Measuring e-Procurement Performance in the Australian Public Sectors: A Preliminary Approach

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Abstract
e-Procurement has drawn great attention and been adopted by increasing number of private and public organisations. However, simply having an e-Procurement system in place does not guarantee that it will bring about benefits in term of improved procurement management. The system must be measured and evaluated. This study discusses the importance of measuring e-Procurement performance and the key elements in successfully developing a measurement framework for e-Procurement in Australian public sector. A “Balanced Scorecard” approach has been suggested. Hopefully, “show-case” of such a tool will motivate and encourage other public sector agencies that are still adopting “wait and see” strategy to adopt e-Procurement.

Keywords
e-Procurement, e-Procurement performance measurement, Key Performance Indicator (KPI), Balanced Scorecard, public sector, e-Commerce

1. INTRODUCTION

1.1 e-Procurement Defined

Purchasing is the act of buying goods and services, whereas procurement encompasses all activities including purchasing involved in obtaining goods and services toward the end user (Gebauer & Segev, 1998). Electronic procurement (e-Procurement) is defined as the use of electronic commerce (e-Commerce) for procurement. It involves the use of electronic technologies such as the Internet to automate and streamline an organisation’s processes – from requisition through to payment (DPWS, 2002, Morris et. al, 2000, Thomson and Singh, 2001). Undoubtedly, e-Procurement is one of the most important enablers of supply chain management.

There are various approaches of classifying e-Procurement models and applications in the literature. Thomson and Singh (2001) propose an e-Procurement model consisting of four quadrants namely Buyer model (few buyers, many sellers), Marketplace Model (many buyers, many sellers), Longer Term Relationship Model (few buyers, few sellers) and Seller Model (few sellers, many buyers). The concept of e-Procurement has many meanings (Knudsen, 2001). Some examples of e-Procurement approaches that have appeared in the literature include e-Marketplace, e-Tendering, e-Ordering, Electronic sourcing, supplier and contract management, Electronic receipt and payment of invoice and e-Auctioning/Reverse Auctioning (DPWS, 2002; DOF 2001, Birks et. al, 2001, Knudsen, 2001).

Although every e-Procurement approach can be utilised in many ways (Knudsen, 2001) to support the seven phases of the procurement life cycle namely 1. information gathering 2. supplier contact 3. background review 4. negotiation 5. fulfilment 6. consumption, maintenance and disposal and 7. renewal (Archer and Yuan, 2000) and the term ‘e-Procurement’ is used to refer to individual approaches of a full e-Procurement system which encompasses procurement/purchasing, audit, finance and Information Technology (IT) (CIPFA, 2002), however, for the purpose of this article, the term “e-Procurement” will be used to refer to electronic procurement in general and not in reference to any specific e-Procurement models or applications.
1.2 e-Procurement: Public Versus Private

Procurement is one area where public sectors can reduce inefficiencies. Unlike procurement in the private sector, public sector procurement must work within regulations and policies established to fulfil social as well as economic goals (Miami-Dade County, 2000). For example, Australian government’s procurement policies are guided by the principles of value for money, accountability, transparency, equity and fair dealings and open and effective competition (APCC, 2002).

The table below points out the objectives for e-Procurement systems in private and public sectors (AMS, 2001 p.3):

<table>
<thead>
<tr>
<th>Private Sector</th>
<th>Public Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase bottom-line profitability</td>
<td>Increase top-level funding availability</td>
</tr>
<tr>
<td>Allow uniform access to standardized supplier information</td>
<td>Create open markets in which every provider can compete</td>
</tr>
<tr>
<td>Leverage buying power of corporation to provide uniform pricing and contracts among multiple divisions and groups</td>
<td>Harness aggregated buying power of the government to achieve dynamic pricing of goods and services</td>
</tr>
<tr>
<td>Increase the speed of the procurement cycle</td>
<td>Improve efficiency of the procurement cycle while meeting all legislative mandates</td>
</tr>
<tr>
<td>Increase compliance with established contracts by reducing off-contract (maverick) purchasing</td>
<td>Ensure compliance with purchasing policies, both within departments and across the government agencies</td>
</tr>
</tbody>
</table>

Table: 1 Objectives of e-Procurement system in private and public sectors (Source: AMS, 2001)

Also, applying the e-Procurement measurement concept to the complex business of the public sector is not as easy as it is in the private sector where profit is the sole goal. Coulthard and Castleman (2001) note that government agendas are more complicated than those of private sectors where efficiency, cost reduction and time savings are sufficient justifications to adopt e-Procurement. The concept of Return on Investment (ROI) has been replaced by “Appropriation Efficiency Factor (AEF)”. According to AMS (2001 p.4),

Any savings that a public sector agency achieves through the implementation of an e-Procurement system increases the funds available for appropriation by decreasing each procurement obligation, hence improving the appropriation efficiency of the agency. The magnitude of this appropriation efficiency, or Appropriation Efficiency Factor (AEF), becomes the public sector equivalent of Return On Investment (ROI).

