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Abstract

Many companies have implemented enterprise resource planning systems to support their various business processes. These companies are now trying to manage the performance of this information technology infrastructure in terms of usage, support and maintenance. An important part of this process is the identification of appropriate performance measurements. This paper reports on a study which captured data from SAP Australian customers and establishes a number of benchmarks for Total Cost of Ownership and resource allocation for the usage, support and maintenance of SAP solutions.

Keywords

Benchmarking, Enterprise Resource Planning, SAP, Total Cost of Ownership

INTRODUCTION

There is a plethora of articles, books and presentations on the importance of strategy in today's companies (Mintzberg, 1994; Porter and Miller, 1985; Kaplan and Norton, 1996). But even with this emphasis on corporate strategy, companies struggle with their strategy development and implementation. This is reflected by a much cited reference to a Fortune Magazine article which stated that "Less than 10% of strategies effectively formulated are effectively executed" (Kaplan and Norton, 1996). In other words more than 90% of companies who are able to create an effective strategy struggle to implement that strategy. An integral component of effective strategy implementation is performance management (Miller, 2005). Miller (2005) argues that performance management involves both long term and short term planning to achieve strategic goals and accountability. However it is important to remember the quote by Peter Drucker (1988), "if you can't measure it, you can't manage it". Accordingly there has been a significant growth in performance measurements and metrics as companies realize that strategy development and implementation is a multifaceted task reliant on a number of inter-dependent factors. Each one of these factors' performance needs to be managed and implicitly also need to be measured. Kaplan and Norton's (1996) balanced scorecard is built upon this premise.

Over the last three decades companies have increasingly identified the importance of information technology in the achievement of strategic objectives. Scott Morton (1991) identified five interrelated factors that influenced the attainment of strategic objectives and one of these factors was information technology. Even though the role of information technology in strategy development and implementation has been identified, one of the major issues facing companies is the alignment of information technology strategy with their business strategy (CSC, 2000; Price Waterhouse, 1996). The importance of this alignment has been identified as a priority for companies over the past twenty years (Brancheau et al, 1996). Bakos and Treacy (1986) argued that the increased attention being paid to the role information technology has in the corporate strategy is mainly due to the publicity received by companies who have gained significant advantage due to their information technology utilisation.

Lack of alignment can result in failure to gain value from information technology investments (Gerstein and Reisman, 1982). Factors which have been identified and which have contributed to this lack of value realisation include; lack of understanding of the potential of information technology by senior management, lack of communication between information technology managers and business managers, change management issues, lack of focus on opportunities for competitive advantage, and a lack of availability or use of instruments to quantify possible business benefits or value (Gerstein and Reisman, 1982). Information technology executives, similarly to other executives, are constantly expected to demonstrate value of their various investments. However just to define the "value" of information technology investments is difficult in itself. Many, view value as a reduction in costs. But this ignores the value propositions associated with standardization, flexibility, innovation, efficiency, productivity and the avoidance of future costs. The challenge to quantify the value of information technology has been well documented (Murphy and Simon, 2001; Parker and Benson, 1988). Often traditional accounting methods to measure value are difficult to apply to information technology. This is mainly due to the intangible benefits associated with information technology usage (Parker and Benson, 1988). The identification of the value of information technology is further exacerbated when trying to assess complex and enterprise wide information systems such as Enterprise Resource Planning (ERP) systems.

ENTERPRISE RESOURCE PLANNING SYSTEMS

Klaus et al (2000) define an ERP system as:

> "An Enterprise Resource Planning (ERP) software application package is a suite of pre-engineered, ready-to-implement, integrated application modules, catering to all the business functions of an enterprise and possessing the flexibility for configuring and customizing dynamically the delivered functionality of the package to suite the specific requirements of the enterprise. ERP enables an enterprise to operate as an integrated, enterprise wide, process-oriented, information-driven, and real-time enterprise." (Klause et al, 2000)

Due to the purported benefits ERP systems offer, many companies consider them as essential information systems infrastructure to be competitive in today's business world and provide a foundation for future growth. A survey of 800 top US companies showed that ERP systems accounted for 43% of these companies' information systems 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 major vendor of ERP systems is SAP with approximately 56% of the world market and 75% of the Australasian market (McBride, 2005).

