neutral vendors.

Further horizontal integration or collaboration between vendors in Software and vendors in IT Services and Hardware is likely, but supplier-neutral players are also likely to do well.

Consistent with all sub-sectors in the System Infrastructure and Applications Development area, the main uncertainty in System and Network Management is the adoption, or not, of Web Services.

All three existing business models—integrated Hardware or IT Services vendor and supplier-neutral provider—are likely to be sustainable.

Existing Australian firms might be able to expand internationally or position themselves to be acquired. In addition, there could be potential to encourage major MNCs to locate their R&D here and draw on the existing local research base.

Current state—Systems and Network Management

At this time, entry into the Systems and Network Management sub-sector is constrained by the increasing horizontal integration of leading Operating System providers—for example, IBM has acquired Tivoli and Microsoft has partnered with InfoVista.

Customers typically only purchase systems management software when overhauling their hardware. For this reason, established relationships with hardware providers are important. In addition, users are generally risk-averse given the 'mission critical' nature of the applications so a reputation for reliability and a proven track record are paramount.

Not surprisingly, therefore, the market leaders are global—Tivoli has 18 regional offices worldwide, Network Associates has 35, and Agilent has 33. There are also many smaller companies whose presence is limited to one or two regions.

Demand in Network Management markets is currently driven by telecommunications carriers and service providers. In 2001, these companies accounted for 40% of total Systems and Network Management demand worldwide. The investment profile and performance of the Telecommunications sector, therefore, has a considerable effect on the Network Management market.

Demand in the Systems Management market is driven by the growing need for performance management, which is in turn linked to the trends and uncertainties shaping the Operating Systems market. Currently, Mainframe platforms account for approximately half of Systems Management software, with Unix

and NT accounting for a further 29% and 18% of the Systems Management market respectively.

There are at least three types of competitors in the Systems and Network Management sub-sector—Hardware vendors, IT Services vendors and supplier-neutral vendors.

Hardware vendors—for example, Cisco, Lucent and Nortel—produce circuit-end or packet-switched hardware and build monitoring capabilities into the hardware. Their disadvantage is that unless a customer purchases an entire network from the one hardware provider (which is unlikely in a legacy environment), these vendors do not offer a total network monitoring solution.

IT Services vendors such as HP use software as a foundation for service-oriented installation and customisation. These companies have been relatively successful—for example, HP has grown its System Management business by 24% in the last 3 years.

The start-up supplier neutral providers—for example, BMC and Micromuse—have been most successful. BMC has grown at 13% to a Number 2 position in Systems Management, and Micromuse was among the best performing start-ups as a result of its service provider success. Both providers offer a best-of-breed solution to a particular need and are 'neutral' in terms of hardware and platform selection.

The global industry leaders—IBM, Network Associates, Agilent, Computer Associates, Symantec, and Managesoft—are all present in Australia.

Compared with overseas companies, Australian-owned companies recorded approximately A$95 million revenue in 2001, or 0.2% of global revenues. In 2001, the largest Australian companies were Adacel Technologies, which earned A$55 million revenue and Integrated Research, which earned A$33 million. A number of Australian companies have experienced high growth rates—Adacel's revenues grew 77% between 2000 and 2001—however, Integrated Research is the only profit-making company of the firms analysed. The local industry overall continues to experience losses in the order of A$20 million in this sub-sector.

Trends—Systems and Network Management

There are three main trends in this sub-sector.

Trend 1: There is growing demand for server rather than mainframe Systems Management solutions. Solutions for the NT platform are expected to grow 24% per annum to 2005, Unix at 18%, Mainframe at 2%. Limited growth in Mainframes will inhibit growth in Systems Management solutions. By 2005, Mainframes will account for less than a third of systems management, and Unix and NT are expected to account for approximately a third of the market each.

Trend 2: There is increasing competition from hardware and services vendors. The challenge facing Hardware vendors such as Cisco, Lucent and Nortel in their core markets has put pressure on these vendors to find additional sources of revenue. Their ability to succeed in Network Management will become clearer in the next 2 years. Services-based offerings, such as that offered by HP, have also been successful recently.

Trend 3: Network Management vendors will be challenged in the short term, but face strong long-term demand. The recent poor performance of second-tier telcos, as well as the exit of some, has resulted in a decreased demand for Network Management. Vendors have responded by pursuing revenues from services and modifying their product packaging and pricing. For example, some firms have standardised their offerings so they can be sold to multiple customers with limited customisation. The next 2 to 3 years will test the viability of a number of smaller providers. By contrast, the long-term trend towards intra-enterprise networking is likely to result in an increasing number of interconnection points with public networks. This is likely to increase the demand for Network Management products over time.

Uncertainty—Systems and Network Management

Consistent with other sub-sectors in the System Infrastructure and Applications Development area, the main uncertainty in System and Network Management is the adoption, or not, of Web Services.

Two scenarios are possible.

Scenario 1: High take-up of Web Services drives the demand for Network Management in core connectivity markets—for example, Frame Relay and ATM. This scenario could see any or all of the following:

- Most applications of most enterprises are networked inter- and intra-enterprise.
- Demand in Systems and Network Management is driven by high growth in networking and increased performance expectations—for example, performance and availability for networked systems, such as storage.
- Vendors that offer 'best-of-breed' solutions, rather than complete management solutions, benefit.

Scenario 2: Low take-up of Web Services reduces the demand for Network Management. This scenario could see any or all of the following:

- Applications integration continues to be costly and time-consuming, and results in a non-networked applications base.
- Customers continue to acquire 'complete management solutions'. Large existing software and hardware vendors with significant installed legacy bases benefit from this.

Potential Business Models—Systems and Network Management

There are three main business models.

Vendor-neutral providers are likely to benefit from a high take-up of Web Services, which will increase demand for third-party network monitoring. In this model, successful players are likely to require, or will benefit from, the following:

- Global scale with an existing telecommunications carrier customer base that is economically viable.
- Established relationships with the emerging Web Services standard-setter.
- Strong performance record of applications.

- Applications that are easily integrated across heterogeneous networks.

Integrated hardware vendor. Vertically integrated Hardware vendors will benefit most in the event of a high take-up of Web Services.

Success will depend on the vendor's ability to pre-install management software into hardware and meet the same requirements as for vendor-neutral providers, namely:

- Global scale with an existing economically viable telecommunications carrier customer base.
- Established relationships with the emerging Web Services standard-setter.
- Strong performance record of applications.
- Applications that are easily integrated across heterogeneous networks.

Integrated IT Services vendor. Vertically integrated IT Service vendors will benefit most in the event of low take-up of Web Services.

Success will depend on the vendor's ability to use software as a foundation for service-oriented installations or customisation. They will also need to meet the same requirements as vendor-neutral providers and integrated Hardware vendors, namely:

- Global scale with an existing telecommunications carrier customer base that is economically viable.
- Established relationships with the emerging Web Services standard-setter.
- Strong performance record of applications.
- Applications that are easily integrated across heterogeneous networks.

Opportunities for Australia— Systems and Network Management

Australian companies could succeed in this sub-sector by pursuing a vendor-neutral business model or by being acquired

by global Hardware or IT Services vendors. Australia could also seek to provide specialist R&D.

Vendor-neutral providers. There are already a number of recognised Australian Cooperative Research Centres (CRCs) in this sub-sector. They have the potential to create additional commercial opportunities for globally oriented specialists. Examples include CRC Distributed Systems Technology, and the University of Queensland—developing cluster software that could potentially transform processing capacity and the speed of networked computer systems.

In addition, the leading Australian players in this sub-sector, Adacel Technologies (who earned A$55 million in 2001) and Integrated Research (who earned A$32 million), are not insignificant relative to the Top 15 firms globally. For example, in 2001, the global Number 10 in Network Management, Concord, recorded an equivalent of A$108 million global revenue.

To be successful local companies would need to do the following:

- Drive product innovation through focused world-class R&D efforts. For example, KAZ Group focuses on Mainframe Systems Management.
- Build reputation, client base and access to global distribution networks. For example, KAZ Group has established a partnership with IBM.

Local subsidiary of a major global firm. Local companies could become attractive acquisition targets for global Hardware or IT Services firms if they were able to develop and demonstrate the following:

- Cutting-edge products in areas that complement an MNC's product portfolio.
- Distinctive engineering skills and the ability to manage product upgrades.
- An established (preferably global) customer base.

Provision of specialist R&D. A number of MNCs have already located their R&D in Australia. For example, Alcatel has facilities here for its R&D in optics, software and services, network and

radio communications; and IBM/Tivoli has located its main Asia-Pacific development centre on the Gold Coast, employing 40 people. Australia could encourage other MNCs in the Systems and Network Management sub-sector to locate their R&D here as part of its overall R&D initiatives.

3.3 Middleware

Middleware is software that provides guaranteed message delivery between applications and systems. Middleware can also be empowered to perform security services such as encryption and decryption, authentication and authorisation.

Middleware is also essential for successful communication across different applications. It converts otherwise incompatible messages and gives users a serviceable substitute for the interoperability that has yet to be developed.

Middleware technology evolved during the 1990s when mainframes gave way to client/server computing architectures.

Key Statistics

2001 Global revenue
US$7 billion

2001 Australian revenue
Total: n/a
Revenues from overseas activity: n/a

Expected global growth rate to 2005
11%

Global market structure
Top 3 companies—IBM, Neon and Mercator—hold 47% of the market

Multinationals (MNCs) in Australian market
IBM and Neon are present in Australia
No local companies identified

Snapshot

As long as the adoption of Web Services is moderate, Middleware's basic role as a translator between applications and systems will remain. However, another role is also emerging for Middleware—as an integrator of business processes. For example, NEON's Middleware product NEONet, originally designed as one of the first message brokers, is used in IBM MQSeries Integrator.

