

# A DELPHI EXAMINATION OF PUBLIC SECTOR ERP IMPLEMENTATION ISSUES

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## **Abstract**

*A Delphi survey of ERP life cycle management issues was conducted within five agencies of the Queensland government. The five agencies each implemented SAP Financials at around the same time using the services of a common implementation partner. Responses were elicited from ERP project participants, from managers at the agencies, and from users of the financial systems. Valid questionnaires were returned from 61 respondents in the first round survey (response rate = 55%) and yielded 274 perceived issues. Through two rounds of the Delphi survey, these issues have been summarized and categorized into 10 major issue categories (with 38 sub-issues). The final survey round in which respondents will assign weights to these issues is currently underway. Lessons drawn from this study will assist in understanding the ERP life cycle and specific characteristics of the public sector ERP life cycle, and will provide insights into the strengths and weaknesses of ERP systems for public sector organizations.*

## **1. INTRODUCTION**

Organizations world-wide are moving away from developing information systems in-house and are instead installing enterprise resource planning (ERP) systems and other packaged software (AMR Research 1998; Price Waterhouse IT Surveys 1995). More recently, ERP sales have declined for several of the main vendors. Regardless, the outlook through to 2004 is for a compound annual growth rate of 11.4 for license, maintenance, and related service revenue associated with enterprise resource management applications (IDC 2000). The sustained interest in implementing ERP systems, and the consequent life cycle issues, provide the rationale for this study, which deals specifically with major ERP life cycle implementation, management and support issues in the context of the public sector (this need is espoused in Gable 1998; Gable et al. 1997, 1998).

Although increasingly widespread, and despite warnings in the literature (Boston Consulting Group 2000; Standish Group 1996), many organizations appear to underestimate the issues and problems often encountered throughout the ERP life cycle. ERP life cycle-wide implementation, management, and support are ongoing concerns. The pre-implementation, implementation, and post-implementation stages continue throughout the lifetime of the ERP as it evolves with the organization (Dailey 1998). As the number of organizations implementing ERP increases and ERP applications within organizations proliferate (Bancroft 1998; Davenport 1996; Hiquet et al 1998; Shtub 1999), improved understanding of ERP life cycle management issues is required so that implementation, development, management, and training resources can be allocated effectively (Gable 1998). Understanding life cycle management issues will also help direct the ERP research agenda.

Although deployment of ERP systems originated in the private sector, public sector organizations, driven largely by efficiency concerns, are increasingly adopting ERP to replace existing control and operational systems. The Queensland Government Financial Management System (QGFMS) was introduced in 1983 to provide a common financial management system to state

government agencies. In the subsequent decade, QGFMS continued to evolve to support new initiatives and changes in the business and public sector environments. In 1995, the Queensland Government selected SAP R/3 Financials to replace the existing QGFMS across all state government agencies. Later some agencies extended their SAP implementations with Payroll and Human Resources modules under a separate central government initiative. The Queensland Government has not extended SAP software beyond Financials and Human Resources in any centrally planned way. By the end of 1999, most agencies had completed their initial implementation. A standard accounting environment driven by central government (Treasury) regulation combined with other centrally driven reporting requirements and standard software (SAP Financials) provided an excellent research opportunity. Despite SAP Financials having been in place for a considerable period in some agencies, new issues associated with the ongoing support and evolution of the SAP Financials continue to arise. Unlike the traditional view of operational information systems that describes a system life cycle in terms of development, implementation, and maintenance, examination of ERP systems is revealing that their life cycle involves major iterations. Following the initial implementation are subsequent revisions and re-implementations that go far beyond what would normally be considered system *maintenance*.

The research project described in this paper was designed to explicate the major issues in relation to the ERP life cycle within several public sector departments. In order to obtain a broad view of these issues, a Delphi approach was adopted to systematically identify and determine the major issues from individuals involved with SAP Financials within five Queensland state government agencies. To incorporate multiple perspectives, respondents were drawn from client and implementation partner groups.

