2006

Investigating Business Intelligence (BI) Solution Adoption in Australian Companies: An ERP Perspective

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Abstract

The global Enterprise Resource Planning (ERP) systems industry blossomed in the 1990's automating back office operations. Although these systems have become essential infrastructure for many companies, it is now critical that these transaction based systems are extended to support more strategic and complex decisions. The demand for more effective decision making tools has seen the move away from Decision Support Systems to more complex solutions. Accordingly ERP vendors have developed a range of solutions focussing on business intelligence (BI) in various functional areas. However the question must now be asked, "What is the status of BI solution integration in Australian companies and what is the nature of the adoption and use of these various solutions"? This paper adopts a two pronged research methodology. The first methodology involved a web based survey to identify BI implementation patterns. This was then expanded upon using a case study approach. The research identified an evolutionary maturity to the way in which BI solutions are adopted in Australian companies.

Keywords

Enterprise Resource Planning, Business Intelligence, Decision Support Systems (DSS), Data warehouse,

INTRODUCTION

Many companies consider enterprise systems as essential infrastructure for daily operations and a critical foundation for business transformation since they provide readily accessible transactional data. This belief was especially true during the 1990s when such enterprise systems as Enterprise Resource Planning systems (ERPs) became the standard replacement for legacy systems particularly in multinational companies (Parr & Shanks, 2000). ERPs enable companies to integrate disparate systems enabling improved information flows within and across complex organisations. This connectivity of information flows allows managers to make timely decisions based on data that accurately reflects the current state of their business (Davenport et al, 2004). Companies' requirements have changed and over the years ERP systems have evolved so that the system's focus has moved from one of only supporting internal transactions to now encompassing transactions with external stakeholders. With this move has come the necessity for real time transactional data, which has previously been the backbone to decision making, to support more strategic and complex decisions. The relevance of this data comes from the information that can be drawn from examining multiple issues simultaneously and the ability to derive inferences critical to strategic planning (Berry & Linoff, 1997).

These benefits are a major contributor to the firm's business intelligence and subsequently to its overall competitive advantage (Francis, 1997; Meyer, 1987). Much attention has been given to optimising business transactions and the associated processing of data however there is disappointment by top-level management as to the role that information technology plays in supporting decision making in organisations (Drucker, 1998).

The challenge facing analysts is in manipulating this data to provide acceptable levels of strategically applicable information. One of the fundamental problems of information extraction is that the formats of available data sources are often incompatible, requiring extensive conversion efforts. In an attempt to reduce this difficulty,

several ERP software developers namely SAP and Baan, have organized and archived the transactional data into their application databases. This incorporation has been termed data warehousing. The data warehouse extracts data from operational systems and then transforms, consolidates and aggregates this data in readiness for reporting to assist in decision making. There has also recently been a concentrated effort to provide data mining tools able to assist analysts faced with unstructured knowledge discovery tasks (Bendoly, 2003). Data mining requires specific applications and tools to define rules and relationships among the data (Sherry, 1997).

