Towards a framework for the adoption of Business Intelligence in public sector organisations: the case of South Africa

Kaashief Hartley
Information Systems Department
University of Cape Town
Private Bag, Rondebosch, 7700
Kaashief.Hartley@uct.ac.za

Lisa F Seymour
Information Systems Department
University of Cape Town
Private Bag, Rondebosch, 7700
+27-21-6504259
Lisa.Seymour@uct.ac.za

ABSTRACT
This paper investigates adoption of Business Intelligence in the public sector of developing countries, particularly South Africa. The status of service delivery in South Africa is seen as a situation of concern. The South African government operates a Performance Management System to enable service delivery and Business Intelligence is seen as a supporting technology. Through a synthesis of an assessment model and review of Business Intelligence and South African public sector literature, the study derives a framework that allows for identification of factors that might affect Business Intelligence adoption into public sector organisations.

1. INTRODUCTION

There is much activity in the usage of Information and Communication Technologies (ICT) in developing countries to improve on public service delivery [2, 5, 9]. ICT projects in government organisations are primarily known as E-government projects. E-government projects are inherently embedded in combinations of political and social reforms and organisational changes, designed to support and steer transformation in the organisation of the public sector.

However, it is widely believed that weaknesses in information and control systems in developing country bureaucracies have traditionally given rise to service diversions, and corruption inside government organisations and among government officials and public workers [9].

Owing to weak supervision and communication systems, government officials lack information about costs and needs of various local communities, and are unable to monitor actual service delivery patterns. This then results in the misuse of power by the public workers entrusted with service delivery.

In addition to this, service delivery processes contain elements that indicate overall process performance. When reporting on these elements, critical areas of service delivery may be highlighted. It is therefore crucial that senior officials in public service operations manage performance and control service delivery. Processes in most cases may be monitored by assigning a metric to ascertain its effectiveness. There are a number of well known methods used to create metrics, such as the Business Scorecard method by [10]. By implementing and monitoring these metrics, organisations gain access to key information allowing them to align operational (service delivery) performance and business (fulfil citizen needs) strategy.

Business Intelligence (BI) is an ICT tool that allows its users to leverage the best use of their data, summarising and aggregating information. BI tools provide aggregation, analyses and reporting functions on the organisations’ data. As such, BI facilitates achievement of mission objectives through providing required information or intelligence to the decision makers with regard to the evaluation and control of predefined metrics.

Accordingly designing and implementing monitoring and control systems to generate information on the status of service delivery is a possible way of enhancing performance measuring, and accountability in the delivery mechanism [2]. Users (public workers) can evaluate the costs and needs of citizens, and monitor actual delivery patterns; hence improving service delivery.

This paper will focus on the case of South Africa, a developing country. South Africa is a country that has suffered from a history of Apartheid. The country is still plagued with the Apartheid legacy: that of inequality and inefficiency. It is in this context that South Africa presents a good platform on which to investigate ICT solutions to support service delivery in developing countries. The paper will highlight some of the challenges in public sector governance in South Africa. In addition, the paper presents some insights from the literature that supports good practice of BI within the public sector.

The paper then proposes a framework to identify factors that affect the adoption of BI for enabling service delivery in the public sector environment. The research methodology selected was to survey the relevant literature, analyse it and to formulate a general framework for the use of BI within the public sector. The research paradigm selected for this study is interpretivism. Selecting the interpretive paradigm is intended to create a greater understanding of the ‘use of BI for improved service delivery’ through human interpretation [11].

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

SAICSIT '11, October 3–5, 2010, Cape Town, South Africa. Copyright © 2011 ACM 978-1-4503-0878-6/11/10... $10.00
2. SERVICE DELIVERY IN SOUTH AFRICA

From local newspapers as well as news bulletins appearing on national television it is clear that demands made by South African communities for service delivery from municipalities have escalated [16]. Local government has been in the news, sometimes for days on end particularly, in areas where communities have made forceful requests for improved services. More recently, residents have embarked on mass action to underline their demands. These actions by citizens of South Africa demonstrate that there is a ‘real situation of concern’ regarding the poor levels of service delivery.

The South African “government acknowledges that the state has not performed as well as it could have since 1994 in terms of service delivery and vows to ratchet up performance” [18]. The minister in the presidency responsible for performance, monitoring and evaluation, has promised, during a department budget vote to “strengthen and stimulate the performance of government in a relentless effort to ensure that government programmes yield the desired outcome”. These statements underscore that South African government acknowledges the need for improving service delivery, by enhancing practices of performance and monitoring and evaluation. The South African department of monitoring and evaluation has set out to develop a set of 30 to 40 main outcome indicators that determine the levels of service delivery [17]. A key system has been identified by the South African Presidency, the Performance Management System (PMS), to aid in enabling service delivery.

“A PMS is basically a management technique intended to holistically consider the performance of (usually a group of) employees or machines to work towards optimum performance of a particular task or (more frequently) a group of tasks” [22].

The PMS framework is regulated by Public Service Regulations, which serve as primary guide to governmental departments in developing and implementing their departmental PMS. The Regulations require of each executing authority to determine a system for performance management and development for employees in that department. A PMS will typically follow the activities [18]:

- Politically agreed outcomes – This is the starting point produced by a Planning Process. E.g. it will be a five year plan arising from issue-specific policy research.
- Outcome measures – Define and agree on the most valuable output measures, as to indicate if the if the desired outcome is achieved.
- Key Activities – The key activities required.
- Inputs – The essential inputs are identified.
- Delivery and Performance Agreements – The delivery chain is developed into a detailed delivery agreement.