## 2. RESEARCH OBJECTIVES

The study design began with a broad research question: “What do individuals consider have been the major issues in implementing, managing, and/or supporting the ERP life cycle in relation to the adoption of SAP Financials in their organizations?”

Working with data collected from the two stakeholder groups (clients and implementation partners), the analysis is guided by the following research questions:

- What are the major SAP Financials implementation, management, and support issues faced by the stakeholder groups?
- What are the relationships between the issues identified?
- How do stakeholders rate the relative importance of these issues?
- What are the points of consensus and difference between the stakeholder groups?
- What recommendations does this study suggest with respect to ERP life cycle implementation, management, and support?

The research described in this paper has several objectives. First, the research is designed to elicit a comprehensive catalogue of concerns with respect to public sector ERP installations. Second, the research will highlight the special concerns of some important demographic groups in government agencies. Third, it serves to focus discussion and promote constructive interaction for the purpose of developing an increasingly sophisticated understanding of the nuances of both ERP life cycle management generally, and of ERP life cycle management within the public sector in particular.

All key players in ERP life cycle support are potential beneficiaries of a better understanding of these issues. ERP software vendors seek to redress negative perceptions that ERP implementation duration and costs are difficult to manage, and to improve ongoing customer support and satisfaction. Consulting firms seek to streamline implementation and share in the savings with clients. Both software vendors and consultants seek to increase the size of the ERP market through reduced costs and increased benefits to clients. Also, to the extent that software vendors and their implementation partners are more attuned to the issues identified, they will be well placed to further support clients throughout the ERP life cycle. Potential benefits to clients from identifying and analyzing ERP life cycle support related issues include rationalized and more effective support from both the software vendor and implementation partner, improved ability to react to a changing environment, lower costs, and ERP systems that more accurately reflect business needs.

## 3. THEORETICAL FOUNDATIONS

ERP systems are largely a product of the increasing competitive forces within global and domestic markets. ERP systems have begun in recent years to revolutionize the ways in which organizations conduct their business processes and functions. Although

ERP systems hold the promise of better resource planning and execution together with improved product and service delivery, implementing ERP is, for many organizations, their largest ever project, bringing with it considerable risk (Gable 1998). A recent Boston Consulting Group survey of 100 executives of leading companies found that only one in three ERP initiatives was considered successful (Boston Consulting Group 2000). This difficulty with effectively implementing ERP systems suggests that many organizations do not appreciate the issues and problems typically encountered during the ERP life cycle. The research described in this paper is targeted at developing a better understanding of these issues.

The data collection method adopted in this study is based on the Delphi method developed at the Rand Corporation in the 1950s (Dalkey and Helmer 1963). The method uses an iterative feedback technique with a group of experts and is particularly useful for aggregating the judgements of several dispersed individuals (Bass 1983). It is a technique for the systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses (Delbecq et al. 1986).

The Delphi method has been used to evaluate strengths and weaknesses of information systems relative to developmental planning and key issues and problems in information systems management. For example, the identification and prioritization of key issues in information systems management that are critical to U.S.-based IS managers, was the focus of a study by Dickson and Nechis (1984). A similar approach was used in subsequent studies by Brancheau and Wetherbe (1987) in the USA; Watson (1989) in Australia; Niederman et al. (1991) in the USA; Pervan (1993) in Australia; Dexter et al. (1993) in Estonia; Dekleve and Zupancic (1996) in Slovenia; and Brancheau et al. (1996) in the USA, to investigate critical information systems management issues. Watson and Brancheau (1991) recommended that the Delphi method is appropriate for comparing and contrasting current findings with those of earlier similar studies, and that such an approach contributes to a cumulative IS management discipline.

Despite the extensive background literature concerning the application of the Delphi method to IS key issues studies, the actual step-by-step processes for generating a comprehensive and meaningful set of major IS issues from diverse survey responses has not been adequately reported. Researchers contemplating the use of a Delphi approach are confronted with a range of methodological issues and find little in the literature to guide their choices with respect to data analysis; for example, (1) how to deal with a large amount of non-numerical, unstructured, and rich data, (2) how to select between alternative coding/indexing systems, (3) how to ensure those issues identified accurately reflect the respondents' intentions, and (4) how tools or approaches can be used to manage textual data to support the process of qualitative concept building, typology construction, and theory development.