As the demand for information systems to support effective decision making have increased, so have the terms used to describe them: data warehousing, knowledge management, data mining, collaborative systems, online analytical processing, with business intelligence tending to encompass all.   Gartner (2005) have attempted to classify information systems which facilitate decision making by the temporal nature of the decision outcome and the level of user involvement (Figure 1).
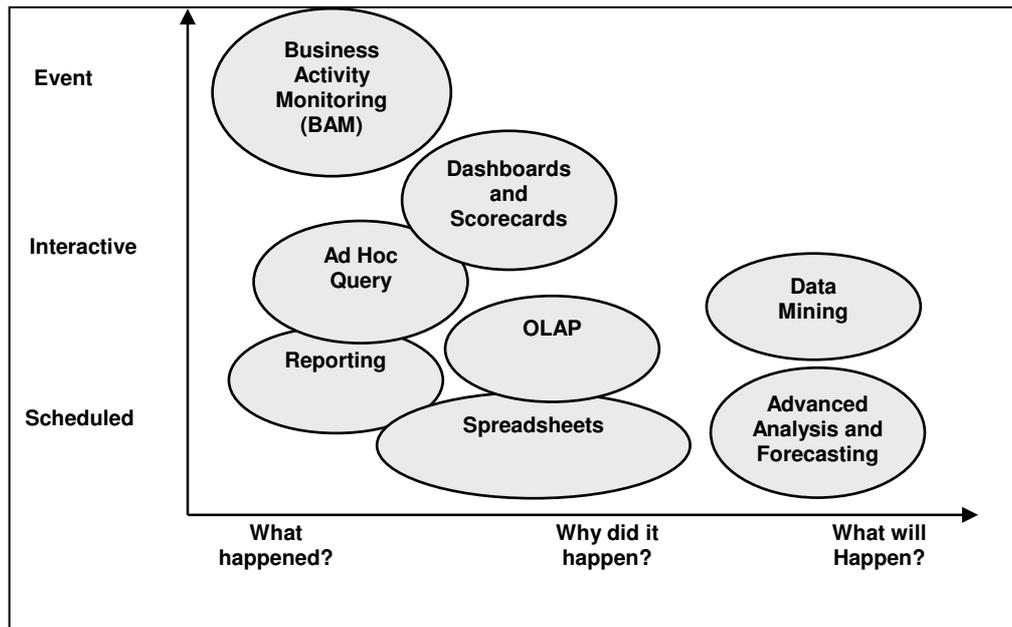

Figure 1 Classification of Decision Systems

The market for business intelligence solutions has been one of the fastest growing with revenues reaching $12.8 billion in 2002/03 (Knights, 2004). McDonald (2003) attempts to classify business intelligence solutions as per "decision velocity" and "decision effectiveness" (Figure 2). However the model also demonstrates an evolutionary nature or maturity of these solutions.
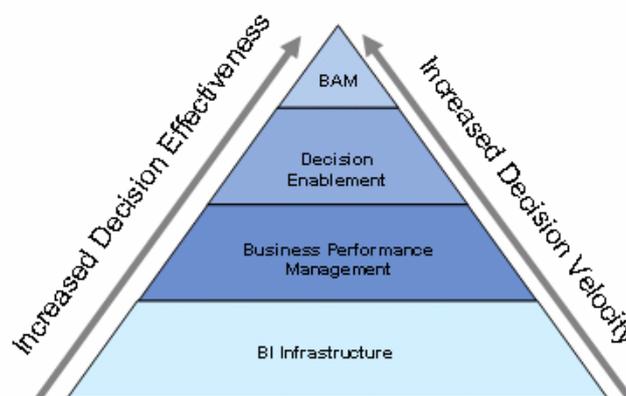
Figure 2 Business Intelligence Evolution Model (McDonald, 2004)

The lowest level of the hierarchy is the business intelligence infrastructure. This represents the data warehouse which extracts data from operational systems and then transforms, consolidates and aggregates this data in readiness for reporting to assist in decision making. The next level, Business Performance Management refers to the use of the data from the data warehouse to provide feedback for management on key performance indicators (KPI). Decision Enablement refers to the automation of decisions including KPI's based on historical decisions stored in a knowledge repository. The highest level of the hierarchy refers to Business Activity Monitoring

(BAM). This term, first coined by Gartner, refers to a process whereby key business events are monitored for changes or trends indicating opportunities or problems, and enabling business managers to take corrective action. These BI systems are event driven, real time and rule based (Nesamoney, 2004). This also gives rise to the concept of analytics and dashboards. A dashboard in the corporate world provides a visual summary to the performance of the company as measured by the key performance indicators in a similar fashion to an automobile dashboard which provides a visual summary to the car's performance.   SAP's have recently changed their approach to "analytics" in line with BAM. Analytics complete the full cycle by providing real time decision support for transactional related activities based on historical information.

McDonald (2004) further attempts to classify many of the BI solutions as outlined in Figure 3.

