

Enterprise Resource Planning: Experiences in Implementing SAP in Project Management Environment

Perry J Beor¹ and Purnendu Mandal²

¹Water Corporation, Western Australia, Australia E-mail: beor@carmen.murdoch.edu.au

²Lewis College of Business, Marshall University, West Virginia, USA
E-mail: mandal@marshall.edu

ABSTRACT

Enterprise Resource Planning (ERP) could provide significant improvement in efficiency across the company, but only when implemented correctly. Otherwise, ERP system could be a curse and drag the whole enterprise into spiralling inefficiency. Plan for an ERP system and their implementations require an integrated approach to meet the requirements of areas such as engineering, finance, operations and services. This paper describes the experiences in implementing an ERP system, namely SAP, in a water corporation. The case study reveals some of the intricacies that may occur during the planning and implementation stages and the ways to approach them.

Key words: ERP, Information System Implementation, Water Industry, SAP

INTRODUCTION

ERP systems have received much attention for their potential in more effective decision making. Many companies are implementing ERP packages as means to reducing operating costs, increasing productivity and improving customer services. Ironically, the very ERP system can cripple a company, if not implemented properly. There are horror stories concerning implementation (Laughlin, 1999).

Implementing ERP systems successfully calls for strong leadership, a clear implementation plan and a constant watch on the budget (Wagle, 1998). From project managers' point of view, the most important consideration is a clear implementation plan and a strategy to implement that plan. The plan and strategy, however, should evolve through systematic consideration of the company's requirements and its ability to manage changes that would be required under the new situation. Some of the questions needed to be considered in the plan and strategy stages are:

What are the specific information needs at operational and managerial levels for various functional areas?

How the proposed ERP system integrates with the existing information systems?

What is the schedule for adaptation of the new system?

Questions such as above should be considered for successful implementation of an ERP system. This paper highlights on such questions with the help of planning and implementation for SAP in a water company (referred here as the Water Corporation). The Water Corporation started implementing SAP in 1997, and it is believed it has been a success story. This paper focuses on the chronological developments, particularly in its Project Management Branch (PMB).

ERP SYSTEMS IMPLEMENTATION

Public utilities, such as water authorities, have implemented ERP systems to track cost and resource information, monitor service levels and expenditures, and provide front-line workers with the information they need to better serve the public. ERP has grown further as an integration tool where the aim is to integrate all enterprise applications to a central data repository with easy and discrete access to all relevant parties (Black, 1999). By creating a centralised database and standardising corporate data flow, ERP can make changes and efficiencies take root in a firm (Kirschner, 1997). Even with such advances project managers often wonder 'what are the ingredients of successful system implementation?'

For successful implementation three basic requirements should be met: a clear business objective, understanding of the nature of change and understanding of the project risk. Strong leadership and constant watch to budget are other two requirements as stressed by Wagle (1998).

'Iterative evolutionary method' for developing enterprise-wide information system (Bailey, 1999) is an important method. This enables the system developers and their customers to communicate effectively with each other to evolve the system towards some defined objective. This method is useful from IT projects' implementation point of view and due to the following characteristics:

- It is difficult to visualise from project specification or design how the IT system will work or will impact on the organisation
- It may be necessary to change the way people do things, or even their views of what they really need, with the introduction of IT systems.
- It is more likely that IT projects fail because of poor communications between technical experts and customers than results of technical problems.

Bailey (1998) also attempted to link planning approaches to change characteristics. He observed three approaches to planning for project management and they are linear, exploratory and personal. Linear planning is associated with the planning and management of a project through the identification of a detailed set of related tasks and deliverable. Exploratory planning is associated with the use of an iterative approach to evolve a product toward a defined end goal. Personal planning is associated with the setting of targets and time scales for managing organisational and personal change.

Cleland (1991), Skelton and Thamhain (1993) stressed on the 'concurrent engineering method' in developing ERP system. It requires simultaneous involvement of several functions with joint responsibilities for the development, as a time-based management innovation directed for shortening the ERP delivery time. Prasaei and Sullivan (1993) stated two basic approaches for implementing concurrent engineering - team-based and computer-based approaches. In team-based approach, the application of concurrent engineering to design improves the development of the system. The team approach also facilitates technology transfer because relevant parties are involved in the development process. The team-based approach has been enhanced by the computer-based approach. Application of computers enables design justification. However, it is necessary to acquire, represent, integrate and coordinate the requisite concurrent engineering knowledge in information system design.

Bailey (1998) studied in depth the type of change characteristics (tangible, conceptual and personal) that could be expected once a project has been implemented. Tangible characteristics are associated with the production of some physical thing that has a practical purpose. Conceptual characteristics are associated with the production of an object or effect that creates an emotional response or intellectual idea. Whereas, personal characteristics are associated with the change in people's attitudes, the way in which they behave or the things they do.