There is considerable debate, however, about whether basic Middleware functionality will become redundant. All depends on the emergence, and level of adoption, of the standards, services and protocols that enable systems and applications to interact.

Regardless, however, two models are likely to co-exist—the incumbent Middleware providers and the firms that extend the Middleware offering into business process integration.

Overall, the Middleware sub-sector is not highly prospective for Australian companies, although encouraging MNC activity may be an opportunity for Australia.

Current State—Middleware

The Top 3 players—IBM, Neon (acquired by Sybase) and Mercator—hold 47% of the market. The demand for Middleware is fuelled by the need to integrate applications using software that is external to the main platforms.

Middleware also includes Applications Servers, such as IBM Websphere, BEA Systems Weblogic and SUN iPlanet. Applications Servers enable new and legacy enterprise information systems to access the Internet (for example, Internet banking) and the intranet (for example, remote Client Relationship Management) and often carry out security, authentication, authorisation and transaction boundaries functionalities. All three of the above products are J2EE standard compliant and Web Services enabled.

Trends—Middleware

There is one main trend within this sub-sector.

Trend 1: The functionality of Middleware is extending to business process integration. The base of legacy applications will ensure Middleware's role as a translator between applications remains. However, another role is also emerging for Middleware as an integrator of business processes. That is, Middleware functionality is expanding—rather than only translating between two databases it can now convert information into a more usable form before transferring data. This could be of great value. Consider that different business processes require different forms of data input when transferring information between an enterprise and its supplier.

Uncertainty—Middleware

The main uncertainty in this sub-sector is the development and adoption of Web Services.

Scenario 1: The value proposition of Middleware continues to be as 'application integrator'. If the take-up of Web Services is low, then interoperability will continue to be a major concern to customers and will influence software purchases. This scenario could see any or all of the following:

- The existing legacy systems and applications base require Middleware for integration.
- Even if take-up of Web Services is high, interoperability is technically difficult to achieve. (One commentator referred to working towards interoperability as a 'utopian Esperanto'.)
- Existing scale players are successful. New entry into Middleware is challenged by the Middleware legacy—for example, once a customer has installed Neon or IBM middleware, it is a long-term client.

Scenario 2: The value proposition of Middleware shifts from 'application integrator' to 'business process integrator'. If the take-up of Web Services is high, then inter- and intra-enterprise application integration will be simplified, requiring Middleware to provide more 'value add'. This scenario could see any or all of the following:

- Middleware players develop functionality to facilitate inter- and intra-enterprise business process integration. Industry specialists and those with close relationships with systems integrators are at the forefront.
- Existing scale players make this shift most easily by attracting major reference clients to pilot the software required.
- Smaller specialists codify their industry insights in partnership with scale players.

Potential Business Models—Middleware

Two business models are likely to co-exist.

Incumbent Middleware providers that offer applications to enable interoperability. This model is likely to dominate in the event of low take-up of Web Services. To be successful in this model, companies would need to possess the following attributes and capabilities:

- An established customer base (as barriers to customer exit are high).
- Perceived company stability.
- Product innovation and demonstrated performance.

- Partnerships with Operating Systems vendors.

Providers that extend the Middleware offering into business process integration. A high level of adoption of Web Services is likely to push vendors to 'add value' through extended functionality. In this model, in addition to the attributes listed above, successful companies would need to demonstrate the following:

- Knowledge of business processes.
- Ability to secure pilots.

Opportunities for Australia—Middleware

There are no major Australian companies in the Middleware sub-sector, and building a successful business from scratch is likely to be too difficult.

However, a number of MNCs have located their R&D in Australia and, as part of its overall R&D initiatives, Australia could encourage more Middleware providers to locate their R&D here.

Establishing a leading R&D presence in Australia—Fujitsu Australia.

In September 2002, Fujitsu was awarded a Certificate of Recognition for the company's R&D contribution to the Australian ICT sector and export activities. Fujitsu operates a number of centres in Australia—a Systems Engineering Research Centre, Internet Data Centre, Fujitsu Australia Software Technology and Fujitsu Microsoft Solution Centre.

The Microsoft Solution Centre develops solutions for business and government. This work is based on Microsoft technology in general, and the Microsoft .NET platform in particular, and its integration with the Fujitsu technology, Interstage middleware.

The Centre is wholly owned by Fujitsu Australia with support from Microsoft and other Fujitsu Group companies. The 30 full-time staff can draw on expertise from Fujitsu's pool of over 120 certified Microsoft engineers and developers across Australia and New Zealand.

3.4 Security Applications

Demand for sophisticated Security Software has never been greater—and it continues to grow.

The Security Applications sub-sector encompasses those software applications designed to meet the needs of Administration, Authorisation and Authentication (the 'Security 3A'). This includes user identification and firewalls, encryption software and intrusion detection and security software.

Key Statistics

2001 Global revenue
US$6 billion

2001 Australian revenue
Total: A$50 million +
Revenues from overseas activity: A$28 million +

Expected global growth rate to 2005
19%

Global market structure: relatively fragmented
Top 3—Computer Associates, Symantec and Network Associates—earn 29%

Multinationals (MNCs) in Australian market
Leaders—Computer Associates, Symantec, Network Associates and RSA Security are present in Australia

20% of Computer Associates security development base is in Australia, employing 150 development staff; RSA Security operates its international cryptographic development centre and employs 25 staff

Australian leaders—Securenet, e-Sec, QSI Payments

Snapshot

The demand for Security Applications software has grown tremendously over recent years. This demand growth reflects the impact of high profile security violations and external shocks such as September 11, as well as the growth in wireline and wireless networking and products.

Applications vendors are increasingly acquiring security vendors. There have been over 100 M&A transactions since 1998, each worth over US$100 million.

The only real uncertainty for the sub-sector as it moves forward is how the competition between Global Sign-On solutions is resolved. And this situation is linked to the uncertainty surrounding the adoption of Web Services—the services, standard and protocols that enable systems and applications to interact.

What can be said is that there is likely to be one of three outcomes—a proprietary Web Services standard is widely

adopted; an open Web Services standard is adopted; or dual Web Services standards co-exist.

Against this background, two business models could emerge. The first is a large vendor characterised by significant scope or scale. The other is a best-of-breed specialist provider.

Today, there are relatively few Australian companies participating in the global Security sub-sector. However, opportunities do exist, provided companies can bridge capability gaps.

To succeed in Security, a new Australian entrant would need to be able to develop best-of-breed specialised products, foster customer relationships and demonstrate an understanding of end-user needs, and secure access to distribution.

Current State—Security Applications

The increasing demand for more sophisticated Security Applications matches the increase in awareness of the importance of security. External shocks such as September 11 have brought the issue of security to the fore. Recent high-profile security violations such as the Nimda, Goner and Code Red viruses are increasing demand for layered antivirus solutions on desktop, server and gateway. And the increasing move by enterprises to mesh IP networks will continue to drive the demand for enterprise security solutions. The proliferation of mobile communication devices has also increased the need for security. Securing data and transactions on a mobile device raises problems at three levels—device, carrier and enterprise. So, as mobile growth continues so will the demand for integrated security solutions across wireless interfaces. And across all of these areas, companies also require internal management software to determine access rights.

Firms operating within Security Applications are continuing to integrate their businesses and products with both the Operating Systems and Applications Development sub-sectors. Horizontal integration is an important way to stay competitive given that it is not possible to determine which of these sub-sectors will dominate. For example, relationships between Security vendors and Operating System vendors could play an important role. Microsoft's Passport, which is installed as part of Windows, potentially challenges independent competitors, but could also

act as a complementary offering for large Applications vendors. In addition, Security functionality is often embedded in Applications. As a result, the long-term sustainability of independent Security vendors may be tested as they are acquired or squeezed out by vendors in Applications or Systems software.

Trends—Security Applications

There are two main trends in the Security Applications sub-sector.

Trend 1: Large security vendors are consolidating the sub-sector. There have been over 100 mergers and acquisitions since 1998, each worth over US$100 million. Symantec, for example, has made 11 acquisitions, including PassGo and Binary Research.

One result of this trend is that small generalists are becoming less viable. These companies must focus on specialist areas and may wish to license their technology to major companies.

Trend 2: The demand for aggregator solutions is increasing. Multiple enterprise infrastructure solutions significantly complicate any security infrastructure. 'Aggregator technology', on the other hand, such as ipEnforce5000, integrates multiple technologies into a single device.

These solutions are only just emerging. However, it is likely that large existing players will benefit, as aggregator solutions firms tend to work with proven technologies.

Uncertainty—Security Applications

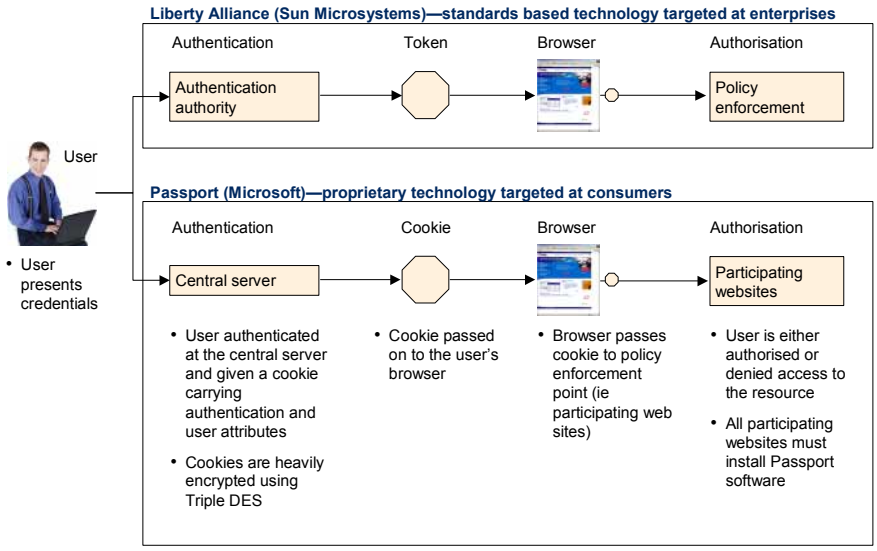
The main uncertainty in this sub-sector is how the competition between Global Sign-On solutions will be resolved. This is in turn linked to the uncertainly around adoption of Web Services and Operating Systems standards.