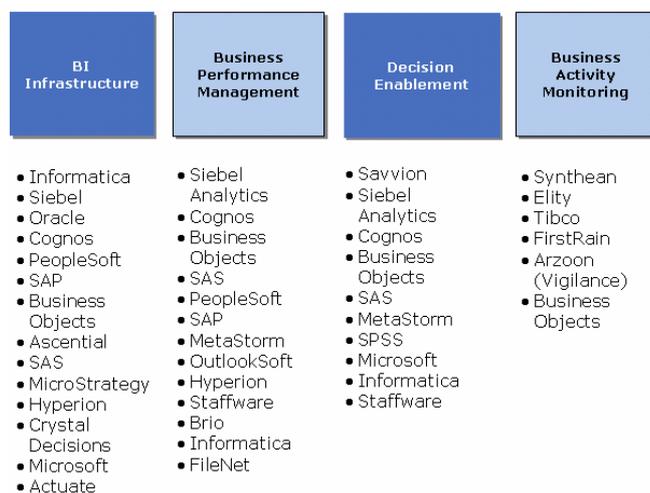| BI Infrastructure	Business Performance Management	Decision Enablement	Business Activity Monitoring
• Informatica	• Siebel Analytics	• Savvion	• Synthean
• Siebel	• Cognos	• Siebel Analytics	• Elity
• Oracle	• Business Objects	• Cognos	• Tibco
• Cognos	• SAS	• Business Objects	• FirstRain
• PeopleSoft	• PeopleSoft	• SAS	• Arzoon (Vigilance)
• SAP	• SAP	• MetaStorm	• Business Objects
• Business Objects	• MetaStorm	• SPSS	
• Ascential	• OutlookSoft	• Microsoft	
• SAS	• Hyperion	• Informatica	
• MicroStrategy	• Staffware	• Staffware	
• Hyperion	• Brio		
• Crystal Decisions	• Informatica		
• Microsoft	• FileNet		
• Actuate			

Figure 3 BI solutions (McDonald, 2004)

More recently there has been a consolidation of vendor BI solutions through take overs and mergers. The effectiveness of a business intelligence solution is largely reliant on the underlying data infrastructure as reflected by McDonald's (2004) model (Gartner, 2003). Accordingly, the major ERP systems vendors with their data warehouse solutions have become major players in the business intelligence market (META Group, 2004). Although ERP systems have traditionally been concerned with managing the processing of business transactions rather than business intelligence, ERP system vendors are transforming their solutions into the BI arena. This paper discusses this transformation with specific reference to the leading ERP vendor, SAP.   This is accomplished in two phases: Phase 1 involves surveying Australian companies as to their current and future BI implementations; the second phase builds on the findings of the first phase through the use of a case study to examine the adoption of BI solutions; thus enabling a more thorough and in depth investigation to be conducted.

ERP SYSTEMS

ERP systems are information systems that are; integrated, modular, have broad business functional scope and are responsible for transaction processing in a real time environment.

The purported benefits of ERP systems make them essential information systems infrastructure to be competitive in today's business world and provide a foundation for future growth. The purported benefits from ERP systems make them essential information systems infrastructure A recent survey of 800 top US companies showed that ERP systems accounted for 43% of these companies' application budgets (Somer & Nelson, 2001). The market penetration of ERP systems varies considerably from industry to industry. A report by Computer Economics Inc. stated that 76% of manufacturers, 35% of insurance and health care companies, and 24% of Federal Government agencies already have an ERP system or are in the process of installing one (Stedman, 1999). The global market for ERP software, which was $16.6 billion in 1998, is expected to have a compound annual growth rate of 32%, which reached more than $66 billion in sales by 2003 and is estimated to have had 300 billion dollars spent over the last decade (Carlino, 1999). The major vendor of ERP systems, SAP has approximately 56% of the ERP market worldwide and 75% Australian market. In Australia a recent report (BRW, 2002) identified the top 100 companies by IT usage. This was then compared with SAP's customer list to determine the market penetration of this vendor's ERP system. It was determined that 9 out of the top 12 IT users were SAP customers and 45% of the total list were also SAP users.

Researchers believe the growth in the uptake of ERP systems is due to several factors; the need to streamline and improve business processes, better manage information systems expenditure, competitive pressures to become a low cost producer, increased responsiveness to customers and their needs, integrate business processes, provide a

common platform and better data visibility, and, as a strategic tool for the move towards electronic business (Davenport et al, 2003; Hammer, 1999; Iggulden, 1999; Somer et al, 2001; Markus et al, 2001).