The data analysis complexities in this study stemmed from two main sources. First, in order to get broad coverage of the ERP implementation issues, the respondent group was intentionally diverse. The respondent group included managers involved with the project, internal IS personnel, personnel from the external implementation partners, agency personnel involved with the development, and user groups. Second, in order to yield issues across the full ERP implementation life cycle, the initial survey question was deliberately very general in scope. Responses to the first round of the survey were consequently diverse, making data analysis more complex than is the case for simpler Delphi studies. The research team found little in the extensive Delphi literature to direct the data synthesis efforts.

#### **4. METHOD: THE PUBLIC SECTOR SURVEY**

Individuals from the vendor (SAP), the implementation partners ("big 5" consulting firms and large regional firms), and five closely related Queensland government client agencies were selected and contacted for participation in the study. To qualify for participation in the study, individuals were required to have had substantial involvement with SAP Financials in one of the target government agencies. Each person was asked to specify the issues they experienced in relation to the implementation, management, and ongoing support of the SAP Financials system with which they were/are involved.

A three-round, non-anonymous Delphi type survey was adopted using personalized e-mail with an attached survey instrument. The objective of the first round of the study was to "inventory" the major issues experienced to that time. Having structured a preliminary set of major issues, a second survey round sought confirmation of this set of issues and further comments. After reviewing the feedback from the first two rounds, a final round will seek respondents' scores on the relative importance of the major issues.

In the process of coding the survey responses, several potential coding schemes were examined and tested. Attempts to code the data to existing models (e.g., the MIT'90s framework) failed to provide a satisfactory level of discrimination between substantive issues, thus an open coding approach was adopted as a means of structuring the issues identified in the first survey round. The major strength of the open coding approach is that this form of coding is data driven: the categories so formed reflect the range

of issues that were collected as data rather than some pre-defined scheme. Because the categories are determined from the data themselves, respondents should comprehend them more readily in subsequent survey rounds. Multiple coders were used for the open coding procedure. A panel of domain experts from within the government agencies then examined the resulting coding scheme to establish content validity; discrepancies were discussed with the research team. Multiple coders were then used to test coding reliability.

## 5. CURRENT STATUS OF THE STUDY AND PRELIMINARY RESULTS

A total of 116 questionnaires were distributed to individuals who have had substantial involvement with the five government agencies' SAP Financials project. A total of 71 questionnaires were returned, yielding a 64% response rate. A total of 61 valid questionnaires were eventually obtained from the first round survey, providing a net response rate of 52%. In all, 274 issues were identified from the 61 respondents, or 4.5 issues per respondent on average. Table 1 shows the profiles of respondents and Table 2 the first round responses grouped by agency.

**Table 1. Profile of First Round Respondents**

<b>Roles of Involvement</b>	<b>Count</b>	<b>Duration of Involvement</b>	<b>Count</b>
Steering Committee Member	13%	Within 1 year	39%
Project Manager	3%	1 to 2 years	43%
Consultant	15%	2 to 3 years	15%
Business Process Team Member	25%	3 to 5 years	3%
Power User	21%		
Trainer	5%		
Help Desk Team Member	3%		
Change Management Team Member	7%		
Developer	5%		
Administrator	3%		
<b>Total</b>	<b>100%</b>		<b>100%</b>

**Table 2. First Round Responses by Agencies**

<b>Agencies Involved</b>	<b>Non-Respondents</b>	<b>Not able to Participate</b>	<b>Respondents</b>	<b># Surveyed</b>	<b># Issues Collected</b>
Agency A	15	2	33	50	136
	14%	2%	31%	46%	50%
Agency B	4	2	12	18	53
	4%	2%	11%	16%	19%
Agency C	12	4	3	19	14
	11%	3%	3%	17%	5%
Agency D	7	1	6	14	37
	6%	1%	5%	13%	14%
Agency E	2	1	7	10	34
	2%	1%	6%	9%	12%
<b>Total</b>	<b>40</b>	<b>10</b>	<b>61</b>	<b>111</b>	<b>274</b>
<b>Total %</b>	<b>37%</b>	<b>8%</b>	<b>55%</b>	<b>100%</b>	<b>100%</b>