Researchers have identified a number of possible benefits of ERP systems. These include: 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). Many companies can identify the benefits they are realising from their ERP system implementations but have great difficulty in quantifying them (Hawking et al, 2004). The integrated nature of these types of systems and the extent to which they have permeated organisations to support various business processes, makes it difficult to quantify the value of these systems. Additionally for the value of these systems to be quantified there needs to be metrics for business processes prior to the ERP system being implemented. This would provide a mechanism to measure improvements in performance. However for many companies these metrics were not identified or measured prior to the implementation.

The difficulty in quantifying the value of ERP systems has seen an increased emphasis being placed on Key Performance Indicators (KPI) and benchmarking (McSweeney, 2005). Benchmarking provides a framework and methodology to assist companies in their assessment of benefits and efficiencies. It identifies a set of commonly agreed upon measures that describe performance and permits meaningful comparisons (Karlof & Ostblom, 1993). As companies are placing greater emphasis on improving performance through the leveraging and optimising their ERP system investment, they are looking for accepted KPI's and associated benchmarks. Many business processes have accepted KPI's and benchmarks but there is limited information concerning benchmarks associated with the usage, ongoing support and maintenance of the ERP systems that support these business processes. One benchmark which is being increasingly applied to the implementation and management of information technology is Total Cost of Ownership (TCO) (Hayes, 2004; Greenbaum, 2005; ASUG, 2006). The TCO concept was originally developed by Gartner for measuring the costs associated with the deployment and use of technology. It considers both the direct and indirect costs associated with technology usage and is now a commonly used measure to compare IT costs across and between organisations. The calculation of TCO

provides important information for planning and implementing projects as well as consolidation of system landscapes (Bailey and Heidt, 2003).

In 2000, KPMG in conjunction with the Nolan & Norton Institute conducted a study in Australia on the costs associated with ERP systems management and support, and in particular SAP. The report attempted to develop a number of benchmarks including TCO. They also mapped companies to their level of maturity in terms of ERP usage and argued that with increased maturity there would be associated improvements in performance (Nolan and Norton, 2000). Based on this assumption it would be reasonable to expect that many of the benchmarks would improve if a similar study was conducted more recently.

RESEARCH METHODOLOGY

The primary objective of this study was to survey a range of information system professionals and seek responses to quantify the level of costs and resources associated with management and support of their SAP ERP systems. These measures would then be compared to similar measures collected in 2000 in an attempt to provide up to date benchmarks.

In August 2004 the KPMG survey (2000) was updated by Victoria University's ERP Research Group in partnership with BearingPoint Consulting (formerly KPMG Consulting). The Web based survey consisted of five sections; company demographics, SAP resource allocation, outsourcing, benefit realization, and return on investment. Both qualitative and quantitative questions were used.

Through the support of SAP and the SAP Australian User Group the survey was distributed to SAP Australian customers during August 2004 via email. The email directed the respondent to a web site that incorporated a web based survey delivery platform. Several studies (Simsek, 2000; Stanton and Rogelberg, 2000; Comley, 1996; Mehta and Sivadas, 1995) have compared email and Web based survey methods versus mail information collection methods and have proposed that email surveys compare favourably with postal methods in the areas of cost, speed, quality and response rate. It was necessary to preen the email address book to remove and amend email that had bounced back.

Sample

The sample was made up of the key contacts for each company, which are members of the SAP Australian User Group. The user group is representative of approximately 65% of the SAP customer base. The original email list contained 186 potential respondents. A number of emails were undeliverable due to members of the cohort moving positions, having incorrect email addresses, having changed email addresses or automatic out-of-office responses. There were two unusable replies, leaving a total of 41 usable responses. The overall response rate once removing the undeliverable addresses was 26%.

RESULTS

Background data was collected to provide background information on the respondent companies. The data was analysed by: business activity, company size as measured by annual revenue and employee numbers; extent of SAP usage measured by solutions implemented and number of SAP users; and SAP maturity indicated by years of usage and number of implementations. These factors provide a basis for understanding the costs associated with the usage, support and maintenance of SAP solutions.

Business Activity

Respondents were asked to select the term that best describes their organisation's main business activity.

The industry sectors which were representative of the majority of respondents were: Energy and Natural Resources (21%), Manufacturing/Distribution (21%), Retail/Wholesale Trade (18%), and Public Sector (18%). This representation would be expected as these industry sectors have traditionally shown the greatest uptake of SAP solutions in Australia. Conversely SAP represents a high proportion of the ERP systems implemented in these sectors.

Annual Revenue

Respondents were asked to indicate the annual revenue of their organisation in the financial year 2002/2003, in AUD$million.