The benefits expected from the implementation of ERP systems varies from company to company and is dependent upon the level of ERP maturity of a company. Early research indicated the main benefits companies were expecting were related to technical issues. A landmark study by Deloitte (1998) identified the main benefits of implementing an ERP system was associated with addressing the Y2K problem and overcoming issues associated with poor and disparate systems. This research also identified an evolutionary nature to ERP usage post implementation. They identified three key phases: Stabilise, Synthesise and Synergise. In the Stabilise phase companies familiarise themselves with the implementation and master the changes which have impacted on their organisation; at the Synthesise phase companies seek improvements by implementing improved business processes, adding complimentary solutions, and motivating people to support and adopt the changes. While in the final phase, Synergise process optimization is achieved, resulting in business transformation.

EVOLUTION OF ERP SYSTEMS

Holland and Light (2001) developed a maturity model of ERP usage and then considered how; cost, entropy (level of disorder), complexity, flexibility and competitiveness would be impacted at each stage. They identified three stages. In Stage One, companies are commencing their ERP implementation while at the same time managing their existing legacy systems. In Stage two, the implementation is complete across the organisation and the functionality is being adopted. In the third and final stage, the ERP system has been accepted and companies are investigating avenues for achieving strategic value from the additional functionality available in the ERP system.

In the model, proposed by Cap Gemini and Ernst & Young (2002), maximum shareholder value could be gained when an organisation efficiently and effectively adapts to its environment. This could be in relation to mergers, acquisitions, spin offs, new markets and improved collaboration with customers and suppliers They believe that ERP systems can assist in the goal of an adaptive enterprise through what they term the "Adaptive ERP Value Trajectory". The model focuses on companies moving from core ERP transactions to Enterprise Application Integration (EAI) to integrate and collaborate with business partners. This implies a increased reliance on BI solutions.

Davenport et al (2004) supported this evolution of ERP systems towards BI through three value drivers identified for ERP usage:

- Integrate - where a company is able to integrate their data and processes internally and externally with customers and suppliers,

- Optimise - where a company standardises strategic processes based on best business practice as offered by the ERP system, and,

- Informate - where a company has the ability to provide context rich information to support effective decision making.

The Davenport et al (2004) study identified a list of benefits companies were expecting from their systems. The top benefits identified are related to effective decision-making and business intelligence. All the ERP usage models identify the evolutionary nature of how companies use these types of systems to gain greater business value. Accordingly to satisfy customer demands, ERP systems have evolved from a transactional focus to a more analytical strategic focus incorporating BI functionality. As Gartner (2002) explains it "enterprises must understand the impact that BI as a strategic initiative can have on their business. It is the beginning of the search for BI enlightenment", where BI becomes an integral part of the attempt to build a more agile enterprise. They contend the goals include:
- Having more insight into your market than your competitors
- Adapting quickly to take advantage of changing business conditions
- Creating new profit opportunities

ERP AND BUSINESS INTELLIGENCE

Although an ERP system's strength is in the integration of data across various functional areas to support particular business processes, the reporting capability has been limited. The systems had extensive reporting capabilities within functional modules however were limited in regards to reporting across modules. This was the case for SAP's ERP system (R/3) which primarily focused on transaction processing and the associated reports. In an attempt to solve this problem SAP developed its Logistic Information System (LIS), which was incorporated into its ERP system (R/3 Ver. 2). This was SAP's first foray into a data warehouse solution however there were a number of shortcomings (McDonald et al, 2002). One of the major issues involved

transaction-processing systems (OLTP). OLTPs are finely tuned for performance with much of the processing required for analytical processing (OLAP) impacting on the performance of the OLTP system (Roze et al, 2002). Therefore it is often recommended that these two systems are separated in order to optimise performance. In addition the LIS interacted with only certain modules of SAP, and this necessitated a separate system being used for human resource reporting. Another significant disadvantage of the LIS was that it assumed that all the data required for effective decision-making was contained in the ERP system. Rarely is an ERP system responsible for all of a company's transaction processing needs; often there are still numerous legacy systems operating. This is either due to budgetary constraints or because the ERP system did not have the necessary functionality.