The coding procedure resulted in a set of 10 major issue categories (Table 3) with 38 sub-issues (Appendix A). In a broad coding of the first round responses, 56% of respondents identified issues concerning knowledge management (difficult to retain people with SAP skills due to market pressure to leave, etc.), 52% of individuals referred to issues in system development (frequency of SAP upgrades places a large burden on system maintenance, etc.), 49% nominated operational deficiencies as major issues (operational deficiencies that impact the accuracy and efficiency of operations and ease of use of the system, etc.), 26% of respondents rated organisational context as a source of issues (diversity of government systems makes integration difficult, etc.), 25% of respondents rated system performance as inadequate to meet operational requirements, 20% related specifically to the implementation costs and benefits of the systems (complexity of SAP far exceeds the requirements of some agencies, etc.), and 20% of respondents specified ongoing support for the SAP systems as inadequate.

**Table 3. Categorization of Issues in the Preliminary Set of Major Categories**

Issue Categories	Respondents Who Nominated the Issue		Issues Distributed by Categories	
	#	%	#	%
Knowledge management	34	56%	37	14%
System development	32	52%	63	23%
Operational deficiencies	30	49%	67	24%
Organisational context	16	26%	28	10%
System performance	15	25%	17	6%
Cost/benefit	12	20%	20	7%
Support	12	20%	14	5%
Data Conversion	8	13%	8	3%
Lack of consultation	6	10%	8	3%
Indeterminate	4	7%	5	2%
Reluctance to accept dissenting view	3	5%	7	3%
Total			274	100%

## 6. SUMMARY OF RESEARCH RESULTS TO DATE

As more organizations implement Enterprise Resource Planning (ERP) systems, issues in implementing, managing and supporting ERP projects have become a major concern. This study seeks to explore the nature and severity of issues related to ERP life cycle management. Through two rounds of a Delphi survey, a set of 10 major issue categories with 38 sub-issues has now been identified for further comment and evaluation by respondents. The validity and reliability of this synthesized set of major issues has been tested through the use of multiple coders, feedback from senior management responsible for the ERP implementation across Queensland Government, and a confirmation e-mail to respondents clearly indicating the linkage between their specific issues (274) and the sub-issue categories (38).

Using incidence of nominations as an early crude indicator, it would appear at this stage that ERP knowledge management is most problematic, followed closely by system development concerns and operational deficiencies.

In the final round of the survey, respondents will rate the relative importance of the issues. The final round survey instrument is, as at this writing, being pilot-tested and will be sent by electronic mail to the respondents during September 2000. Consistent with past IS major issues studies, respondents are being asked to score each of the sub-issues on a scale from 1 to 10 where 1 indicates the issue is “not important” and 10 indicates the issue is “very important.” It is expected that these data will allow interesting and revealing analyses (1) ranking the issues on perceived importance, (2) clustering respondents based on issue scores, thereby identifying the existence of respondent groups with clearly differing perceptions or priorities, and (3) comparing respondent groups: across clusters; across clients, vendors, and implementation partners; across various demographic groupings (e.g., agency, level in organization).

These analyses, combined with further intended workshops with respondents, and case studies of the individual agencies, are expected to yield valuable insights into ERP life cycle issues that are important to user organizations, implementation partners, and ERP software vendors, and also for the IS community at large.