Figure 1 below provides a breakdown of the respondent organisation's annual revenue by industry group for the financial year 2002/2003. Approximately a third of the organisations reported annual revenue is under $500 million. This reflects the emphasis placed by ERP vendors on mid market organisations. It is envisaged that

future research will indicate a significant growth in the uptake of SAP's new solutions by small to medium sized companies.
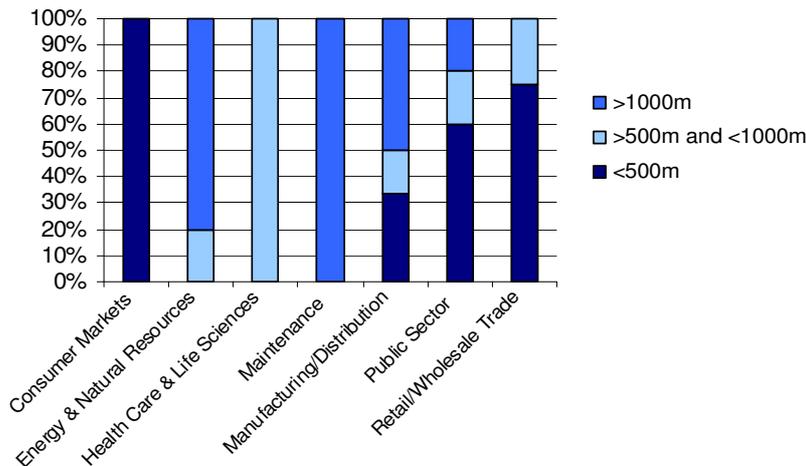

Fig. 1: Annual Revenue by Industry Sector

Number of Employees

Respondents were asked to indicate the number of Full Time Equivalents (FTE's) working in their organization in Australia.

Half the respondents had a workforce greater than 1000 employees (FTE) with the average workforce in this segment being 3,215 FTE. Employee numbers in the sample organisations ranged from 40 to 6,800 (FTE). Figure 2 provides a breakdown of employee numbers per industry segment.
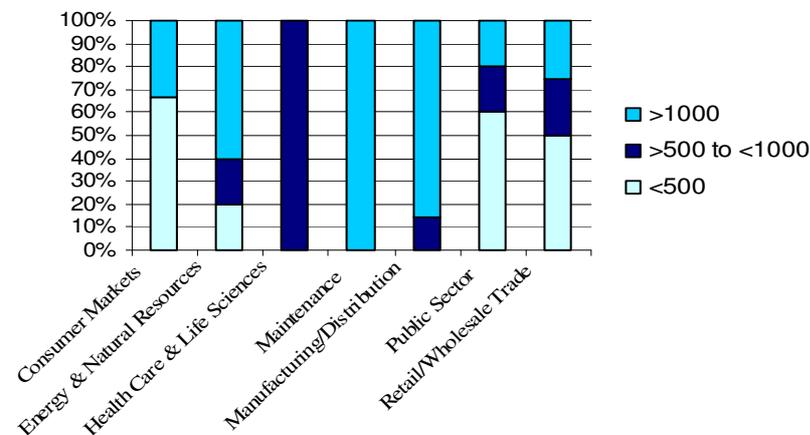

Fig. 2: Employees (FTE) Per Industry Sector

SAP User Population

Respondents were asked to indicate the number of SAP users (FTE) for Australian operations.

The number of SAP users in an organization provides an indication of the extent SAP solutions have permeated throughout the organization. It also indicates the level of support resources which may be required. The average number of SAP users across the sample was 655. Over half the sample indicated that more than 50% of their workforce were SAP users. Health Care and Life Sciences and Maintenance (Fig. 3) indicated 100% of the workforce as SAP users.
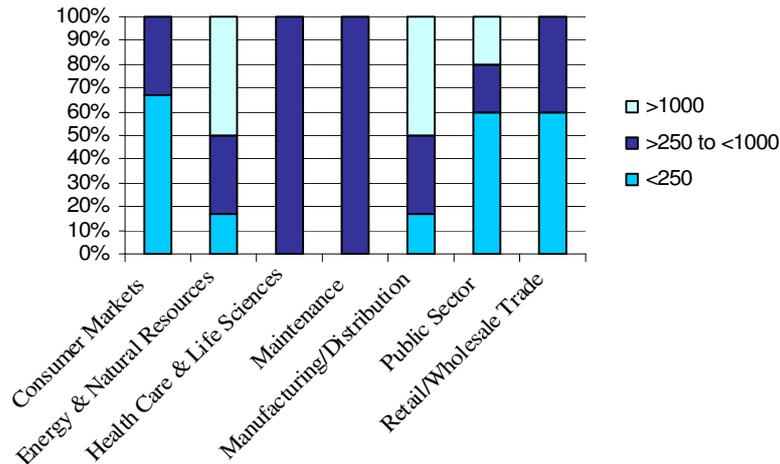
Fig. 3: SAP Users by Industry Sector