The result of these performance issues encouraged SAP to develop a separate data warehouse to facilitate business intelligence. This is known as Business Information Warehouse (BW). Stein & Hawking (2002) performed an analysis of SAP's Australian customers and identified that BW was the most common "second wave" solution implemented post core ERP. The META Group research found that 56% of SAP customers who had implemented three or more modules, planned to implement BW within the next two to three years. This percentage increased to 63% when customers had five or more modules implemented (Schlegel, 2004).

The evolution of ERP systems has resulted in a broad range of "bolt on" solutions being developed. These solutions built upon the underlying data contained within the ERP system and provided extended functionality to assist with more strategic decision making. In addition to the Business Information Warehouse (BW) the other solutions included: Customer Relationship Management (CRM), Strategic Enterprise Management (SEM), Advanced Planner Optimiser (APO), and Workplace (later to become Enterprise Portal). SAP originally, collectively referred to these solutions as "New Dimension" solutions and later re-branded these as part of marketing and licensing exercise to be included with the ERP system as part of mySAP.com.

As ERP systems are considered a necessary infrastructure, maturing companies are placing similar importance on their data warehouse solution. One of the characteristics which Holsapple and Whinston (1996) identified for any decision support system including a data warehouse was:

> "*the inclusion of a body of knowledge that encompasses a component of the decision makers domain. This includes how to achieve various tasks and the possible valid conclusions for various situations.*"

In accordance with this characteristic, SAP introduced "Business Content" to enable companies to fully utilise the power of their BW solution. This was comprised of pre-defined reports including the underlying infrastructure to support specific business situations.

The more strategic solutions of mySAP.com relied heavily on the data contained in BW and provided domain specific information to assist in decision making. For example Advanced Planner Optimiser (APO) is responsible for facilitating planning, pricing, scheduling and product shipping across the supply chain using real time information from retailers and suppliers. This solution uses various models to assist decision makers in satisfying customer demands and requires data from internal systems, suppliers and retailers to be transformed and analysed and presented in a format which allows easy interpretation. Obviously BW plays an important role in this solution as it acts as the extractor, integrator and repository for this data.

Similarly Customer Relationship Management (CRM) is responsible for supporting the decisions associated with customers in terms of marketing, sales, service and interactions. CRM requires information to be captured and applied to a pre-stored scenario and much of the required information is supplied via the BW solution (McDonald et al, 2002). While the Strategic Enterprise Management (SEM) solution facilitates corporate performance management, it has a number of tools that assist with strategy formulation and monitoring. As the data required to assist with this decision making can come from numerous systems, SEM is dependant on a data warehouse solution (McDonald et al, 2002). The analytical solutions of mySAP.com are increasingly reliant on a data warehouse to supply the necessary information. This is consistent with McDonald's (2004) model of BI evolution (as shown in Figure 1) which identified a data warehouse (BW) as the infrastructure to underpin other BI solutions.

The SAP "bolt on" solutions satisfy many of the characteristics of DSS as identified by Holsapple & Whinston (1996). The BW solution collects and transforms the data from various systems. This is then provided to the other solutions for analytics in specific business domains. An important component of the BI solutions, is the presentation of knowledge to assist with decision making. The BW solution has a number of interfaces that allow end users to create Ad hoc queries and drill down on the results to get further detail. The level of detail can be as granulated as the individual transaction documents. The final component of mySAP.com is the Enterprise Portal (EP). This solution recognises that users often require more than one solution to perform their daily tasks. The portal provides single sign on whereby a user logs on to the portal which in turn automatically logs the user on to all other specified systems. Similarly all the required reports, queries and transactions from the different systems

are accessed through a standardised portal interface. This means that information required for decision making is quickly accessible on one screen rather than moving from system to system with different interfaces.

It would be expected, that the adoption of SAP's BI solutions by companies should reflect an evolutionary approach according to Evolution of Business Intelligence (McDonald, 2004).