THE CASE STUDY

It is useful first to look at the Water Corporation and its function, size and operations as a whole in order to appreciate the cost significance of implemented ERP system. The Water Corporation is wholly owned government organisation. Its function is to provide water, wastewater, drainage and irrigation services across an entire state in Australia. It has an annual revenue of over \$900 million and capital expenditure over \$465 million.

In 1997 the Water Corporation decided to introduce a new corporate information system and SAP was chosen. The specific requirements of the Project Management Branch (PMB) of the Corporation were to be met by the installation of the SAP- PS (Project System) module. PMB's role is to deliver engineering asset infrastructure to support the provision of water, wastewater and drainage services to the Water Corporation's customers. In addition it is the Corporation's Centre of Expertise for Project Management and the Administration of Works Contracts.

Legacy Management Systems

Prior to the introduction of SAP, PMB carried out its operations via a number of information systems. The GCS (General Corporate Systems), though not specifically orientated to project management functions was used by PMB in carrying out its operations. The GCS system consisted of:

- General Ledger (GL) - the overall accounting database for the Corporation;
- Corporate Costing System, called WORKS, and associated with it the IRS (Internal Recharge System);
- Stores Management Information System (SMIS) which was used for purchasing and supply;

- Capital Works Planning System (CWP), which tracked costs against estimates and cashflows for specific projects; and
- Numerous minor systems, such as Electronic Asset Registers, Human Resource Systems (HURMIS) and various paper based systems such as the Water Corporation Policy Library and its Supply Manual.

PMB had also developed a number of internal branch systems for both its own operating efficiency and as part of its role as the centre of expertise for project management within the Water Corporation. It had a full quality system certified to ISO 9001 by Bureau Veritas with associated Quality Manual; Operating Procedures; Work Instructions and Standard Forms and Records. PMB also had its own small electronic Project Management system called IPACS (Interim Project and Contract System). This had its own database and reporting system, and was provided with downloaded data from the WORKS system and CWP. It was able to integrate information relating to project and contract schedules and payments, keep track of all PMB projects and generate branch KPI's (key performance indicators).

Replacement Need

Prior to the introduction of SAP, the Water Corporation relied for its operations upon a host of mainframe based systems, which were basic, inflexible, not user friendly, had very little integration, decreasing functionality and ever increasing maintenance requirements. In late 1996 the Corporate Information Management Strategy found that there were only two solutions - repair or replace. At about the same time the Corporation adopted Windows NT and MS Office, which allowed for the introduction of a corporate Intranet and E-mail. This combination and the potential it unlocked put paid to any thought of repair. Replacement of all or most of the corporate mainframe systems was required.

After considerable study and with wide internal consultations, it was determined that the vital requirements for this new system were the replacement of the General Ledger, WORKS and the Stores Management Information System. Registrations of interest were sought from the market for a system to meet these needs and address the issues of functionality and integration. The responses were evaluated in detail both internally and externally.

In mid 1997 the choice was made in favour of SAP with Deloitte & Touche - ICS as the Implementation Partner. One of the features of SAP, which surprised many with its potential for benefit to the Corporation, was its PS or Project Systems Module. While this was not part of the original benchmarked requirements it was an option which became available with the choice of SAP. With the Water Corporation's capital budget amounting to almost a quarter of its operating expenses, any savings in this area, by improved project management, however slight, would have a considerable impact on the organisation as a whole.

There was concern though that while most of the other modules of SAP were relatively mature and had been extensively refined in other organisations, the PS Module was the least developed and had never been used to this extent. It was decided however that the integration benefits of SAP-PS were sufficient to warrant its inclusion in the modules to be implemented.

SAP IMPLEMENTATION

The System in General

The following table shows just how SAP was configured to replace the entirety of the Corporation's operating systems.

Legacy System	Replaced by SAP Module
IRS Internal Recharge	FI Financials
GL General Ledger	CO Controlling
CWP Capital Works Planning	PS Project Systems
HURMIS Human Resources and Payroll	HR Human Resource Management and Payroll
WMS Works Management System	PM Plant Maintenance
SMIS Supply Management	MM Logistics / Materials Management

The PS Module

While from the above table it appears that the overall system seems to meet the corporate needs, the question was whether the SAP-PS module had the project planning, budgeting, scheduling, monitoring and reporting functionality which were vital for PMB?