Major software companies, such as Microsoft and AOL, are developing 'Single Global Sign-On' solutions. These solutions use authentication and profiling software that allow users to log on once, with a single password, to access all authorised resources on all accessible servers and websites. Some examples of 'Single Global Sign-On' solutions are Microsoft's Passport; the open source AOL Project Hailstorm; and an open source solution

developed by Sun Microsystems through the Liberty Alliance (Exhibit 5).

Exhibit 5

GLOBAL SIGN-ON COMPETITION



Source: www.microsoft.com

The extent to which governments intervene to regulate access to identity information will also affect the outcome of this competition.

Against this background, there are three possible scenarios.

Scenario 1: Proprietary Web Services are widely adopted and favour the Global Sign-On solution of the standard-setter. This scenario could see any or all of the following:

- The standard-setter leads the diffusion of Global Sign-On.
- Smaller players, who are not compatible with the leading Global Sign-On, cannot compete independently in the authentication market.

Scenario 2: Open Web Services are widely adopted and the authentication market becomes more competitive. This scenario could see any or all of the following:

- An increase in development of modular best-of-breed security solutions.

- Aggressive competition from the proprietary source leader in Global Sign-On through strong relationships with Computer Systems manufacturers.

Scenario 3: Dual Web Services and Global Sign On standards co-exist. This scenario could see any or all of the following:

- Slower Web Services take-up.
- Low take-up of Global Sign-On solutions.
- Large independent Security vendors become 'trust brokers' between competing solutions.

Potential Business Models—Security Applications

Two business models could emerge.

Large vendors that are characterised by breadth of scope or scale are likely to emerge in line with the trend towards consolidation. These vendors will be more prominent in the event of competing Global Sign-On standards. Co-existing standards create an opportunity for an established global security player to carry out a 'trusted broker' role to integrate competing technologies. However, this model could also evolve if a proprietary Global Sign-On standard prevails.

This type of vendor would offer large enterprise customers a broad security portfolio that encompasses all technology solutions on offer. Symantec is an example of such a vendor.

In this model, successful vendors would require the following attributes:

- A broad portfolio of security products.
- Strong customer relationships and distribution capabilities.
- Strong relationships with service providers to ensure successful implementation of applications.
- Relationships with Global Sign-On players in the event of dual standards or, alternatively, affiliation with the standard-setter if a proprietary standard prevails.

Best-of-breed specialist providers who offer innovative products are likely to continue to prosper. The value proposition of innovative players will be their rapid and effective response to security problems. Such specialist providers might focus on SME needs or provide modular add-ons to major products.

An example of the innovative products such companies would offer is biometric security solutions—such as handprint identification. San Francisco Airport, for example, uses handprint readers to monitor and determine access rights to 200 portals.

The best-of-breed specialist model will be sustainable if there is either (1) low take-up of Global Sign-On, which could aggregate some of the specialist functionality; or (2) an open source Global Sign-On standard, which would simplify the integration of best-of-breed solutions.

In this model, successful vendors would require the following attributes:

- Best-of-breed quality products and solutions.
- Strong product innovation capabilities.
- Customisation of solutions to segment needs—for example, SMEs.
- Strong distribution capabilities.

Opportunities for Australia—Security Applications

The development of best-of-breed specialist providers and partnerships with (or acquisitions by) global integrated Security vendors offer the most attractive opportunities for Australian companies.

Develop best-of-breed specialist providers. There are currently a limited number of independent Australian Security Vendors. One of the them, SecureNet, offers security solutions in Systems Infrastructure, Applications and perimeter security and provides product services in professional services, trust services and managed services segments.

Given the fragmented nature and strong growth in the Security sub-sector, there could be potential for further development of

existing companies and new Australian entrants with world-class technical skills in specialised security products. To be successful, these companies would need to:

- **Focus their R&D to maintain product differentiation.** To differentiate themselves from broad global offerings, existing or new firms need to customise their offering to specific end-user needs globally. This requires targeted R&D expenditure in areas of sustainable competitive advantage.

- **Build customer relationships and understanding of end-user needs.** New and existing firms in the sub-sector need to develop insight into their customers and build relationships that allow them to pilot technology. Software developers with strong customer relationships exist in other Applications sectors, and Security firms may be able to leverage the relationships of non-competing Software vendors.

- **Establish access to distribution networks.** The experience of specialist providers overseas indicates that Australian companies could overcome the current gap in global distribution by establishing resale distribution alliances. Australian firms could learn from the overseas examples of specialists that have broadened their distribution network—for example, ZoneLabs and Sygate Technologies.

Accessing global distribution: Sygate Technologies and Zonelabs

Sygate Technologies and ZoneLabs are examples of SMEs that have been successful in accessing global distribution.

Sygate Technologies serves more than 2 million users in over 30 countries with Sygate Home Network, its leading Internet sharing software applications. Sygate has only one office, its US headquarters. Its partner program, Sygate Connect, uses OEMs, SIs, retailers and resellers to distribute its products worldwide. Sygate's major channel partners include Acer, Cisco and Samsung—and more than 1,500 registered resellers globally. Over 2000/01, Sygate's revenues have increased from US$2.5 million to $8.5 million.

ZoneLabs is a leader in Internet security products, with only two offices in the US and Germany. To capture new market opportunities it formed the Zone Labs Authorised Reseller Program. This program trains and certifies its partners on key products, ensuring that up-to-date advice and solutions are provided to customers. Zone Labs' partners are also provided with qualified leads and dedicated sales and technical support. Over 2001/01, Zone Labs' revenues increased from US$2.4 million to $12.8 million.

Build scope and scale with global integrated vendors. Australian vendors lack the required scale to act as security solutions aggregators. They could however partner or become acquisition targets for global integrated vendors. To be attractive in these roles, local companies would need to demonstrate:

- Cutting-edge solutions that have been recognised by the local customers.
- Strong engineering skills.

In addition, Australia could encourage MNCs to locate their R&D activity here. A number of global security companies have already located their R&D in Australia, recognising the level of local engineering skills.

For example, 20% of Computer Associates' security development base is in Australia, employing 150 development staff; US Security developer, RSA Security, has located its cryptography security development centre in Brisbane; and another US player, Citrix Systems, has announced its plans to expand its Australian software development into Security.

3.5 Applications Development

Definition

Applications Development embraces Software in the areas of database management systems and programmer languages and environments.

IBM Visual Age, IBM Websphere Studio Application Developer, Forte (Sun Microsystem), MS .NET, Oracle's JDeveloper, Borland's Jbuilder—these are all examples of Applications Development software.

Key Statistics

2001 Global revenue
US$42 billion

2001 Australian revenue
Total: A$1.2 billion—1.4% of global revenue
Revenues from overseas activity: greater than A$40 million

Expected global growth rate to 2005
12%

Global market structure
Top 3—Oracle, IBM and Microsoft—hold 44% market

Multinationals (MNCs) in Australian market
Global leaders have distribution locally, but no R&D.
Top 3 global leaders hold 43% of Australian market
A small number of Australian vendors, including Altium and Prophecy International

Snapshot

The Applications Development sub-sector is relatively concentrated, led primarily by large software companies such as Oracle, IBM and Microsoft. Looking ahead, this situation will likely continue.

Consistent with the other Systems Infrastructure sub-sectors, there is uncertainty around the adoption of Web Services and bifurcation of Operating Systems.

The Australian ICT industry is unlikely to be able to capture any major opportunities in the Applications Development sub-sector.

Current State—Applications Development

The Top 3 companies in this sub-sector are Oracle (20% market share), IBM (16% market share) and Microsoft (8% market share). Oracle and IBM's leading positions come as a result of developing original database management systems (DBMS).

Although these companies have grown faster than the rest of the market—up to 20% compared with the negative growth for other players—as the database segment matures, growth is declining. In this segment, estimated royalty payments to

database vendors amount to only 8% to 10% of all Application royalties. And two-thirds of DBMS revenues are generated from the enterprise segment, where demand is increasingly limited to product upgrades—for example, over 2000/01, growth slowed to 1.7%.

Therefore, companies providing a high-end product range, such as IBM, and those providing a low-end product range, such as Microsoft, are now competing more vigorously. The result of this is that companies that occupy the 'middle ground', such as Oracle, are being challenged.

Australian spend in Applications Development is estimated to be A$1.2 billion, representing 1.4% of the global market and growing at 22% to 2005. In 2001, the Top 3 MNCs—Microsoft, IBM and Oracle—recorded just over A$500 million in revenues.

Australian-owned companies have only a limited presence in this market. There is no significant MNC activity beyond sales and marketing and no indication that MNCs are planning to locate R&D in Australia.

Trends—Applications Development

Within this sub-sector there are three main trends.