RESEARCH METHOD/RESULTS

The research questions which this paper attempts to answer is:

What is the status of BI solution integration in Australian companies and

What is the nature of the adoption and use of these various solutions

In an attempt to understand the BI solution implementation in Australian companies, this paper adopts a two phased research methodology. Firstly as part of a much broader study Australian companies were surveyed as to their current and future BI implementations. The second phase involves case study methodology to enable a more in depth investigation to be conducted.

Phase 1 Survey

In 2000 KPMG (now BearingPoint) in conjunction with the Nolan and Norton Institute (2000) conducted research related to benchmarking ERP system implementation, usage and support. In August 2004, a research project building upon the original survey was undertaken by Victoria University's ERP Research Group in conjunction with BearingPoint and supported by SAP and the SAP Australian Users Group (SAUG). The purpose of this study was to determine a number of benchmarks related to the use, maintenance and support of SAP solutions by Australian companies and to evaluate Total Cost of Ownership (TCO). As part of this research the intended use of various business intelligence solutions was determined.

A web based survey instrument was developed to collect information in seven major areas; Organisation Profile, Resource Allocation, SAP Solutions Implemented, Upgrades, Return on Investment, Outsourcing, and Future Technologies. Closed questions included Yes/No and five point Likert scale responses. Open-ended questions sought responses from the cohort allowing for qualitative data to be collected. The survey was distributed through the use of an email directing the respondent to a web site that incorporated a web based survey delivery platform. Several studies (Stanton and Rogelberg, 2000; Comley, 1996; Mehta and Sivadas, 1995) have compared email and Web based survey methods versus mail information collection methods, and conclude that email surveys compare favorably with postal methods in the areas of cost, speed, quality and response rate.

SAP, in support of the study, supplied the contact details of the key IT executive for each of their customers. Of the 267 customers supplied only 235 had valid email addresses. A number of emails were undelivered due to members of the cohort moving positions, having incorrect email addresses, changing email addresses or automatic out-of-office responses resulting in 216 potential respondents. After a two week period and a follow-up reminder email, 56 responses were received reflecting a 26% response rate.

Company Demographics

The respondent companies came from a variety of industries. Predominantly: Energy and Natural Resources (21%), Manufacturing/Distribution (21%), Retail/Wholesale Trade (18%), and Public Sector (18%). These results are expected as these industry sectors have traditionally shown the greatest uptake of SAP solutions in Australia and conversely SAP represents a high proportion of the ERP systems implemented in these sectors. In terms of company size in respect to revenue, companies were equally spread in the <$500m, $501-$1000m, >$1000m brackets. In terms of employees half the respondents had a workforce of greater than 1000 employees (FTE). Employee numbers ranged from 40 to 6,800 (FTE). The average number of SAP users across the sample was 655 (FTE). Over half the sample indicated that more than 50% of their workforce are SAP users.

SAP Business Intelligence

A list of SAP BI solutions were provided to the respondents for them to indicate which they had implemented or intended to implement (Table 1).

BI Solution	Currently Implemented	Implemented in 1 year	Implemented in 3 years
Business information Warehouse (BW)	60%	20%	10%
Advanced Planner and Optimiser (APO)	10%	10%	15%
Customer Relationship Analytics (CRM AN)	0%	0%	15%
Strategic Enterprise Management (SEM)	5%	25%	15%

Table 1 Business Intelligence Solution Adoption

Phase 2 Case Study

As it was important to study contemporary phenomena within real life contexts, a case study approach was used to further examine the adoption of BI solutions (Yin, 1994). This reflects the statement by Yin (1994) who emphasises the importance of asking "what" when analysing information systems. This also supports Walsham's (2000) argument that researchers should move away from traditional information systems research methods, such as surveys, towards a more interpretative approach using case studies, ethnographies and action research (p.204). The case study approach has also been used successfully in several studies representing information systems (Benbasat et al.,1987; Chan & Roseman, 2001; Lee, 1989). In phase 2 of this research, data collection involved interviews and access to relevant documents to support the case study.