- *Project Planning*

The fundamental tool used by SAP-PS in carrying out its task is the WBS or Work Breakdown structure. This is a model of the Project which breaks it down into a hierarchy of major tasks, (WBS Elements), which give the overview. This is in turn broken down into individual activity networks for the detail. Project Planning can be carried out at either level with costs and dates recorded as estimates, budgets or actuals and an automatic roll up from network to WBS. This is all displayed on the Project Planning Board, a graphical interface which brings together the project elements, structures and relationships

- *Project Budgeting*

This is achieved by comparing the estimates against actuals or committed costs at either WBS or network level, there being automatic roll up to the required level. In addition, budgetary calculations such as earned value can be carried out at differing levels.

- *Project Scheduling*

This is carried out on the Project Planning Board and at any desired level with updates from forecast to actual dates being carried out automatically. The standard requirements of earliest start/latest start, earliest finish/latest finish and the various types of float can also be determined at any level

- *Project Monitoring*

At any particular level and at any particular time the status of the project can be monitored – either as a snapshot or for trend analysis. Monitoring can be on a cost basis, time basis or combinations of both. Milestones can also be assigned to either WBS elements or Network Activities.

- *Project Reporting and Performance Monitoring*

Both standard reports and customised reports are available. With SAP being a real time system, information which has just been saved is immediately available. Performance monitoring carried out by extract reporting and is enhanced by having the information on hand, in one place and readily extractable.

PS Module Configuration

The fundamental advantage of PS is that it is an integral part of SAP and works off the common database with the entire system being real time. What it also implies is that all the peripheries have to adopt common standards, conventions, and business methodologies. How then did the Water Corporation configure PS to suit its purposes? After all many of PS's features were fully configured for the first time.

Initially work concentrated on the set up of the package, the links, drafting and naming conventions and the business rules. Unfortunately it was soon found that time constraints in implementation program and testing and training liabilities meant that no enhancements, which were seen as desirable in the definition stage, were possible prior to going into operation. Any necessary modifications to the Module would have to be carried out post-changeover. It was thought however that the commonality and integration with the rest of SAP and the features and functionality within the Module were sufficient for its use by PMB. Also Release 4 of SAP was due within two years and in this version it was understood that the PS module had been substantially upgraded. In short the risk was considered acceptable.

SAP IN OPERATION

An overall implementation timetable was set out, which provided guidance on the tasks required, the preferred order of tasks and likely durations. Over 1400 people were trained over a six week period, the training being tailored to a person's specific role and priority. Enormous amounts of data were converted over to SAP, both Master Data (primarily for reference purposes) and Transactional Data (day to day operations of the Corporation).

The Changeover itself had its own project plan and schedule of over 1500 separate activities. A full dry run was carried out a month prior to the actual changeover. This was necessary because the changeover process itself was sequential - once started it had to continue to its conclusion. In actual fact the changeover was somewhat of

an anticlimax with no real problems and was actually finished ahead of time. On 2 November 1998, SAP (Release 3) was brought on line, replacing all previous Corporate Mainframe Systems.

- **Initial Operations**

PMB 's initial operations with SAP-PS was characterised by the effort by all to carry out whatever task was necessary to make the system work and pay Contractors on time. This effort included creating all the WBS activities, purchase orders and outline agreements as well as the project structures themselves. It was during this phase that the first shortcomings in the system became apparent.

Firstly a considerable amount of the WORKS' project structures were transferred across to SAP-PS. Unfortunately this proved fruitless as no future cashflow information transferred across nor was any contract information was brought over. Also the initial configuration of having one network per contract proved to be unworkable. Contracts categorisation had to be changed from external activities to general cost activities to reflect multiple payments, resulting in the loss of many drill down features and negated much of the Project Analyst training. In addition, process guidelines had not been properly thought out for contract variations and retention monies. Despite all this, all commitments and payments were made on time and the system was in place and operational.

- **Interim Modifications**

To fix these faults a number of interim modification were made. A baseline WBS was created with a number of standard activities and milestones, and enhanced to suit the particular project. Networks were created on the basis of only one network per project. A number of standard reports were also rewritten in order to meet customer requirements.

In short, progress was being made. Unfortunately external requirements then overtook the pace of the improvements. The Corporation required all cashflows, by period, for all projects, for the 1999/00 to be available by the end of July 1999. It was found that this requirement was impossible to achieve in this time frame without excessive effort within the current network based SAP-PS system. The decision was made therefore to download the planning data into an offline database, process it there to give the required cashflow information and then input it back into SAP-PS for project execution.

- **Present System**

This changeover occurred on 14 - 16 July 1999. The new arrangement was that all project planning would be carried out offline by a variety of means. The WBS structures were to remain in place as were the networks but these used only for cost accruals. The planning functions of PS being now only minimally used. The module is currently being mainly utilised as an accounting and financial management package, and as a data collector and presenter for the purposes of project reporting and monitoring.