1.3 e-Procurement: Drivers and Benefits

Why are public sector organisations implementing e-Procurement systems? It is because e-enabling makes the procurement process more economical, efficient and effective. Apart from increased efficiency in Government business, the adoption of e-Procurement greatly assists in the reengineering of Government business processes and can be viewed as a way that Government can lead by example (Coulthard and Castleman, 2001). Talero (2001) emphasises the transparency benefits as e-Procurement can be a major contributor to the anti-corruption campaigns of the government. Also, the elimination of manual processes frees up the time of procurement personnel, allowing them to accomplish more strategic aspects of procurement, such as managing relationships with suppliers (CIPFA, 2002). Other benefits of e-Procurement include: better access to tendering information, increased ability to negotiate and leverage buying power, improved financial management, improved information, communication and knowledge management and innovation in procurement (DPWS, 2002).

Although, each organisation has a specific business case for e-Procurement, Birks et. al, (2001) have identified the most common drivers as increase in contract compliance, collaboration, process improvement, order accuracy, improved value for money and better management information. They further state that benefits for e-Procurement depend on the ability of the organisation to achieve purchase price reduction and process cost savings, which need to be identified and measured against the cost of the initiative. BuyIT (2002) suggests measuring reductions in purchase prices and savings from lower process costs and identifies the five main savings drivers for e-Procurement as Transactional benefits, Payment benefits, Compliance benefits, Management information benefits and Price benefits.
2.0 BACKGROUND

2.1 e-Procurement and e-Government

e-Procurement is without doubt one of the most important topics on the e-government agenda today. Neef (2001, p.109) states that e-Procurement is the most important area of development in the e-Commerce arena – and “if there is one sector in the economy where e-Procurement can and will have an enormous effect, it is government”.

e-Procurement is one of the very important e-Government initiatives currently taking place within the Australian public sectors. Because there is a demand to integrate e-Government and e-Commerce (Kubicek & Hagen, 2001), e-Procurement is the ideal link to enable such integration (Joia & Zamot, 2002).

2.2 e-Procurement Initiatives in NSW

Procurement is an activity of high value. The NSW Government currently spends $17 billion on procurement of capital assets, maintenance and goods and services. It is estimated $130 million per annum will be available after the first 3 years through the wider take-up of e-Procurement (DPWS, 2002). Given this, the NSW Government Electronic Procurement Implementation Strategy sets out goals and targets for moving government procurement online by 2003 and encourages industry to adopt e-Procurement. As approved by the NSW Government for the development of a single e-Marketplace in April 2001 to reform the procurement activities, Australia’s largest online procurement system will be operational within months following the NSW Government’s recent announcement of Logica (please visit www.logica.com for more information), a multinational company, as the winning bidder for its e-Marketplace project. Other current e-Procurement technologies and tools in use or being implemented within the NSW Government sector include (DPWS, 2002):

- e-Tendering (www.tenders.dpws.nsw.gov.au)
- QICS Web (www.qics.dpws.nsw.gov.au)
- Q Stores online (www.qstores.dpws.nsw.gov.au/Q+Stores)
- Service NSW (www.service.nsw.gov.au)

Building on the strategies and actions in the NSW Government Procurement Policy, the NSW Government Electronic Procurement Implementation Strategy, and Construct New South Wales, the recent Smarter Buying for Government strategy provides the framework for procurement reform in NSW. The Audit Office of NSW has released various audit reports on e-Government initiatives in NSW and its latest report Electronic Procurement of Hospital Supplies examines a business-to-business application of e-Government in the NSW public health system.

3.0 THE E-PROCUREMENT CONTEXT AND PERFORMANCE MEASUREMENT

3.1 The Need For E-Procurement Performance Measurement Framework

For the e-Procurement benefits to be measured and the e-Procurement drivers to be understood, a framework for e-Procurement performance measurement has to be developed. Factors that contribute to the development of e-Procurement performance measurement framework include:

- The demand of measures for e-Procurement performance.
- The desire to provide a comprehensive picture of e-Procurement systems to facilitate the managers.
- The desire to help with the newness and complexity of e-Procurement measurement and management.
- The need to motivate and encourage Australian public sector agencies to adopt e-Procurement systems.