Case Study

The company known as KP, employs approximately 4000 staff and operates in the service sector across Australia. It originally implemented SAP in late 1999 to address the Y2K issues. Initially KP used SAP to support its financial and billing processes and limited human resource functionality. Additionally as part of the implementation KP consolidated its five disparate practices into one system to facilitate the flow of information. The initial implementation was mainly concerned with back office processes where forms would be completed manually by employees and sent to a centralised processing area to be entered into SAP. Accordingly the system was used by relatively few employees.

Since the initial implementation, more extensive HR functionality has been implemented, including payroll, training and events, travel management and employee self service. Following on from this, additional modules were implemented and included: customer relationship management (CRM), enterprise portals and BW. These more recent implementations, other than providing the required functionality, have enabled KP to create a customised user environment away from the standard SAP interfaces. This has been successful as the initial implementation of SAP was poorly received by employees throughout the company. This was partly due to the organisational changes which occurred concurrently.

Prior to the implementation of SAP BI solutions, all reports were hand delivered via hard copy. Due to the variety of information systems, which supported the five disparate practices, the reports did not provide company wide information. After the initial SAP (R/3) implementation, customised reports were created using SAP's proprietary programming language (ABAP) and were run overnight in batch mode, printed centrally and distributed in hard copy. This usually resulted in a three to four day turn around before employees received the final report. In some cases staff were downloading soft copies of reports and manipulating data to suit themselves.

In light of these data integrity issues, KP realised they needed to improve the speed of report availability and improve the consistency of data across the organisation. Also there was a requirement to perform complex calculations in relation to key performance indicators (KPI's) and store the results to assist with future decisions. To incorporate this functionality KP implemented SAP's data warehouse solution (BW) in March 2003. In

addition to the functionality offered by BW, was selected due to the pre-delivered extractors which enabled data to be sourced from a number of systems.

The initial BW implementation took 5 months and focussed on profit centre management reporting for approximately 500 users. Subsequent work occurred to implement specific reporting for partners, and basic CRM reporting. The next major implementation of BW involved engagement and time management reporting which was fundamental to KP's business and involved all employees.

In March 2005 KP implemented SAP's Strategic Enterprise Management (SEM) solution to support profit centre budget reporting.

The key features of KP's BI solution landscape are:
- all reports are delivered via the enterprise portal and the web. The level and type of reporting is determined by the portal design which is dependant on the user's role within KP.
- related reports are linked via hyperlinks and reports are also linked back to SAP's ERP for further detail where applicable.
- Most reports can be downloaded to Microsoft Excel to enable further calculations and manipulation if required.
- Default views for reports have been created to enable employees to address common questions. These reports also incorporate context menus to assist with navigation.
- Some reports are available to senior management via their smart phones. For example a user can access the CRM system to bring up details about a customer and then click on the phone number to ring them.

The next evolution of KP's BI landscape will involve extending HR salary reporting, improved CRM reporting and the incorporation of data from non SAP systems into BW. In terms of SEM, which is one of SAP's more advanced BI solutions, KP wants to implement a forecasting model which directly linked to budgeting, This will involve job level budgeting and staff scheduling. Eventually KP intends to implement SEM Manager's Cockpit providing a graphical representation of KPI's across the organisation. This also has the facility for management to "drill down" on any KPI to obtain the level of detail they require to assist in decision support.

KP identified a number of challenges associated with the implementation of the various solutions including project management, availability of skilled resources and technical issues. However these challenges are not discussed here as they are outside the scope of this paper.

DISCUSSION

The Business Intelligence Evolution Model (McDonald, 2004) identified a data warehouse as the bottom tier. Accordingly it was the first BI solution implemented and provided the necessary infrastructure for other BI solutions to build upon. The survey results indicated that 60% of the sample had implemented SAP's data warehouse. If the percentages are totalled horizontally for BW in Table 1, within three years of the completion of the study 90% of the respondents would have implemented a data warehouse.