SAP Usage

Respondents were asked to indicate which SAP modules their organisation currently uses.

The number of SAP modules used in an organisation provides an indication of the extent SAP solutions have permeated throughout the organization. This would provide an indication of the complexity of the solution which needs to be managed and supported. The pie graphs (Fig. 4) below indicate the percentage of companies that have implemented individual modules within the total Financial (10), Logistics (7) and Human Resource (5) modules available. For Financials 100% of all responding organisations were using between five and nine modules out of the possible ten offered within the SAP solution; 94% of the organisations implemented between three and six of the seven Logistics modules and 58% of organisations implemented between one and five of the five Human Resources modules available.
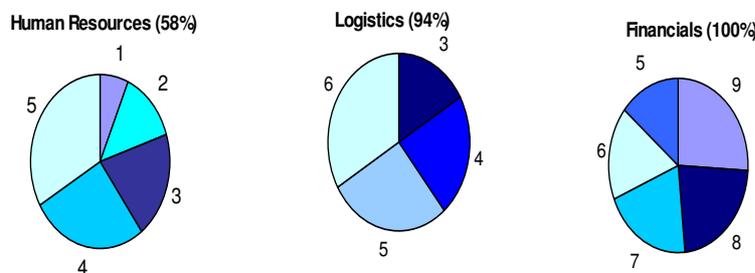

Fig. 4: SAP Module Usage

These results indicate respondents had extensively implemented SAP functionality throughout their organisations to support their various business processes and can be considered heavy SAP users.

Maturity of SAP Usage

When comparing SAP related costs, previous research classified companies as to their ERP maturity. The level of maturity reflected how long an ERP system had been installed in the organisation. It is assumed that with increased ERP experience, organisations can identify and realise opportunities to gain additional benefits and reduce costs. The previous research (Nolan and Norton, 2000) on the Australian SAP marketplace classified maturity into three categories.

- Beginning - organisations that have implemented SAP in the previous 12 months (41%)

- Consolidating - organisations where SAP has been implemented between one and three years (47%) and

- Mature - organisations that have had SAP installed for more than three years (12%).

The results of this current survey indicated that all the responding companies were in the Mature phase with the average length of usage being 6 years.

Benchmarks

The focus of this research was to identify benchmarks for costs associated with SAP solution usage and maintenance. These costs were correlated against various demographic factors such as; company revenue; total IT spend and the number of SAP users. This was designed to allow comparisons to be made between companies involved in this survey.

Total Cost of Ownership (TCO)

As previously mentioned the TCO concept was originally developed by Gartner for measuring the costs associated with the deployment and use of technology. It considers both the direct and indirect costs associated with technology usage and is now a commonly used measure to compare IT costs across and between organisations. The calculation of TCO provides important information for planning and implementing projects as well as consolidation of system landscapes. TCO costs incorporate the cost of SAP solutions, implementations and operations. This can include external and internal implementation services, software licenses, hardware infrastructure, application development and maintenance, software maintenance, infrastructure support, and internal administration

For the purpose of this survey respondents were asked to identify costs associated with their ERP usage and maintenance and their total IT costs for the 2003 financial year. Total IT costs included associated costs such as, internal and external personnel, hardware, software and other costs. Other costs could include version upgrades, hardware modifications and or ongoing support and maintenance. The following table (Table 1) provides a summary of the data.

Annual Revenue	Average IT spend ($ Millions)	Average SAP IT spend ($ Millions)	SAP spend as % of total IT spend	SAP spend as % of revenue
Under $500M	2	.5	25%	.6%
Between $500M to 1B	5	1.5	31%	.23%
More than 1B	33.5	5.5	14%	.35%

Table 1: SAP IT spend categorised by company revenue.