The characteristics of the Internet, such as “ubiquity and connectivity, immediacy and interactivity, multimedia and universal interface and ease of use” (Ware et. al, 1998), have the potential to trigger significant changes in traditional procurement (Gebauer et. al, 1998). More specifically, as Subramaniam and Shaw (2002, p. 4) state, “use of e-procurement impacts four major B2B procurement activities – search, negotiation and contracting, coordination, and monitoring and control”. Although some of the issues for traditional procurement are relevant for e-Procurement, other issues and critical “e²”-variables are of increased importance. Therefore, performance...
measurement established for a traditional procurement environment is not applicable to the procurement in the electronic environment. It is inevitable to go beyond traditional procurement metrics and establish dynamic measurement system that focuses on e-Procurement performance.

Krach (2001, p.1) states, “It’s not enough to simply have an e-procurement system in place and assume you are saving time and money – this must be measured and proven”. Needless to say, as the adopters of the first generation public e-Procurement system are struggling to justify the value of the e-Procurement initiative, the e-Procurement performance measurement framework can be used effectively as the basis for convincing the politicians and decision makers.

3.2 e-Procurement performance measurement frameworks – lack of research?

While management and IT companies such as BuyIT, Gartner, Aberdeen and Oracle have carried out market research into e-Procurement measurement, most of these work are limited to measure the financial savings only. Most organisations are trying to compute the value and justify their e-Procurement investment by estimating average savings for a procurement transaction and the transaction volume (Subramaniam and Shaw, 2002). There is little in-depth academic research about the overall e-Procurement performance in public sector agencies.

Some suggestions on e-Procurement metrics can be found in the literature (e.g. OSD 2001, BuyIT 2002, DOF 2001, Birks et al 2001, AMS 2001, Subramaniam and Shaw 2002 etc.). Some literature discusses the project assessment and benefits. However, little detailed information is available on e-Procurement performance measures and there is no common approach in the literature. Nevertheless, some insights can be gained from the literature on what to measure and how to measure some of the tangible e-Procurement benefits such as “Transactional benefits, Payment benefits, Compliance benefits, Management information benefits and Price benefits” (BuyIT, 2002).

3.4 Research Questions

So, the premises as outlined in the previous sections evoke a call for “new” frameworks and methods of assessing e-Procurement performance and there is a need for more comprehensive academic research to fully understand the performance of public e-Procurement. The way to do that in this relatively unexplored field is through an exploratory investigation (Yin, 1994) in order to develop deeper knowledge. The authors of this paper will address the following questions:

What are the specific measures by which the performance of an e-Procurement initiative in the public sectors should be judged?
How should e-Procurement performance in public sectors be measured?

4. CONCEPTUAL FRAMEWORK

4.1 Our approach – Adaptation of the Balanced Scorecard

Robert S. Kaplan and David P. Norton developed a measurement framework that they refer to as “a Balanced Scorecard (BSC)”. Managers use this framework to gain a quick yet balanced view of organisation’s performance. Kaplan and Norton (1996) suggest managers gather information within four performance perspectives: financial, customer internal business processes and learning and growth.

Our adaptation of the Balanced Scorecard for e-Procurement takes into account BSC for the IT function (Grembergen and Bruggen, 1997), IS Scorecard (Martinsons et al., 1999), e-Commerce Scorecard (Hasan & Tibbits, 1999), synthesis of the available literature on e-Procurement (e.g. OSD 2001, BuyIT 2002, Talero 2001, DOF 2001 etc.) and our own insights.

The table below lists the perspectives of the adapted Scorecards by various authors and compares them to the original Balanced Scorecard perspectives and our e-Procurement Scorecard perspectives.

<table>
<thead>
<tr>
<th>Original Balanced Scorecard</th>
<th>The BSC for the IT Function</th>
<th>IS Scorecard</th>
<th>e-Commerce Scorecard</th>
<th>Proposed Scorecard</th>
<th>e-Procurement</th>
</tr>
</thead>
</table>

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To achieve balance in assessing the e-Procurement system, six interrelated set of perspectives as set out in Table 4 have been proposed. The proposed framework suggests the four most relevant perspectives of the e-Procurement Scorecard as Transactional Efficiency and Value For Money (VFM), Business Processes and System Support, Buyers and End-Users, and ICT Adoption and Integration to replace the Finance, Internal Business Process, Customer and, Innovation and Learning perspectives of the original Balanced Scorecard and adds two important new perspectives: Suppliers and Relationships and Transparency and Competition. Based on the literature as mentioned in the above section, the sections below briefly describe these perspectives with some illustrative example of Key Performance Indicators (KPI’s) for each perspective.