- **Future Plans**

Currently the Water Corporation is engaging a SAP Consultancy team is to either find solutions or recommend plans of action to meet the Project Management and Reporting needs of the Corporation. The ultimate plan is dependent upon the findings of the consultancy group but two main options are apparent. The first is to provide a bolt-on fix with a sophisticated seamless interface with SAP. The second , to implement a future user friendly, up to date and flexible release of SAP-PS that meets the requirements of the Corporation and PMB.

While this state of affairs could be seen as an indictment of PS, it must be remembered that: it is in operation; it is interfacing with the rest of SAP; project information is available to all users; and all projects have their SAP structures in place. It is only the planning and scheduling aspects which have been turned off and are being carried out offline.

DISCUSSION

In summary then, as part of the new ERP implementation process a review of the legacy systems were carried out. It was found that repair was not cost effective and replacement was the only option. The SAP package was chosen because it provided the best option to replace the General Ledger, Works and the Stores Management Information Systems. These were the primary legacy systems which were vital to the operation of the Water Corporation.

SAP's PS Module was also adopted as there appeared to be considerable benefits in doing so, despite concern about its relative immaturity. After all PS appeared to possess most of the features required of a PMIS, in

particular, integration. The system was tested, business rules promulgated, processes documented, data converted over, staff training organised and run and went live on time.

Once the system went live, a number of minor problems arose, mainly to do with data transfer, project structure, contract categorisation and the process guidelines. The primary concerns were PS's project planning functions and in particular, cashflows. The SAP-PS scheduling package was simply not powerful enough for the work required of it. In the end, corporate needs forced change. Planning and scheduling functions are now being carried out offline.

There were considerable spinoff benefits as an intranet and personal E-mail were used to adapt PMB's existing guidelines, processes and procedures to the new environment. The introduction of SAP forced PMB to upgrade its own procedures and systems, which in turn assisted in the implementation of SAP-PS and improved the PMB's performance overall, especially in its role as the Project Management Centre of Expertise for the Water Corporation.

This was achieved firstly with the Branch Quality System being rewritten to reflect the changes in roles, responsibilities and relationships, which the implementation of SAP had brought about. All documents were posted on the Intranet and available instantly to any user. Secondly, the Branch Procedures were enhanced with PMB's home page going on-line only three days after SAP-PS and the procedures similarly disseminated. They now have hypertext links to the relevant documents, built in responsibility matrices and complete cross-linking into the relevant SAP module.

CONCLUSIONS

Introducing a new ERP system poses a great challenge to an organisation's leadership. It seems the Water Corporation successfully faced that challenge. The SAP package was implemented with out any major disruption. Particularly, the SAP-PS module, which is the focus in this paper, was configured and implemented on time. Apart from initial teething problems, modifications were made to increase its effectiveness. All contracts and project details have been loaded onto SAP-PS and to date no project has been held up because of its introduction. Also the SAP-PS module improved the visibility of projects throughout the Corporation.

PMB implemented a fully integrated project planning and management package. It has new on-line procedures and management systems. Project structures, budgets, costs, and expenditures are all working as planned. In the overall it can be said that project management in the Water Corporation has advanced as a result of the implementation of the SAP package. However, detailed evaluation reveals that the planning and scheduling functions of SAP-PS module are not up to the demands placed on it by the PMB and the Corporation. Fortunately, this limitation could be overcome with the use of existing scheduling software, namely P3, in the organisation.

Acknowledgment: The authors appreciate the opportunity provided by the Water Corporation to use its experience as a basis of this case study. The opinions and interpretations expressed in this paper are however, those of the authors alone and in no way are representative of the Water Corporation.

REFERENCES

- Bailey A., (1998), "Uh-Oh. It's a Computer Systems Project...", *IEEE Engineering Management Review*, winter 1998, pp.21-25.
- Black, J.D. 1999. Enterprise resource planning- spatial information meets business process software in cyberspace. *GeoWorld*, 12(4), pp. 38-40.
- Cleland D. I., (1991), "Product design teams: The simultaneous engineering perspective", *Project Management Journal*, No.4, Vol XXII, pp.5-10.
- Kirschner, E.M. 1997. Running on Information. *Chemical and Engineering News*, volume 78, p. s17.
- Laughlin, S.P. 1999. An ERP Game Plan. *Journal of Business Strategy*, 20(1), pp. 32-37.
- Parsaei H. R. and Sullivan W. G., editors, (1993), *Concurrent Engineering: Contemporary issues and modern design tools*, First edition, Chapman & Hall, London
- Skelton T.M, Thamhain H.J., (1993), "Concurrent project management: A tool for technology transfer, R&D-to-market", *Project Management Journal*, No.4, Vol XXIV, pp.41-47.
- Wagle, D. 1998. The Case for ERP Systems. *The Mckinsey Quarterly*, number 2, pp. 130-138.