The annual IT costs across respondents ranged from $300,000 to $100 million; while the SAP costs ranged from $115,000 to $12 million. The percentage of SAP solution costs as compared to total IT costs is far higher in the smaller organisations. This tends to indicate that although SAP solutions are only part of the total IT infrastructure, they account for a considerable portion of the total IT budget allocation in the smaller organisations. While in the larger organisations there are a substantial number of additional applications with which SAP solutions interact. Table 1 indicates that for all revenue groups, irrespective of industry, annual costs associated with SAP solution usage were less than 1% of total revenue. As expected, SAP costs in the smaller organisations are proportionally greater than in the larger organisations.

Average Cost Per SAP User

Previous research indicated that as companies gained a level of maturity with their SAP usage, their costs per user decreased. This is an expected outcome. As companies become more experienced with SAP solutions they achieve greater efficiencies. Also more mature companies tend to have a greater penetration of SAP solutions and therefore a greater number of users, leading to economies of scale. The previous KPMG research (Nolan and Norton, 2000) identified a reduction in cost per user over all Maturity Stages during the years the survey was conducted (average 1998 - $6910, 1999 - $4581). Table 2 reinforces this trend. The average cost per user across the sample was $4033. It appears that the figure for companies with revenue less than $500m is a little high due to several of the companies undergoing major SAP initiatives in 2003.

Annual Revenue	Average SAP IT spend ($ Millions)	SAP Users (FTE)	SAP cost per user (FTE)
Under $500M	.5	100	$6,200
Between $500M to 1B	1.5	550	$2,800
More than 1B	5.5	2300	$3,200

Table 2: Average cost per SAP user

SAP Resource Allocation

In terms of TCO resource allocation, Figure 5 indicates that 67% of the resources across the sample are personnel related. Respondents were asked to distinguish between SAP personnel as per job area and between internal resources as compared to external contractors.
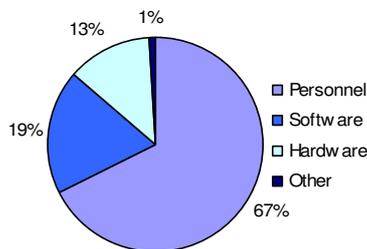

Fig. 5: SAP Resource Allocation

Table 3 displays the average numbers of SAP personnel both internal and external across the different job functions, categorised by the number of SAP users. The results in each category varied significantly and this maybe a reflection of the extent that SAP solutions have permeated organisations, different SAP roles are incorporated into other job functions. For example in training and documentation SAP may be just one of the solutions personnel are responsible for. This would add to the difficulty of distinguishing between the level of personnel resources but would also be an indication of ERP maturity

SAP Users (FTE)	SAP Management	SAP Development	SAP Support
Less than 250	1.6 (min. 1, max. 4)	1.5 (min. 0, max. 3)	1.5 (min. 1, max. 3)
250 to 1000	1.5 (min. 1, max. 3)	3.4 (min. 2, max. 10)	4.8 (min. 2, max. 11)
Greater than 1000	3.4 (min. 2, max. 8)	5 (min. 2, max. 10)	12 (min. 4, max. 21)

Table 3: SAP Personnel Resources categorised by SAP users.

Outsourcing

There has been a trend in recent years for companies to focus on their core business processes and outsource non-core activities. Many companies early in their ERP maturity outsourced a number of activities due to the lack of internal skills. To assess the level of outsourcing in this survey, respondents were asked to indicate their current level of outsourcing in relation to their SAP landscape.

A significant number of respondents (30%) indicated they outsourced some component of their SAP solution environment. The main area outsourced was application development (70%) (Fig. 6). Although there has been considerable media attention regarding the impact of off-shore outsourcing only one company indicated they were using an off-shore outsourcer for administration and support.
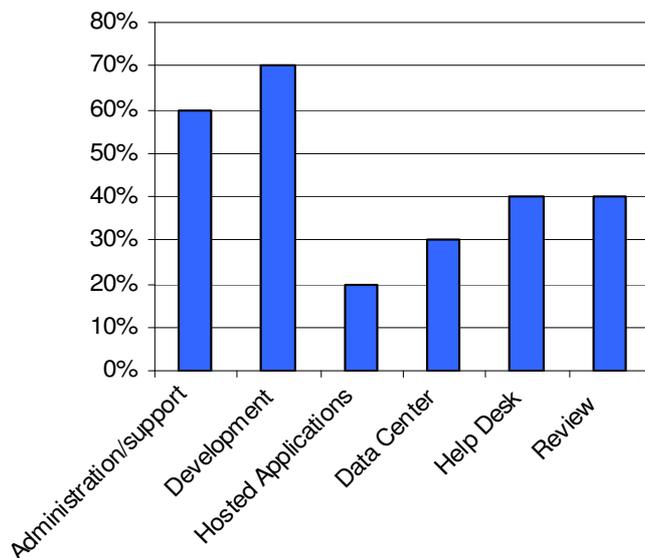
Fig. 6: Level of Outsourcing by Function