Trend 1: Increasing competition among existing providers. Further competition between high- and low-end firms will result in increasingly aggressive pricing, thereby squeezing margins. In addition, existing companies are likely to retain competitive advantages derived from proprietary operating systems and e-business platforms. For example, development tools for new technologies such as Web Services are likely to be developed and deployed by large-scale companies already in the market—for example BEA. The R&D scale of large companies allows them to stay at the cutting-edge of technology and/or to acquire companies or technology from smaller companies. Hence, there are likely to be limited opportunities for new entrants.

Trend 2: Top line growth is likely to come from the SME customer segment. Given the existing high levels of penetration of the enterprise segment, top line growth is likely in the intermediate databases market. However, because SMEs are price-sensitive and have simpler needs, this opportunity could be less profitable than the enterprise segment.

Trend 3: There is increasing value in Embedded and Mobile databases. Embedded database development is an area worth approximately US$1 billion. This is expected to grow given that existing applications will need to be modified or reconstructed to allow delivery of information to wireless devices. Established vendors such as Microsoft and Oracle have contested the niche and are poised to capture most value from it.

Uncertainty—Applications Development

Applications Development is a relatively predictable sub-sector that is unlikely to be affected by the adoption of Web Services in the short-to-medium term due to the large installed base of legacy systems. However, longer term, the wide adoption of Web Services would simplify communications across applications and their databases and may reduce the barriers to entry for specialist providers. The wide adoption of Web Services will also simplify the communications functions currently performed by Middleware, which handles security, reliability and message exchange and would drive lower complexity of systems integration.

Against this background, the following scenario could unfold.

Scenario: Products emerge that provide a single customer view across multiple legacy databases. System Infrastructure vendors could develop functionality that simplifies integration of applications with legacy platforms. BEA's Liquid Data is an example of such a development. It uses a distributed query technology to allow a common view for multiple databases. (For example, EJBs—part of J2EE technology—can be mapped to tables in different databases so that the user will not be constrained by how many databases the data comes from).

This scenario could see either, or both, of the following:

- 'Single customer view' functionality negatively affects the traditional value proposition of Middleware and System Integration Services.
- Manual 'data mining' is still required for the mapping of database output and XML in legacy platforms.
- Specialist applications development providers emerge taking advantage of simplified integration with the existing customer installed base.

Potential Business Models—Applications Development

In light of the current trends and uncertainty, only one business model is likely.

Large integrated Applications Development company is likely to continue to be the dominant model. To be successful, this type of company would need to possess the following capabilities:

- Scale to provide protection against price competition.
- Substantial established customer base—especially as slow market growth reduces sales opportunities.
- Continued interoperability of products with multiple platforms.

Opportunities for Australia—Applications Development

Australia does not have a significant presence in Applications Development. For that reason, and given the importance of global scale and the advantages of incumbency, Australia is unlikely to capture major, independent business opportunities in this sub-sector.

3.6 Mobile and Embedded Operating Systems

Mobile and Embedded Operating Systems are those systems required by handheld devices and mobiles, or those required by devices that are custom-made for single or restricted purposes. As well as the ubiquitous mobile phone, a wide range of industrial and consumer machines—for example, in the automotive, aerospace, and whitegoods industries—have components run by compact and embedded Operating Systems.

Not surprisingly, this sub-sector displays a high degree of vertical integration with the Hardware sector.

Key Statistics

2001 Global revenue
US$660 million (Mobile Operating Systems—US$260 million, Embedded Operating Systems—US$400 million)

2001 Australian revenue
Total: approx. A$550 million[1]
Revenues from overseas activity: approx A$310 million

Expected global growth rate to 2005
Close to 100% in shipped units

Global market structure: concentrated
Top 3 players—Palm, Microsoft, Symbian—account for 93% of shipments and nearly 100% of revenues

Multinationals (MNCs) in Australian market
MNC presence—distribution of global leaders' products

5+ local companies, including ERG, Keycorp and Intellect Holdings

Snapshot

Looking ahead, there are three main trends—an increasing focus on handsets rather than Personal Digital Assistants; the continued presence of device vendors; and an increasing trend towards commercially available Operating Systems.

The greatest uncertainty in this sub-sector is the evolution of a leading standard and the adoption of mobile data. The industry outcomes from this uncertainty are likely to lead to two sustainable business models—large-scale company and specialist Embedded Operating Systems company.

Australia could help Australian local vendors develop into global leaders in the Embedded Operating Systems market and expand its MNC R&D base to include leaders of Mobile Operating Systems.

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[1] Includes related Products and Services revenues recorded by ERG, KeyCorp, Intellect Holding and RedSherriff

Current State—Mobile and Embedded Operating Systems

The sub-sector revenues have declined by 2% between 2000 and 2001. This decline was caused largely by the slowing demand for mobile handsets and is expected to pick up in the near- to medium term. The major growth area is in handhelds.

Today, the Telecommunications and Datacom markets account for 32% of demand in this sub-sector. Military Aerospace accounts for 16% and Industrial Automation accounts for 13%.

In Mobile Operating Systems, the Top 3 companies capture a total of 93% of all shipments. These companies are Palm Operating Systems (75%), Windows CE (12%), and Symbian (6%), which is an alliance between Nokia, Ericsson, Motorola, Matsushita and other handsets manufacturers.

The leading companies also participate in other sectors. For example, Palm participates in the Hardware sector, and Microsoft participates in the Client/Server Operating Systems sub-sector. Against this, analysts expect a redistribution of market share in the next 3 to 5 years.

Palm and Microsoft both focus on Embedded PC systems. Symbian focuses on handset Operating Systems. Equipment manufacturers of the long life-cycle devices develop and maintain embedded Operating Systems that are specific to devices. For example, Cisco has developed its own proprietary IOS for installation in its routers.[2]

The market leaders in Mobile and Embedded Operating Systems are present in Australia. In 2000, Palm Operating Systems captured 47.5% of shipped units; Windows CE, 35%; and Symbian/EPOC, 9.5%. The revenue generated from licensing Mobile and Embedded Operating System is still low (less than $10 million[3] but is expected to grow at nearly 50% pa as the next generation handsets require OS unlike the previous generation.

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[2] OEM hardware and associated embedded Operating Systems—for example, SmartCards and medical equipment—are considered more fully in Section 5: Hardware

[3] 146,000 units shipped in 2001 at US$10–20 per licence

A number of Australian companies have been successful in niche Embedded solutions, such as smart cards, EFTPOS, measurement, ticketing and scanning equipment.

Australian Stories: ERG and Keycorp

ERG specialises in fare management, high security, payment and identity smart card systems. The Group operates globally and has 17 offices across 13 countries.

ERG has formed alliances with a range of companies to provide depth of expertise and professional service to its customers. These alliance partners include The Bank of Western Australia, card.etc, ECard Pty Limited, National Roads & Motorists' Association Limited (NRMA), Interpay, Prepayment Cards Limited, Sun Microsystems, The Post Office (UK), Triumphant Launch Sdn Bhd, Unisys Corporation and Westpac Banking Corporation.

ERG's customer list includes automated fare collection projects in more than 200 cities working with in excess of 500 banks through licence agreements. Throughout the world, the ERG Group has more than 50 million smart cards in circulation. ERG recorded A$302 million in revenue in 2001-2002.

Keycorp is a global provider of secure electronic transaction solutions—from cards and terminals to network carriage and payments engines. Its global headquarters are in Sydney and the Group has approximately 250 employees worldwide. The company's products have been installed in more than 50 countries, including the US, Brazil, the UK, Sweden, Canada and Hong Kong. Keycorp's core areas of business are reflected in the company's four business units—Smartcard Technologies, Access Device Technologies, Solution Services and E-commerce Technologies.

Keycorp products and solutions are backed by a comprehensive range of support services—including consultancy, training, repair and maintenance—and comprehensive logistics support—including distribution, installation and asset tracking. Keycorp has contacts around the globe, with sales and technical support in Canada, the United States, the United Kingdom and Japan. In 2001–2002, Keycorp recorded A$121 million in revenue.

Trends—Mobile and Embedded Operating Systems

There are three main trends in this sub-sector. Beyond these trends, however, it is clear that handset manufacturers are likely to be active in shaping industry outcomes.

Trend 1: The growth of the Mobile Operating Systems market will increasingly come from handsets rather than Personal Digital Assistants (PDAs). The main reason for this is that the installed base of mobile phones is 25 times that of PDAs. The next generation of mobile phone handsets will require Operating Systems.

Trend 2: The continued presence of device vendors in the Mobile and Embedded Operating Systems sub-sector. The Embedded Operating Systems market has traditionally been vertically integrated with equipment manufacturers, who are likely to continue serving their specialty areas.

Trend 3: Commercially available Operating Systems are penetrating the long life-cycle device industries. Industries such as the automotive and aerospace industries have traditionally used proprietary Operating Systems. However, the use of standard Operating Systems tends to reduce costs and increases the 'scalability' of a product. The US military, for example, has begun to use commercial off-the-shelf Operating Systems where viable.

'I think that the trend in the military industry is changing from proprietary to commercialised software. It is a tough choice to make whether we develop a proprietary product or not. The main factor is money. Commercially developed product saves money.'—Radar Systems Developer

Uncertainty—Mobile and Embedded Operating Systems

The two key areas of uncertainty affecting the Mobile and Embedded Operating Systems sub-sector are the evolution of an Operating Systems standard and the take-up of mobile data. The adoption, or not, of Web Services is also likely to influence this sub-sector. Web Services would reduce the need to develop applications that are specific to devices. This would open the Operating Systems and Embedded Applications markets to traditional software players and new attackers. In the short term, however, the limited bandwidth available to mobile

devices will reduce the applicability of Web Services to embedded devices.