### 4.2 The Six Perspectives and the KPI’s

#### 4.2.1 Transactional Efficiency and Value for Money (VFM)

Value for money (VFM) is defined as “the optimum combination of whole-life cost and quality (or fitness for purpose) to meet the user’s requirement” (Europe Economics, 2001, p.9). The objective can be to maximise VFM for the organisation’s expenditure by enhancing the buying power. Transactional efficiency that contributes to Value for Money can be attributed to cost savings through time savings associated with the processing of various transactions to gain maximum Appropriation Efficiency Factor (AEF- public sector equivalent of ROI). While AEF impacts the financial aspects directly, VFM will have an indirect impact on the financial aspects of e-Procurement. There are different approaches to measure this financial perspective in the literature.

The table below lists some KPI’s for this perspective.

<table>
<thead>
<tr>
<th>Metric</th>
<th>KPI’s</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit cost reduction</td>
<td>Variance in the percentage of on contract expenditure vs. baseline data</td>
<td>Periodic reports and surveys</td>
</tr>
<tr>
<td>Fees paid to contractors</td>
<td>Variance in the percentage of transaction cost savings vs. baseline data</td>
<td>Surveys</td>
</tr>
<tr>
<td>Appropriation Efficiency Factor (AEF)</td>
<td>Variance in planned vs. actual AEF</td>
<td>Surveys</td>
</tr>
</tbody>
</table>

Table 3: Transactional Efficiency and VFM

#### 4.2.2 Buyers and End-Users

The objective of this perspective is to ensure that buyers and end-users are satisfied with the outcomes of their procurement activities and will receive the best help when they have a problem. It is important to know to what extent the e-Procurement solution allows the buyers and end-users to interact with suppliers. Buyers and end-user satisfaction levels (percentage/ degree of satisfaction with timeliness, flexibility and responsiveness) can be recommended as one of the KPI’s which can be measured by dividing the responses indicating a satisfied or higher degree of satisfaction by the total number of responses.
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<table>
<thead>
<tr>
<th>Metric</th>
<th>KPI’s</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier satisfaction</td>
<td>The percentage of supplier satisfaction vs. baseline data/pre-determined goals</td>
<td>Surveys, interviews</td>
</tr>
<tr>
<td>e-Commerce Adoption</td>
<td>Rate of current email usage vs. baseline data</td>
<td>Surveys</td>
</tr>
<tr>
<td></td>
<td>Extent of the Internet access vs. baseline data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of e-Commerce transactions etc. vs. baseline data</td>
<td></td>
</tr>
<tr>
<td>Supplier performance</td>
<td>Level of adherence to Service Level Agreements (SLAs)</td>
<td>Surveys, periodic reports</td>
</tr>
<tr>
<td></td>
<td>Unit cost reduction because of volume purchasing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level of service quality</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Suppliers and Relationships

4.2.4 Business Processes and System Support

This perspective looks at how well the system supports the procurement needs of the organisation. Quality of the procurement process can be one of the KPI’s which can be measured by the proportion of business orders rejected or returned by the user (Subramaniam and Shaw, 2002). Similarly, the quality of system support can be measured by looking at system availability/responsiveness, resolution of technical issues.

<table>
<thead>
<tr>
<th>Metric</th>
<th>KPI’s</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of business process</td>
<td>Proportion of rejected/returned business orders</td>
<td>Surveys</td>
</tr>
<tr>
<td>Efficiency of business process</td>
<td>Increase/decrease of average turnaround time vs. baseline data</td>
<td>Periodic reports</td>
</tr>
<tr>
<td>System availability</td>
<td>Increase/decrease in average uptime vs. baseline data</td>
<td>Periodic reports</td>
</tr>
<tr>
<td>Resolution of technical issues</td>
<td>Percentage of technical issues resolved vs. baseline data</td>
<td>Help desk calls</td>
</tr>
</tbody>
</table>

Table 6: Business Processes and System Support

4.2.5 ICT adoption and Integration

This perspective looks at measuring the innovation and progress in the adoption of procurement related Information and Communication Technologies (ICT). Addressing innovation and ICT adoption progress ensures that the e-Procurement solution will be unified within the e-Business and supply chain framework of the organisation. This perspective looks at measuring improvements in the e-Procurement solution, adoption of new modules and features to support procurement and integration of e-Procurement with other systems such as accounting, finance and human resources over time.

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Table 7: ICT adoption and Integration

4.2.6 Transparency and Competition

Talero (2001) suggests that effective transparency in public procurement depends on the timeliness, quality, and accessibility of procurement information. The objective of this perspective is to improve the transparency of public procurement expenditures while maintaining competition.