## References<sup>1</sup>

- AMR Research. "AMR Research Predicts Industrial Enterprise Applications Market Will Reach \$72.6 Billion By 2002," *AMR* (www.amresearch.com/press/981102.htm; March 20, 1999).
- Bancroft, N. H. *Implementing SAP R/3: How to Introduce a Large System Into a Large Organization* (2<sup>nd</sup> ed.), London: Manning/Prentice Hall, 1998.
- Bass, B. M. *Organizational Decision Making*, Homewood, IL: Irwin, 1983.
- Boston Consulting Group. "Getting Value from Enterprise Initiatives: A Survey of Executives," *Boston Consulting Group* (www.bcg.com/news/enterprise\_report; March 31, 2000).
- Brancheau, J. C., and Wetherbe, J. C. "Key Issues in Information Systems Management," *MIS Quarterly* (11:1), March 1987, pp. 23-45.
- Brancheau, J. C., Janz, B. D., and Wetherbe, J. C. "Key Issues in Information Systems Management: 1994-95 SIM Delphi Results," *MIS Quarterly* (20:2), June, 1996, pp. 225-242.
- Dailey, A. "SAP R/3: Managing the Life Cycle," *GartnerGroup, Symposium/Itxpo 98*, Brisbane, Australia, October 28-30, 1998.
- Dalkey, N. C., and Helmer, O. "An Experimental Application of the Delphi Method to the Use of Experts," *Management Science* (9:3), April 1963, pp. 458-467.
- Davenport, T. E. "Holistic Management of Megapackage Change: The Case of SAP," in *Proceedings of the AIS Americas Conference on Information Systems*, Indianapolis, IN, August 16-18, 1996, pp. 51a-51c.
- Delbecq, L., Van de Ven, A. H., and Gustafson, D. H. *Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes*, Middleton, WI: Green Briar Press, 1986.
- Dekleve, S., and Zupancic, J. "Key Issues in Information Systems Management: A Delphi Study in Slovenia," *Information & Management* (31), 1996, pp. 1-11.
- Dexter, A. S., Janson, M. A., Kiudorf, E., and Laast-Laas, J. "Key Information Technology Issues in Estonia," *The Journal of Strategic Information Systems*, June 1993, pp. 139-152.
- Dickson, G. W., and Nechis, M. "Key Information Systems Issues for the 1980's," *MIS Quarterly* (8:3), September, 1984, pp. 135-159.
- Gable, G. G. "Large Packaged Software: A Neglected Technology?," *Journal of Global Information Management* (6:3), Summer 1998, pp. 3-4.
- Gable, G. G., Scott, J., and Davenport, T. "Cooperative EWS Life-Cycle Knowledge Management," in *Proceedings of the Ninth Australasian Conference on Information Systems*, September 29 – October 2, 1998, Sydney, Australia, pp.227-240.
- Gable, G. G., van Den Heever, R., Erlank, S., and Scott, J. "Large Packaged Software: The Need for Research," in *Proceedings of the Third Pacific Asia Conference on Information Systems*, Brisbane, Australia, April 1-5, 1997, pp. 381-388.
- Hiquet, B. D., Kelly, A. F., Kelly-Levey and Associates. *SAP R/3 Implementation Guide: A Manager's Guide to Understanding SAP*, New York: Macmillan Technical Publishing, 1998.
- IDC Software Research. "Enterprise Resource Management Application Market Forecast and Analysis, 2000-2004," *IDC Software Research*, #22326, June 2000.
- Niederman, F., Brancheau, J. C., and Wetherbe, J. C. "Information Systems Management Issues for the 1990s," *MIS Quarterly* (15:4), December 1991, pp. 474-500.
- Pervan, G. P. "Information Systems Management: An Australian View of The Key Issues," *Proceedings of the Fourth Australian Conference on Information Systems*, Universtiy of Queensland, St. Lucia, Brisbane, Queensland, September 28, 1993.
- Price Waterhouse. "Information Technology Survey," Price Waterhouse, London, 1995.
- Shtub, A. *Enterprise Resource Planning (ERP): The Dynamics of Operations Management* (2<sup>nd</sup> ed.), Dordrecht: Kluwer Academic Publishers Group, 1999.
- Watson, R. T. "Key Issues in Information Systems Management: An Australian Perspective – 1988," *The Australian Computer Journal* (21:2), August 1989, pp. 118-129.
- Watson, R. T., and Brancheau, J. C. "Key Issues in Information Systems Management: An International Perspective," *Information & Management* (20), 1991, pp. 213-223.