Uncertainty around Operating Systems standard evolution is linked to competition between standards. Two competing standards exist—Java/J2ME and .NET. The open standard Palm and Symbian Operating Systems support Java/J2ME and are backed by a large Java development community (of over 1 million developers). Support for open standards is growing, as witnessed by Nokia licensing its user interface to third parties—an interface that, historically, has been a market differentiator. Moreover, recently Motorola, Siemens, Ericsson and Research in Motion have launched 15 million Java-enabled handsets.

The proprietary standard Pocket PC for PDAs and Stinger for Smart Phones are driven by Microsoft and support Microsoft's .NET. This standard is also backed by a large developer community that is Windows-based.

As a result, support for each of the standards varies across the development community. A recent Giga survey found 36% would designate Pocket PC as the mobile Operating Systems and 32% 'don't care provided it supports J2ME'.

Exhibit 6 sets out the characteristics of the two standards in question.

Exhibit 6

J2ME OR .NET COULD LEAD MOBILE & EMBEDDED OS STANDARD

	Characteristics	Strengths & weaknesses		Supporting companies	Strengths & weaknesses
J2ME	• Platform-independent programming environment featuring Java language and programming models for various devices—eg Mobile Information Device Profile (MIDP) • Provides runtime system (VM), APIs, and deployment tools	• Community-driven platform & broad distribution • Limited portability because add-ons needed to use enhanced features • Performance optimisation weaker than for native applications	**Palm OS**	• Palm (70% market share of PDAs)	• Market for PDAs small compared to handsets • No support by big mobile phone player
			Symbian OS	• Psion • Nokia • Ericsson • Motorola • Matsushita • Siemens	• Supported by major mobile phone players • Communication- rather than information-centric
.Net Compact	• Microsoft's programming model for developing and deploying applications (desktop, Web-based, or mobile) • Provides a runtime system, and libraries for core classes • .Net CF is a compact version of the .Net framework	• Good integration with Windows • Multi-language • Proprietary to Microsoft • Final shipments not until 2003 • Unproven on mobiles	**Pocket PC and Stinger**	• Casio • Philips • Compaq • Sharp • Everex • HP • Samsung intends to use Stinger	• Power of Microsoft • Integration with Microsoft applications • No partnerships with mobile players

Source: Microsoft, Javasoft, press releases, analyst reports, McKinsey analysis

Uncertainty around the take-up of mobile data is linked to consumer demand for mobile applications. Forecasts of the longer-term take-up of mobile data are optimistic. However, to date, it has been limited to a few countries—notably Japan, Korea and Finland. Limited take-up can be explained by the lack of a standard platform, appropriate handsets, effective development tools and skills. Hence, limited availability of applications.

The extent of mobile data take-up will influence the evolution of the Consumer Applications market; which in turn relies on the evolution of common standards to drive applications development.

Against these two areas of uncertainty, three industry outcomes are possible.

Scenario 1: A proprietary standard[4] emerges and gives the standard-setter a lead position. The standard setter is likely to be vertically and horizontally integrated and able to leverage its Client/Server Operating Systems position to coordinate applications development for the handsets and handhelds markets. This scenario could see any or all of the following:

- High take-up of mobile data.
- The proprietary standard-setter benefits from accelerated take-up of its own applications without hosting support from carriers.
- Proprietary standard-setter is likely to be vertically integrated along value chain—from Operating Systems to content aggregation and publishing. It is likely to aggregate applications that work with its proprietary software or aggregate ideas and control development.
- The standard-setter forms partnerships with handset manufacturers.

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[4] Microsoft's Pocket PC 2002 and Stinger standards will use an open API (application programming interface). However, it is understood that the full source code is not intended to be publicly available. Thus they are referred to as proprietary standards throughout this document

- Opportunities for independent developers are limited to those applications that do not compete with standard-setter's applications.

Scenario 2: Open standard emerges and drives disaggregation and fragmentation of the value chain, creating opportunities for new and existing independent developers. The emergence of an open standard is likely to become a catalyst to applications development; which in turn is likely to drive the take-up of mobile data. This scenario could see any or all of the following:

- High take-up of mobile data.
- Developers distribute new applications directly via carriers.
- Branded image is important and large independent publishers emerge that screen talent, provide development resources and aggregate content.
- Handset manufacturers assume a publisher role.

Scenario 3: Many standards co-exist, constraining both applications development and the take-up of mobile data. Mobile carriers and handset manufacturers would be required to choose a preferred operating system, which would limit the number of available applications. This scenario could see any or all of the following:

- The evolution of publishers including houses aligned with proprietary and open standards but also encompassing independent houses.
- Publishers play a 'content broker' role which limits the need for developers to 'bet on a standard' as publishers leverage scale to 'port' applications across systems.
- Proprietary standard-setter is vertically integrated along value chain.
- An open standards alliance is likely to drive partial vertical integration—from handset manufacturers to publisher.

Potential Business Models—Mobile and Embedded Operating Systems

In each aspect of this sub-sector, there is one likely business model:

In Mobile Operating Systems, a large-scale company is likely to be successful—either as a proprietary standard-setter or open-standard supporters. If continued competition between Operating Systems standards proves to be economically sustainable in the long-term, both proprietary and open standard-setters could continue to exist. To be successful, these operators would require development scale and relationships with handset manufacturers, the development community and standards boards.

In Embedded Operating Systems—in existing long life-cycle devices, specialist incumbents are likely to persist. These incumbents are predominantly hardware vendors and developers that develop embedded Operating Systems in-house. To be successful, these operators require industry knowledge in long life-cycle devices, long-term sales support, and capabilities in custom applications development.

Opportunities for Australia—Mobile and Embedded Operating Systems

Australia could help local vendors to develop into global leaders in the Embedded Operating Systems market and expand its MNC R&D base among leaders of Mobile Operating Systems.

Develop Australian companies into global leaders in Embedded Operating Systems. As noted above, a number of Australian vendors have developed Embedded Operating Systems or applications for specialist devices. Examples include ERG—a developer of integrated fare management software; KeyCorp—a distributor of MULTOS SmartCard Operating Systems and Internet payment gateway systems; and RedSheriff—a developer of interactive measurement technologies. To become global leaders in their respective products, local companies will need to be able to do the following:

- Attract talent, either locally or from overseas, in each of the identified product areas.

- Focus their R&D to maintain product innovation and differentiation in each area.
- Identify target markets for each of the product areas and strengthen global distribution networks in those markets through partnerships and alliances.

Support R&D for Mobile Operating Systems development by global leaders. Australia is unlikely to be able to develop an independent Mobile Operating Systems business. Today, the Australian Mobile Operating Systems market is dominated by large software and hardware vendors and local companies do not participate.

However, a few MNCs—such as, until recently, Ericsson—conduct R&D on mobile standards in Australia. And Australia could pursue this and encourage further participation in this arena.

3.7 Horizontal Applications

Horizontal Applications covers those major enterprise or functional applications that support business productivity.

Examples include SAP's Enterprise Resource Planning (ERP), Manugistics' Supply Chain Management (SCM), and Siebel's Customer Relationship Management (CRM).

Key Statistics

2001 Global revenue
US$56 billion

2001 Australian revenue
Total: approx A$1.5 billion
Revenues from overseas activity: approx A$770 million

Expected global growth rate to 2005
11%

Global market structure
In ERP Applications, the Top 3—SAP, Oracle and People Soft—hold 54%

Multinationals (MNCs) in Australian market
Top 10 MNC vendors include Horizontal Applications leaders—PeopleSoft, SAP, PTC, Autodesk

Approximately 12 Australian vendors with revenues greater than A$5 million. Leaders include Computershare, Lasata Software and Looksmart

Snapshot

The Horizontal Applications market displays two classic characteristics of a mature market. The first is the consolidation of firms. The second is the expansion of many firms beyond their initial product focus to compete in adjacent markets.

In this sub-sector, like others in the Software sector, the degree of take-up of Web Services and the emergence of a winning standard, or continued co-existence of dual Web Services standards, will influence the development of the industry.

Three business models are likely—a large integrated applications vendor, a functionally specialised software vendor, and a development centre of excellence.

Australian companies are unlikely to have opportunities as large integrated Horizontal Applications vendors, but they could succeed as functional and/or segment specialists.

Current State—Horizontal Applications

The Horizontal Applications market displays two classic characteristics of a mature market. The first is the consolidation of firms.

The second characteristic is the expansion of many firms beyond their initial product focus to compete in adjacent product markets. For example, SAP has launched both CRM and Supply Chain Management (SCM) applications in addition to its original ERP offering. Similarly, Manugistics and Siebel have expanded beyond their respective SCM and CRM applications to compete with each other.

In 2000, the leading multinationals—PeopleSoft, SAP, PTC and Autodesk—recorded A$220 million revenues in Australia. And Australian vendors recorded a further A$1.3 billion. (This includes A$781 million by Computershare).

Overall, Australian vendors tend to be functional or segment specialists. For example, MYOB develops software solutions for accounting and business management for SMEs.

In addition, Australian vendors have relatively limited distribution globally—apart from Computershare, whose share registry operations cover Canada, the UK, the US, South Africa and Hong Kong.

Trends—Horizontal Applications

There are five trends in this sub-sector, and each of these trends is influenced by the strong competition among Horizontal Applications providers.

Trend 1: There is continued entry into Vertical Applications (or 'industry-specific') markets. To protect customer relationships and capture additional revenue, Horizontal Applications companies are moving into adjacent markets and supplying new or tailored products. For example, SAP has recently moved into the Vertical Applications market with the launch of its mySAP Insurance range, which includes functional modules tailored to the insurance industry. Other major software players such as Oracle also launched Vertical Applications.