The implementation of BW is relatively simple compared to other BI solutions. It does not require major process change or job redesign and the benefits are easily realised. More importantly companies who implement an ERP system to replace legacy system never replace all previous systems. This occurs due to either cost and/or because the ERP system does not incorporate the appropriate functionality. Therefore by inference these remaining systems are necessary for processing data and decision making. Often for decisions to be made, information is required from both the ERP system and the legacy systems. The data warehouse extracts data from all systems and this is then transformed, integrated and consolidated in preparation for querying and reporting. Therefore a data warehouse provides access to information which may not have been readily available. For example the Australian Defence Forces prior to implementing BW had one report which required nearly fifteen days of processing. This same report via BW required only thirty minutes.

The data warehouse is the tool which collects and consolidates this data. This consolidation of data provides the foundation for SAP's other BI solutions. For example APO relies on collecting data across the extended supply chain from suppliers through to customers to enable effective planning and decision making.

It would be expected that companies would solve many of their operational reporting needs via BW and with increased usage and experience the solution's use would be extended. This was reinforced in the case study where KP implemented reporting for a specific area and over time increased the level and scope of reporting. This familiarisation with the reporting functionality available in BW would also result in companies investigating BI solutions for specific functional areas. For example companies with an emphasis on supply chain management would investigate APO while companies with a more customer focus would investigate CRM. KP implemented their SEM solution two years after they first implemented BW which reinforces this concept of familiarisation and BI evolution.

The survey results indicated that there was limited uptake of SAP's other BI solutions however this maybe reflective of the industry sectors in the survey and the maturity of the companies. The results indicate that within three years, 35% of the sample intended to implement APO. In terms of CRM, this is a relatively new solution and for companies to be successful in this area requires a process and culture change to occur rather that the just implementation of this solution. Although a significant proportion had implemented the CRM solution very few had implemented the BI component of the solution (CRM Analytics). We would argue that most of these companies are still coming to grips with the basic CRM functionality rather than investigating the more advanced analytics. The case study reinforces this due to the requirements for basic CRM reporting rather than implementing more advanced analytics.

The survey results for SEM are surprising as this solution relies on information related to a company's overall strategy and the monitoring of key performance indicators. There is a consensus that of all the BI solutions this would be last to be implemented. It relies on companies having formulated a sound and effective strategy and identified the appropriate KPI's. This may require a number of SAP solutions to be implemented to support the various business processes identified in the strategy and assist in the collection of data relevant to the KPI's. Anecdotally companies who have attempted to implement SEM have found flaws in their corporate strategy and have had to revisit it. Therefore for 25% of the sample indicating that they intended to implement SEM in 2005 is surprising. This is supported by KP who implemented SEM nearly six years after the initial implementation of the ERP system and two years after BW. They have yet to implement the more advanced features of the solution in terms of the Manager's Cockpit. The implementation of the enterprise portal in conjunction with the Manager's Cockpit would provide the necessary functionality for Business Activity Monitoring (BAM) as described by McDonald (2004)

CONCLUSION

The purpose of this paper was to provide an understanding of the evolution of business intelligence solutions within Australian companies. Both the survey and the case study demonstrate that there is an evolutionary approach to the adoption of business intelligence solutions. This evolution can be mapped to the Business Intelligence Evolution Model as proposed by McDonald (2004). The continuous use of business intelligence solutions results in companies striving for more strategic solutions. This BI maturity process is similar to how companies evolve with their ERP usage.

There is a very strong interdependent relationship between ERP systems and business intelligence solutions. The reliance of business intelligence on data that transaction-processing systems generate and the long-term dominance ERP vendors have in transaction processing gives these vendors a chance to dominate this market. Already SAP has been identified as a key player (Schlegel, 2004) and with the recent mergers of the other key ERP vendors there will be a more consolidated approach to the development of solutions. ERP systems are no longer solely responsible for transaction processing, they have evolved a range of value adding applications of which business intelligence is the latest iteration. There will be an increasing focus on business intelligence in specific business domains and business solutions.

This is partly reflected in SAP's mySAP Business Suite which now includes; CRM, Supply Chain Management (SCM), Product Lifecycle Management (PLM) and Supplier Relationship Management (SRM) and the associated decision support tools in each area. All these solutions are underpinned by integration solutions branded as NetWeaver. This includes Business Intelligence solutions.

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