Return on Investment (ROI)

Traditionally Return On Investment (ROI) was a measure used to indicate the success of an implemented solution. Although many of the respondents identified a number of benefits from their SAP solutions the majority indicated that they were unsure about the ROI in relation to their implementations. Qualitative comments indicated that it was too difficult to measure due to the lack of existing baseline prior to implementation and or changes occurring during and post implementation. A number of respondents' comments, who indicated that there was no formal business case on which the ROI could be based based. Of the respondents who did measure ROI (25%), their business case expected a 21% to 40% ROI and all expected to achieve this between 3 to 5 years.

DISCUSSION

Companies are seeking metrics which can facilitate performance management of their SAP systems. The data captured in this study provides some benchmarks for the usage, support and maintenance SAP solutions. The results indicated that Australian customers are experienced in the usage of their ERP systems with all companies have implemented their systems at least 4 years and had participated in a number of upgrades. This experience leads to companies investigating avenues for increased benefits and efficiencies by further extending their SAP infrastructure by implementing further functionality.

The respondent companies had extensively implemented SAP solutions to support many of their business processes. Nearly all of the respondent companies had extensively implemented SAP's Financial and Logistics functionality with 60% extensively implementing Human Resource functionality. The penetration of these SAP solutions throughout the respondent companies is also reflected by the number of SAP users, in the majority of the companies, more than half their workforces are SAP users. From a financial perspective SAP solutions account for a significant component of a company's IT related costs.

Compared to previous similar research (Nolan et al, 2000) the TCO has reduced as companies become more experienced with their ERP system. The average SAP solution TCO for the sample was $4,033 per user. As would be expected, as company size and number of SAP users increases the SAP solution TCO reduces. Personnel resources are still the major cost in the implementation, maintenance and support of SAP solutions.

Through the qualitative comments many of the respondents found it difficult to identify the various costs. As SAP solutions become integrated with other applications, both internally and externally to the company, to support various business processes the separation of costs will become more difficult to identify. Companies may have to settle for self defined KPI's and "draw a line in the sand" as the initial benchmark depending on the metrics they can capture. Many consulting partners have attempted to define KPI's for SAP usage, support and maintenance such as IBM's Full Economy Model for SAP (IBM, 2004). SAP in conjunction with the American SAP User group have recently developed a number of online benchmarking tools which enable customers to complete an online survey and have the results compared to previously completed surveys. Assuming SAP customers are able to accurately measure their cost then this benchmarking tool may prove invaluable.

There is potential for bias in the findings as the demographic we have identified as mature are more inclined to answer the survey. This could be offset by the nature of the SAP market in Australia as there are few new installations and most companies are into their nth installation/upgrade.

CONCLUSION

The purpose of this study was to identify and quantify a number of benchmarks associated with the usage, maintenance and support of SAP's ERP solutions. The benchmarks identified from this survey, can provide companies with a foundation for future decisions and strategies regarding their SAP infrastructure and the management of its performance.

The research indicates that Australian companies can be considered to be mature in their use of SAP ERP systems and associated solutions. This is reinforced by their years of usage and the penetration of SAP functionality across their organisations. SAP solutions were a significant component of the surveyed companies overall information technology infrastructure and for most of the companies, the majority of their workforce are SAP users.

With their increasing ERP maturity, surveyed companies are experiencing an associated decrease in Total Cost of Ownership. Further, their increased usage of ERP solutions is resulting in improved knowledge of the solutions. This is providing the foundation for companies to leverage their ERP investment to gain increased benefits through the extension of existing functionality and or the implementation of new functionality or associated

solutions. Additionally companies are gaining efficiencies in the maintenance and ongoing support of their ERP solutions. This has had a direct impact on the reduction in TCO.

It is anticipated that new metrics will be developed to measure the costs associated with SAP usage, support and maintenance to facilitate performance management. Companies will become better at capturing relevant data as they attempt to align their business and IT strategies.

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