Table 8: Transparency and Competition

The above KPI’s are a representative but not an exhaustive list and a public sector agency may choose to use other specific or additional KPI’s in accordance to its specific e-Procurement strategic objectives and the solution.

5.0 RESEARCH APPROACH

5.1 Case Study

Our case study will be focused on the public health sectors that have already implemented e-Procurement systems or Area Health Services (AHSs) that are in the process of doing so as a part of “whole-of-government” program under the NSW Department of Public Works and Services.

NSW Health organisations spend an estimated $1.2 billion annually on goods and services (PPC, 2001). “Reform of procurement in the NSW public health system is a huge, complex and difficult task” (AO, 2002, p.2). But, unfortunately, NSW Health organisations still lack the ability to fully exploit their dominant purchaser position (PPC, 2001) and “there is no robust system for capturing and measuring procurement costs at any level of the NSW public health system” (AO, 2002, p.22). This represents a significant necessity to measure e-Procurement performance in the NSW public health sector.

In this regard, we purpose employing an embedded case research methodology (Yin, 1994) as multiple units of analysis will be considered and measured. Following Yin, our emphasis will be to study contemporary phenomena within real life contexts as the research questions present an exploratory look at measuring e-Procurement performance.

5.2 The Research Design

The research project will be carried out in two phases. The first phase starts with interviewing the various stakeholders and gaining an initial understanding of the e-Procurement initiative and deriving KPI’s from the e-CollECTeR 2002.
Procurement strategies/objectives of the case study organisation. The information gathered will be utilised to develop and refine valid KPI’s for each perspective of the e-Procurement performance measurement framework that address the unique e-Procurement environment of the organisation. A set of questionnaires will be developed and sent to various stakeholders and/or the periodic reports will be extracted from various Management Information Systems (MIS’)/e-Procurement solution for each perspective of the framework as required. Then, the responses from the questionnaires and reports will thus be utilised to establish baseline data for each KPI for a realistic goal.

In the second phase of the project, the same set of questionnaires will be sent to the same stakeholders and/or periodic reports will be extracted in the same manner over time (say, after one year) for each perspective of the framework as required. Then, the responses will again be analysed to come up with the performance data which will compared with the baseline data to determine the level of performance. The project is anticipated to be completed by the end of 2004. The figure below shows an overall process views of the research project.

![Fig 1: e-Procurement performance measurement process](image)

Our measurement process should be viewed as part of an ongoing learning process. It allows for changes to be incorporated into to a new or existing e-Procurement functionalities or approaches in order to meet organisational goals.

5.3 Data Collection Approach

Our data collection approach will be guided by the e-Procurement performance measurement framework and it will be important to adequately complement between quantitative and qualitative data. The quantitative data/periodic reports will be extracted from various Management Information Systems (MIS’)/e-Procurement solution, contract database, helpdesk calls and various surveys. Similarly, the sources for qualitative data will be user/supplier perception questionnaires, anecdotal evidence from user departments and suppliers, literatures/best practices, documentations (procedures, policies or manuals etc.) and interviews as necessary and when practicable. The purpose of using variety of data collection approach is to increase the reliability and validity of the baseline and performance measures.

6.0 CONCLUSIONS AND DISCUSSIONS

Adaptation of the Balanced Scorecard to e-Procurement provides a framework for the design of the performance measurement system that includes both financial and operational measures and is a very useful learning experience in itself. The real benefits of the e-Procurement Performance Measurement System can be realised only when it becomes a part of the day-to-day operations.

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International experiences indicate that the rate of adoption will not accelerate until the agencies with e-Procurement systems in place share their positive experiences regarding perceived technology (Davila, 2002). The ultimate success of the e-Procurement initiatives depends on the participation of public sector agencies and private enterprises. As the e-Procurement initiatives in Australia have been developed on the principle of encouraging rather than mandating public sector agencies to participate (DCITA, 2000), it is very important and necessary to “show-case” such a measurement tool to motivate and encourage public sector agencies and their suppliers that are adopting a “wait and see” strategy to adopt e-Procurement systems.

As the audit report on Electronic Procurement of Hospital Supplies (AO, 2002, p.42) concludes, “there is a need to establish more robust performance management controls and systems over the supply chain to ensure greater accountability for and transparency of public expenditure”. Measuring e-Procurement can provide public sector agencies with deep understanding of the mechanisms that drives their e-Procurement performance. It is acknowledged that it is not an easy task, although it is something which Australian public sectors must seek to address, if they are to remain competitive in the information economy.

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