Companies are likely to continue to move into vertical markets in order to leverage their investment in existing products

marketing and distribution. Such moves will also help mitigate the effects of maturing markets (in areas such as ERP) by enabling players to secure additional revenue sources.

Trend 2: Providers are expanding their offering within the horizontal applications sub-sector. Larger companies are likely to expand their product offering, leveraging their marketing and distribution base to cross-sell additional products. As a result, these larger players may squeeze smaller players out of the market and drive further consolidation of the industry.

For example, PeopleSoft acquired Vantive to add CRM functionality and RedPepper to add SCM functionality to its core ERP suite. Similarly, i2 acquired Supply Base to enter the product life-cycle management arena.

Further, integration challenges may lead customers to favour an integrated package of solutions from one provider compared with the challenge of integrating a variety of best-of-breed applications. The nature and difficulty of this challenge will be determined to a large extent by the evolution of standards. In turn this will affect the competitive position of integrated solutions providers.

Trend 3: Software is increasingly being developed offshore. Given that software development is a significant fixed cost, providers are now shifting development to low-cost labour markets such as India. Given the success of this practice to date—13 of the top 20 independent Software vendors already have a presence in India—and its advantages, it is likely that this trend will continue.

The advantages of moving offshore, however, go beyond cost savings. They include lessening the risks associated with drawing on a single talent market, accessing emerging centres of excellence—for example, India, China and Israel—and the availability of '24x7' development cycles to meet shrinking product releases.

> 'People are doing software projects in India...because this is the place where they can find the people who have the latest skills...it is really not about the price savings.'—*Bill Gates, 2001*

Trend 4: Demand for Horizontal Application software will continue to lessen over the next 2 to 3 years. Most Fortune 500 companies have already implemented a range of enterprise

Applications in the wake of the tech boom. CIOs are now pushing for a strong return on IT investment:

> 'Gone are the days when the IT department could justify the expense of an e-business project using catchy phrases like 'competitive advantage' or 'the future is now'; senior executives are demanding hard numbers.'—*Internet Week*

Against this background, and considering that capital budgets are shrinking, large enterprise segment demand for Horizontal Applications is likely to grow more slowly that in the past, however, the SME segment may represent an attractive opportunity for further growth.

Trend 5: Implementation—or services and support—is becoming a huge market opportunity, especially for Software vendors. Software vendors continue to move into adjacent markets in an attempt to more fully own customer relationships. They are looking increasingly to provide full implementation, integration and, in some instances, configuration advice to their customers.

Services and support now account for an increasing portion of revenues. At present, Software vendors with service functions only implement their own products (currently IBM alone consults on both its own and other products). This is primarily because Software vendors have moved into services as a means to ensure proper integration of their products rather than developing a separate services business model. However, given the growing value of services, it is likely that some vendors will try to participate more fully into the Services sector.

Uncertainty—Horizontal Applications

The main uncertainty centres on the evolution of Web Services standards. One of the major challenges today for businesses is the integration of horizontal software applications. It is often a costly and complex process to integrate new applications with existing applications—for example, ensuring a Siebel SCM application links to an existing SAP ERP application—as well as with business processes—for example, linking the SCM applications of disparate business units.

Overcoming this challenge requires businesses to adopt complex Middleware solutions and retain systems integration providers. Common Web Services standards would offer businesses

seamless operability across applications and would significantly reduce this investment.

It is no wonder then that the potential development of a standard Web Services architecture has major implications for the Horizontal Applications market. Currently there are two global bodies devoted to this issue. The Web Services Interoperability Forum, which has 60 members (including Microsoft, Oracle, SAP and IBM), focuses on the accelerated development and deployment of Web Services. The Worldwide Web Consortium (or W3C), which has 490 members, focuses on the planning technology required for designing Web Services.

While the global regulatory position of Web Services development is uncertain, and may be country-specific, the outcome of US litigation (in particular, Sun Microsystems vs Microsoft) is likely to shape the resulting global standards.

In the meantime, reliability and scale become more important than ever to remain competitive in the marketplace. Large clients in particular have become risk-averse when it comes to technology and systems, and will continue to choose strong, pedigreed vendors.

The uncertainty in this sub-sector could give rise to two scenarios.

Scenario 1: As interoperability of applications increases due to a high take-up of Web Services, the emphasis shifts from product integration to business process integration. This scenario could see any or all of the following:

- Rapid take-up of Web Services, simplifying applications interoperability and inter- and intra-enterprise networking.
- 'Best-of-breed' service implementation and sales model—with service providers operating independently from product vendors.
- Industry majors remain, but opportunities emerge for smaller developers to compete independently due to increased ease of integration.

Scenario 2: Continued complexity of integration due to a low take-up of Web Services will drive preferred supplier relationships as a success factor for process integration. This scenario could see any or all of the following:

- Little take-up of Web Services and continuing multiplicity of operating platforms.
- Preferential service implementation and sales model—with service providers forming exclusive relationships (or creating ownership links) with Software vendors.
- Horizontal Applications sub-sector is dominated by existing vendors, with few opportunities for smaller developers to provide compatible applications.

Potential Business Models—Horizontal Applications

Against these trends and areas of uncertainty, there are three potential business models.

Large integrated applications vendor. This model is possible regardless of the Web Services outcome. However, it is more attractive if adoption of Web Services is low because this would mean interoperability concerns remain, making fully integrated product suites from large-scale vendors particularly attractive. As a result, large-scale vendors with exclusive relationships with Systems Integrators would benefit from their ability to offer integrated solutions with implementation support.

In the event of the widespread adoption of Web Services, the interoperability of applications and systems would reduce the basic value proposition of large-scale integrated product suites. Thus, the competitiveness of a large-scale integrated applications vendor would be a function of the competitiveness of each of its application modules.

To succeed in this model, vendors would need scale, a substantial installed base, and access to distribution.

Product specialist. Horizontal Applications providers that can tailor their product to a specific functional requirement or the unique needs of an end-user group are likely to be able to protect market share from large integrated applications vendors.

To succeed in this model, specialists would need to tailor product features to requirements, access distribution, and develop a recognised brand.

Software development centre of excellence. The viability of this model depends on the willingness of large vendors to move their software development offshore.

A successful development centre of excellence would require a competitive cost structure, highly skilled labour (including project management skills), and a stable regulatory environment.

Opportunities for Australia—Horizontal Applications

Predictably, there will be opportunities for Australian product specialists. Large integrated applications vendor model appears less prospective.

Large integrated applications vendor. Opportunities for Australia to develop a locally based vendor of this type are likely to be limited in the near term due to the scale disadvantage of existing Australian vendors. A product specialist might over time build scope and scale.

Product specialist. Opportunities exist for functional and segment product specialists. The relatively small size and distribution 'footprint' of Australian companies would preclude them from competing with global integrated applications vendors head-to-head.

Firms are likely, however, to succeed with functional and/or segment product specialisation if they do the following:

- Continue to tailor products. Offering products tailored to the needs of specific end-user segments and functions is likely to become increasingly important given intensifying competition from large players. (Microsoft Great Plains, for example, is targeted at SMEs.)

- Increase scale through access to international distribution networks. Developing global distribution partnerships with resellers and OEMs like those of niche security players, ZoneLabs and Sygate (discussed in Section 3.4: Security Applications), is one way to broaden global coverage without building an extensive distribution network. However, the strong partnerships between SIs and integrated horizontal players (such as SAP/Accenture) could make these networks more difficult to build in niche areas.

A software development centre of excellence. To succeed as a software development centre, an operator would need to demonstrate a compelling 'value add' compared with the cost base of Asian development centres. It is unlikely that Australian companies would have significant opportunities in a head-to-head competition with Asian developers. Attracting MNC high end R&D facilities is the most prospective opportunity. The specialist areas where Australia's 'value for money' proposition is likely to be compelling are more likely to be conducted by the MNCs in-house, rather than representing an opportunity for independent contract developers.

3.8 Vertical Applications

The Vertical Applications sub-sector encompasses software that is custom designed and 'written' for a particular industry. For example, mortgage processing software for mortgage providers, documentation software for pharmaceutical companies, and stock control applications for retail outlets.

SunGard, Misys and Fiserv, and Documentum are all examples of Vertical Applications providers.

Key Statistics

2001 Global revenue
US$22 billion

2001 Australian revenue
Total: A$1.3 billion
Revenues from overseas activity: approx A$570 million

Expected Global growth rate to 2005
10%

Global market structure: relatively fragmented
For example, in Financial Services
—Sun Gard, Mysis and Fiserv lead but earn only 24% revenues

Multinationals (MNCs) in Australian market
Data is not available
40+ Australian companies, leaders include Solution 6, Mincom, Tower Technology and Ultradata

Snapshot

To date, Vertical Applications have penetrated only a limited number of industries. This is partly because, like other Software sub-sectors, the development costs are high and scale is required to fully recover this investment. But achieving scale in Vertical Applications is challenging due to the customisation required in Vertical Applications software.

There is also intense competition from companies in the Horizontal Applications sub-sector who are developing alliances to create best-of-breed packages and then customising them for Vertical Applications markets.

Over time, and as end-user industries rationalise, the market demand for Vertical Applications will lessen. However, there is potential for growth in under-penetrated sectors. The strength of the Vertical Applications sub-sector in the face of competition from providers of Horizontal applications will depend on the degree to which each sector's needs remain sufficiently unique. Not surprisingly, how the question surrounding the adoption of Web Services is answered will also affect the nature and competitiveness of Vertical Applications software. Web Services

are those services, standards and protocols that enable systems and applications to interact—or 'interoperate'.