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<sup>1</sup>The following reference list contains URLs for World Wide Web pages. These links existed as of the date of submission but are not guaranteed to be working thereafter. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced. The author(s) of the Web pages, not ICIS, is (are) responsible for the accuracy of their content. The author(s) of this article, not ICIS, is (are) responsible for the accuracy of the URL and version information.

## Appendix A. Categorization of Sub-issues

Major Issue	Sub-Issue
<b>Cost/Benefit</b>	<ul style="list-style-type: none"> <li>• Complexity (and therefore cost) of SAP far exceeds the requirements of some agencies</li> <li>• Complexity of SAP drives costs beyond reasonable limits</li> <li>• Costs of SAP exceed those of QGFMS without commensurate benefit</li> <li>• SAP implementation benefits do not justify costs</li> </ul>
<b>Data Conversion</b>	<ul style="list-style-type: none"> <li>• Errors were found in data converted from former QGFMS</li> </ul>
<b>Knowledge Management</b>	<ul style="list-style-type: none"> <li>• Difficult to retain people with SAP skills due to market pressure to leave</li> <li>• Insufficient resources and effort put into developing in-house knowledge</li> <li>• Training provided was inadequate and did not cover the diversity of circumstances encountered in normal daily operations</li> </ul>
<b>Lack of Consultation</b>	<ul style="list-style-type: none"> <li>• Lack of consultation with operational level users meant that operation requirements were not met</li> </ul>
<b>Operational Deficiencies</b>	<ul style="list-style-type: none"> <li>• Developing reports is difficult in SAP</li> <li>• Not all required reports were available at implementation time</li> <li>• Operational deficiencies that impact the accuracy and efficiency of operations and the ease of use of the system</li> <li>• Persistent minor errors and operational issues have not been rectified</li> <li>• SAP is not sufficiently integrated with other systems</li> <li>• SAP lacks some functionality of QGFMS</li> <li>• Security is difficult to maintain in SAP resulting in some users being granted too much access and others not having access to data they need</li> </ul>
<b>Organizational Context</b>	<ul style="list-style-type: none"> <li>• Differences in work ethic among project personnel</li> <li>• Diversity of government systems makes integration difficult</li> <li>• Implementation across multiple agencies led to suboptimization of the system configuration</li> <li>• Lack of leadership at senior levels</li> <li>• Lack of ownership/responsibility by agency personnel at the project level</li> <li>• Political issues had a negative impact on the project</li> <li>• Poor communication between agencies</li> <li>• Timing of implement was inappropriate because of change underway in the public sector</li> </ul>
<b>Reluctance to Accept Dissenting View</b>	<ul style="list-style-type: none"> <li>• Organization appears unable or unwilling to be responsive to requests for changes in the system to resolve operational problems</li> </ul>
<b>Support</b>	<ul style="list-style-type: none"> <li>• Ongoing support for the SAP system is inadequate</li> <li>• Support personnel are inadequately trained</li> </ul>
<b>System Development</b>	<ul style="list-style-type: none"> <li>• Complexity of SAP means few, if any, people understand SAP beyond a single module, making overall design decisions very difficult</li> <li>• Frequency of SAP upgrades places a large burden on system maintenance</li> <li>• Frequency with which requirements changed caused problems for developers</li> <li>• Inadequate system testing left many errors in the implemented system</li> <li>• Issues that arose during, or result from, the development phase of the SAP system</li> <li>• Requested system functionality was sacrificed in order to meet implementation deadlines</li> <li>• Shared knowledge among project team members was a problem - agency staff did not understand SAP and implementation personnel did not understand agency requirements</li> <li>• System documentation is inadequate, particularly with respect to system design and controls</li> <li>• The project team was disbanded when the system was handed over despite many issues remaining unresolved</li> <li>• Too little effort put into redesigning the underlying business processes, resulting in a system that represented a “technology swap” that failed to capture many of the benefits of SAP</li> </ul>
<b>System Performance</b>	<ul style="list-style-type: none"> <li>• System performance is inadequate to meet operational requirements</li> </ul>