Currently, the specialised Vertical Applications segment continues to be commercially viable for independent developers. And opportunities for Australia are likely to exist for industry specialists, provided they can bridge capability gaps and demonstrate industry knowledge, innovate and access global distribution. Over half of Australian software vendors are developers of Vertical Applications, which suggests that Australian firms realise the need for industry specialisation, and sometimes segment specialisation, in the face of competition from global providers of Horizontal Applications.

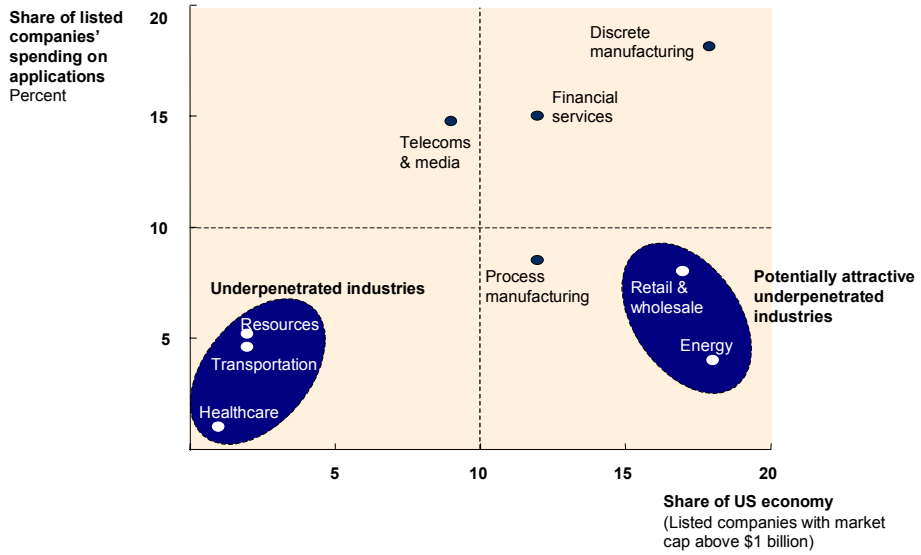
Current State—Vertical Applications

Today, most of the demand for Vertical Applications software comes from transaction-intensive industries. It is in these industries that Vertical Applications can support significant productivity improvement. Telecommunications and Financial Services, for example, generate 60% of sales worldwide.

However, there are also a number of large industry sectors where IT spend is lower, but where IT and, in particular, Vertical Applications software would also lead to productivity improvements—for example, in Retail and Energy (Exhibit 7). What is required is the development of compelling applications.

Exhibit 7

OPPORTUNITIES MAY EXIST IN LARGE VERTICALS WITH LOW HISTORIC ICT SPENDING: US MARKET EXAMPLE



Source: IDC; SIC Code Classifications; McKinsey analysis

In Retail, Vertical Applications software could improve productivity for the following reasons:

- Complexity of retail businesses makes it hard for Horizontal Applications providers to succeed. This complexity is due to the large number of SKUs, changing stock profile due to fashion and the evolution of customer needs and the need to manage across a frequently complex distribution and store networks.

- Organisational barriers to IT adoption are waning, favouring Vertical players. There are signs that a new generation of IT-literate executives is being recruited into top positions—for example, Albertson has recruited an ex-GE executive with IT credentials.

- The value of IT to retail is becoming increasingly clear. Companies with a high level of IT effectiveness have generated the bulk of the shareholder returns in US industry.

In Energy (Oil & Gas), Vertical Applications software could improve productivity for the following reasons:

- Greater adoption of IT and software could facilitate the capture of further operational improvements. The increased competitive intensity resulting from mega-mergers now

requires the major companies to squeeze the most out of existing assets.

- New deepwater oil and gas reserves are becoming harder to reach without the use of information technology. Information-intensive approaches could enable them to exploit these reserves profitably.

Turning to the local market, over half of Australian software vendors are developers of Vertical Applications. Together, Australian Vertical Applications vendors recorded over A$950 million in sales, but most players earned well under A$50 million. Further, in 2000, the cumulative losses of Australian vendors amounted to over A$120 million—and 16 of the 45 vendors analysed made a loss.

There are some good news stories though—in 2000, Computershare earned A$781 million revenue; and, in 2001, Mincom earned A$200 million; and Tower Technology earned A$100 million.

But even though many, if not most, of the Australian Vertical Applications developers have not performed well financially, they have been successful in developing and tailoring products to meet the needs of a range of industries, including the following:

- **Mining and Manufacturing**. Mincom develops software specific to mining and other capital-intensive industries and provides supporting services. Maptek develops mapping software for mining industries. Citec develops automation software, software for facility monitoring and a suite of business products to link plant systems to industrial information management systems—and is now expanding from Mining and Manufacturing into other industries such as Water and Facility Monitoring.

- **Telecommunications and Utilities.** Hansen Technology provides customised billing and customer care solutions for the Telecommunications and Utility industries (electricity, gas and water) as well as providing services in billing, and workforce and asset management. VoiceNet develops multi-services platforms and associated applications such as voice portals.

- **Medical.** ProMedicus provides a full range of integrated software products and services in enterprise-wide technology solutions to large medical corporations and individual medical group practices. IBA Health provides software, hardware and IT services to simplify and improve the efficiency of healthcare management. Health Communications develops clinical management software.

- **Legal, Government and Real Estate.** SoftLaw provides solutions for complex legislation, policy and procedure, and has customised its products to support rule-based decision making across a range of businesses. RP Data provides property information and develops property and sales management systems.

Trends—Vertical Applications

As a result of its structure and underlying economics, there are three main trends in the Vertical Applications sub-sector.

Trend 1: The competition from Horizontal Applications developers is intensifying. Strong competition is coming from cross-industry applications providers such as SAP, which has a sizeable portion of its business in vertical applications solutions such as banking operations, insurance claims management, telco billing or even Oil&Gas specific tax accounting beyind the traditional Horizontal Applications. Other companies in Horizontal Applications are developing alliances to create best-of-breed packages and customising these to compete with Verticals Applications developers.

PeopleSoft and Agile Software, for example, combined their complementary offerings in CRM (PeopleSoft) and Product Life Cycle Management (Agile) to produce a broader offering for their shared customers and to capture the vertical market in high-tech and life sciences.

Trend 2: Market demand is slowing as end-user industries rationalise. Given the recent consolidation in the Telecommunications industry—for example, the high profile bankruptcy of Worldcom—the demand in these industries is likely to contract. This is of particular note as, historically, these industries have been responsible for such a large share of the demand in the Vertical Applications sub-sector.

Trend 3: Custom development and IT Services work by Applications vendors will continue to provide the basis for product development. Multi-client custom development and IT Services work by Horizontal or Vertical Applications vendors such as SAP can facilitate the development of Vertical Applications (for example in health insurance, hospital management) over time.

Uncertainty—Vertical Applications

Two main areas of uncertainty in this sub-sector are around the adoption, or not, of Web Services and the ability of providers to develop compelling solutions for under-penetrated industries. These areas of uncertainty give rise to three possible scenarios.

Scenario 1: Vertical Applications vendors are sustained by successful entry into under-penetrated industries and the high take-up of Web Services. The economics for Vertical Applications are attractive in this scenario given the high revenue growth from new industries and the decreased barriers to adoption due to lower integration costs. This scenario could see any or all of the following:

- Rapid growth in industries that were low users of software.
- The need for tailored industry solutions remains due to the high level of customisation required for each industry.
- A dramatic increase in interoperability of applications and reduction in both complexity and cost of integration.
- Loose networks between Software vendors and IT Services providers as increased ease of integration reduces the need for implementation partners.

Scenario 2: Vertical Applications providers are successful in specialty areas following the high take-up of Web Services, but there is slow growth in new industries. This scenario could see any or all of the following:

- Under-penetrated industries remain low-level users of software as software development fails to provide value-added solutions.
- Horizontal Applications meet a significant proportion of demand.

- Vertical Applications vendors participate in specialty areas where specific knowledge of business processes creates a barrier to entry for Horizontal companies.

- Dramatic reduction in integration complexity and cost leads to loose networks between Software vendors and IT Services providers.

Scenario 3: Vertical Applications vendors participate in existing and new markets following the high revenue growth in new industries, but there is only a low take-up of Web Services. The economics of Vertical Applications vendors may be attractive in high growth areas but, overall, will be challenging in this scenario. This scenario could see any or all of the following:

- Existing integration costs serve as barriers to the adoption of multiple-vendor applications.

- Customers prefer to purchase applications from one vendor if they are better integrated, rather than from multiple vendors—even if they offer a best-of-breed solution.

Potential Business Models—Vertical Applications

Regardless of future scenarios, the nature of the business model in the Vertical Applications sub-sector remains the same.

Vertical Applications vendors will continue to serve those industries and customer segments where demand is unmet by Horizontal Applications. Successful providers would need to possess the following capabilities:

- Deep industry knowledge, based on proven experience.

- Technology that offers an identifiable return on investment.

- An ability to capture global scale by offering products globally in the chosen vertical, better amortising their investment in development costs.

Opportunities for Australia—Vertical Applications

It is clear that innovation and product differentiation are key to the competitiveness of Vertical Applications vendors relative to

global Horizontal Applications vendors. Yet limited data is available on the R&D activities of specific Australian Vertical Applications vendors. Overall, Vertical Applications R&D is estimated at under A$50 million on a revenue base of A$950 million (that is, under 5%). The leaders, Solution 6 and Mincom, spent approximately 10% of revenues on R&D. (This is compared with the OECD average of 10% of value added, which exceeds 10% of revenue.)

Some Australian vendors have significant global presence—most notably, Solution 6 has 20 offices in 11 countries and Mincom has a presence in 40 countries. However, almost all Australian foreign revenues in this sub-sector, estimated at around A$600 million, were recorded by eight market leaders. This means that more than 30 vendors, who contribute nearly A$400 million in revenues, have little, if any, overseas presence or export participation.

Vertical Applications vendors. To be successful, Vertical Applications vendors would need to develop the following important attributes and capabilities:

- Extensive knowledge in an industry that has unique end-user needs. Unique end-user needs lead the demand for Vertical Applications and prevent entry by Horizontal Applications vendors.
- Focused R&D to achieve product differentiation that allows them to compete with Horizontal Applications vendors.
- Focus on international markets and access to global distribution networks in those markets, established through partnerships and alliances.

3.9 Consumer Applications

Consumer Applications consists of desktop productivity applications, entertainment (such as games) and education software. Many consumer desktop applications are sold installed, and therefore their revenues are reported as part of Hardware.

Importantly, outcomes in the Consumer Applications sub-sector are dependent on outcomes in the Mobile and Embedded Operating Systems sub-sector.

Key Statistics

2001 Global revenue
US$6 billion

2001 Australian revenue
Total: approx A$150 million
Revenues from overseas activity: n/a

Expected global growth rate to 2005
11%

Global market structure: relatively fragmented
Top 3—Microsoft, Vivendi and Gores Technology—hold 33% market

Multinationals (MNCs) in Australian market
Global leaders have distribution presence

Few (3–4) Australian companies earn revenues > A$3 million
Market leaders are Reckon (distributor of US software, A$18 million) and Trans-Global Interactive Limited (online games developer, A$8 million)

Snapshot

Consumer Applications is an emerging market, encompassing both small, fragmented developers and large vertically integrated firms. Consumer Applications developers are likely to remain fragmented, but there could be consolidation in publishing.

The evolution of Embedded Operating Systems standards and the take-up of mobile data are the two areas of uncertainty that are likely to influence the market.

Australian companies are unlikely to have opportunities as integrated publishers of Consumer Applications, but they could pursue specialist opportunities as developers of Consumer Applications.

Current state—Consumer Applications

Consumer Applications is an emerging market. It includes small, fragmented developers as well as a small number of large vertically integrated firms. Consolidation and functional specialisation in publishing are already underway—for example, Infogames acquired Hasbro Interactive to move to the Number 2 publisher position in the PC entertainment software market.

There is a high degree of vertical integration between Hardware manufacturers and Consumer Applications firms in each of the CPE (customer premises equipment) segments. For example, console manufacturers compete in gaming software development and distribution. Large players such as Microsoft assume a growing role in publishing and the distribution of entertainment software. This leaves opportunities for new entrants in more fragmented areas such as development.

A number of Australian companies have emerging interests in the Consumer applications market—most notably in gaming and digital media. Examples of these companies include Trans Global Interactive, a developer of casino gaming technology and Auran, a developer of PC games. Auran's game, 'Dark Reign', was the largest ever Activision's game release with 430,000 copies sold in 58 countries since 1997.

In 2001, Australian companies recorded approximately A$30 million revenues. MNC activity in this sub-sector tends to focus on Sales and Marketing. Microsoft, market leader, recorded A$114 million 2000 revenues in desktop applications. But a few companies such as Motorola, NEC and Cannon have located their R&D in Australia.

Trends—Consumer Applications

There are three main trends in this sub-sector.

Trend 1: A variety of consumer devices will continue to co-exist. Today, a variety of home networking devices such as game consoles, set-top boxes (STBs) and PCs co-exist. Examples of devices that co-exist include the MSN X-box, Sony Playstation, and a variety of set-top boxes for pay TV and digital TV reception.

It is likely that this will continue over the next 3 to 5 years. Several factors together act as a barrier to the emergence of a single home networking device—the installed base of each device, the different life-cycles of various devices, the relatively slow adoption of digital TV, and the proprietary nature of pay TV set top boxes.

In mobile markets, devices such as handsets, pagers and handhelds also co-exist despite the uncertainty surrounding the convergence of these devices.

Trend 2: The market will continue to fragment. Similar to those who participate in the music and film industries, interactive software companies are likely to experience 'hit or miss' success.

This is because creativity and innovation are the key success factors for developers and distributors (and increasingly, consumers) 'cherry pick' the best ideas on a case-by-case basis. Therefore distributors are frequently unwilling to establish long-term contracts with developers. The 'freelance' nature of the industry, therefore, should lead to continuing opportunities for new firms in developing Consumer Applications.

Trend 3: The publishing role in Consumer Applications will continue to consolidate. Currently, CPE manufacturers of products such as game consoles and the large-scale publishing houses, such as Activision, assume a games publishing role in the fixed gaming market. For example, Activision has a distribution program set up in which they assist smaller European games console and PC/online publishers with logistics and sales services. In North America, Electronic Arts distributes other publishers' completed games under its affiliated label program.

Mobile games are less mature, but there are emerging examples of publishing scale. For example, Club Nokia (through Starcut) and Universal Pictures have formed a partnership to develop applications based on current movies. These applications include ringtones and graphics.

Uncertainty—Consumer Applications

There are three areas of uncertainty in the Consumer Applications sub-sector:

- **Competition between Operating Systems standards**. Currently, two major competing Mobile Operating Systems standards are being developed. Symbian leads the open standard—the Open Mobile Alliance. Microsoft leads the proprietary standard—Pocket PC/Stinger. (The details of the evolution of these standards are discussed in Section 3.6: Mobile and Embedded Operating Systems.)

- **Take-up of mobile data** is linked to the evolution of standards. The emergence of either an open or proprietary prevailing standard is likely to be a catalyst for applications development and the take-up of mobile data.

- **Convergence of customer premises equipment and mobile devices** also represents a considerable uncertainty (and is discussed in Section 5: Hardware). The main influence here for Consumer Applications developers will be the evolution of the Operating Systems used in converging devices and whether it relies on an open or proprietary standard.

Against these uncertainties, three scenarios are possible.

Scenario 1: A proprietary standard emerges, giving the standard-setter the lead position in publishing. This scenario could see any or all of the following:

- Standard setter coordinates all but the distribution element of the value chain—for example, telco carriers coordinate distribution in mobile data; retailers, in game consoles.

- The development market is more concentrated, possibly through acquisition by the standard-setter.

- Opportunities for independent developers are limited to extensions of the standard-setter's own applications.

Scenario 2: An open standard emerges, leading to the emergence of multiple large, integrated publishers. This scenario could see any or all of the following:

- The structure of the value chain disaggregates and creates an opportunity for a scale publisher model to emerge.

- As in the music and film industries, the economies of scale distribution to mobile carriers leads to the emergence of

large-scale publishers. The role of large-scale publishers is to screen ideas, coordinate development resources and aggregate content for carriers.

- The publishers are linked to equipment manufacturers, operators or others who aggregate content, such as studios.
- Independent developers are likely to proliferate.

Scenario 3: Multiple standards continue to co-exist, supporting multiple independent publishers. This scenario could see any or all of the following:

- Application development and the take-up of mobile data are constrained.
- Publishers are aligned with proprietary and open standards-setters, but can extend to independent houses.
- If independent platform-neutral publishers emerge, they act as idea aggregators.
- Independent developers participate.

Potential Business Models—Consumer Applications

Against this background, two business models are likely to emerge in the Consumer Applications sub-sector:

An independent publisher role could emerge if an open standard is widely adopted.

An open standard would fuel high levels of development activity and the take-up of mobile data. In the case of an open standard, the independent publisher role could be played by a consortium of handsets manufacturers or by an independent firm (possibly one that is linked to others who aggregate content, such as studios).

In the event of a winning proprietary standard, the standard-setter would be most likely to take this role. Here, the development of applications is likely to be more concentrated and possibly limited to extensions of the standard setter's applications.

If multiple standards continue to co-exist, there is likely to be less applications development activity and reduced economies of scale, which will make the independent publisher role more challenging.

To be successful in an independent publisher role, a company would need the following attributes and capabilities:

- Relationships with carriers and the development community.
- An ability to pick winners.

An independent developer role is likely to be the most sustainable model if a dominant standard emerges. If an open Mobile Operating Systems standard emerges, for example, it could lead to greater opportunities for independent developers.

To be successful in this role, companies would need the following attributes and capabilities:

- Creativity and innovation
- Ability to develop 'killer apps'
- Access to tools and specifications for the relevant standard as well as distribution networks.

Opportunities for Australia—Consumer Applications

There are limited opportunities for Australia in this sub-sector as a publisher though independent development could be attractive:

Australia is unlikely to have opportunities as an independent publisher. Rather, industry majors that have the requisite presence are likely to capture this opportunity. However, a number of MNCs have located their R&D or applications development in Australia—for example, Motorola's development centre. Australia could encourage MNCs in this area as part of its R&D initiatives.

Australia could have opportunities as an independent developer. As Consumer Applications is an emerging and fragmented sub-sector, there might be opportunities for both existing and new players.

To capture opportunities in Consumer Applications, developers would need to bridge the following capability gaps:

- Creative network support. The success of Australian films and music overseas indicates globally recognised creativity. But although industry groups such as the Consumer Applications Developers Association are increasing the promotion of the Australian industry, Australia still lacks the network effects and advantages of being part of development communities overseas.

- Global distribution. There is little evidence to date of emerging leaders in Australia who have access to global publishers and distributors.