The Presidency of South Africa has reported that there are underlying factors that are currently leading service delivery to dysfunction [18]. One of which this paper wishes to highlight, is inadequate inputs, referring to people, technology and infrastructure. It is thus that the authors wish to investigate this situation of concern in more detail and proposes a study of assessing the public sector environment adopting technologies to enable a PMS for improving service delivery.

3. BUSINESS INTELLIGENCE

Organisations have always had the potential to improve operational intelligence. From SMEs to big corporate organisations that look at how future events may affect profitability or business process flow. Depending on the nature of the organisation, it may seek to gain competitive advantage by gaining lead information or analyse information to reveal areas of needed attention. BI is a technology that is available to provide information and supply organisation with some level of astuteness. Business Intelligence “combines products, technology, and methods to organise key information that management need to improve profit and performance” [23]. In this study, the focus will be on the use of BI incorporated into a performance management tool within public sector organisations.

4. BUSINESS INTELLIGENCE FOR PUBLIC SECTOR

Information and Communication Technology (ICT) in recent years has presented an opportunity for the IT managers and the senior officials in government to change the way organisations leverage and value their information assets. In contrast to the private sector businesses, government organisations are measured not by profits and losses, but by their ability to deliver upon their mission [4]. In this research, the focus is on public sector’s ability to make use of BI to understand the citizen or South African public and the ability to use resources effectively. These abilities are the key factor in matching services to citizen needs [4]. Government plans and decisions can be derived with the help of detailed multi-dimensional analyses of all the relevant data. Coman [4] describes benefits BI can grant to government organisations as:

- Easy to obtain decipherable and comprehensive information without the need to use sophisticated tools.
- Extensive analysis of stored data to provide answers to exhaustive queries.
- Help to formulate more effective strategies and policies for citizen facilitation.

The next step for public sector organisations is to derive value from data regarding service delivery, to turn data resources into meaningful information. However, there are prerequisites that need to be known [20]:

- Data quality – accuracy and trustworthiness
- Stability – how frequently the data changes
- Granularity – It is important to know whether the data is at the right level of detail
- Context dependency – It’s necessary to understand how much context (meta-information) is required to interpret the data.
- Provenance - It is valuable to know where the data has come from, where it has been, and where it is being used.

Added to the prerequisites, BI requires data quality and data integration management of information to be correct and effective [3].

Within the context of the South Africa, the department of Performance, Monitoring and Evaluation (DPM&E) in the Presidency has stated that the data that is required to inform their Performance Management system will have to be carefully chosen and verified. Much of this work is being implemented
during the development of the government-wide monitoring and evaluation strategy. The Presidency is set to launch a major project on plotting the data architecture of government administrative systems and available datasets. This step will focus on improving the quality of the data. In addition to this, the DPM&E noted that strong emphasis is needed on enhancing the analytic and policy analysis capability in government [18].

5. A MODEL FOR ENHANCING PUBLIC SERVICE DELIVERY

The presence of a BI system or performance management system does not automatically guarantee improved service delivery [14]. However, Maila [14] reveals that an investigation is needed to uncover how a public sector organisation can effectively apply a performance management system (BI system) in conjunction with a complete set of functional policies, systems and instruments to improve on service delivery. As such a careful analysis needs to be given to ‘soft’ organisational aspects in conjunction with implementing and using a BI System.

A study by Pretorius & Schurink [16] investigated major challenges faced by post-apartheid South Africa in ensuring that municipalities provide optimal and professional services to citizens of heterogeneous cultures. The study highlighted that the monitoring of service delivery needs through effective governance and service administration is crucial. PMS can add extra value in managing and public sector delivery [14].

The major claim of their study is that to achieve success in public service delivery, specific leadership skills are required, particularly in South Africa [16]. Thus, the aim of the study was to develop a leadership construct that could assist government to achieve adequate service delivery and reach set goals. The Retro Advanced Leadership (RAL) model was developed by Pretorius & Schurink [16], and presents key components for enhancing service delivery, namely, management of leadership performance, legislative imperatives, achieving realistic goals and continuous maintenance and monitoring of achievements.

The RAL model places emphasis on ‘soft’ aspects of public sector organisations. The RAL model focuses on the following aspects of service delivery:

- The creation or strengthening of a culture of performance excellence amongst employees
- Leadership qualities that lead to service delivery excellence
- The contribution of internal systems (policy, procedures, budget, integrated development planning and the performance management system) to intergovernmental relations and infrastructure development;
- Legislation that stipulates local government’s responsibility and accountability in terms of service delivery;
- The importance of human capital, good governance, environmental stability and economic growth for achieving realistic service delivery goals and
- The need for continuous monitoring to maintain and enhance the quality of service delivery.

Rapid changes fuelled by the world economy and technology, forces organisations to transform themselves to become more responsive, competitive and informed [16]. The RAL model demonstrates that a PMS or a Business Intelligence system should be an integral part of a framework for informing public sector which could thus enabling service delivery. A PMS system would fit in the RAL model to inform and add value to

Figure 1. Retro Advanced Leadership Model [15]
monitoring and maintaining Key Performance Indicators (KPI) that are matched with levels of actual service delivery measurements.

Thus far the paper has defined BI, described current levels of service delivery in South Africa and presented opportunities for implementing a PMS. In the next section, we will explore a model which might frame the adoption of BI within public sector organisation, particularly in South Africa.

6. PROPOSING A MODEL FOR BI ADOPTION

Information system (IS) development models, such as IS development assessment models, are used to determine the state of readiness of organisations to adopt new technologies or undergo digital integration [1]. An IS development assessment model is the Heeks Design-Reality gap model [9]. It introduces seven elements of (IS) development, which can be used to analyse information system, in this case BI, adoption by organisations. The elements are identified as

- Information,
- Technology,
- Processes,
- Objectives and values,
- Staffing and skills,
- Management systems and structures and
- Other resources.

This model was developed specifically for the case of developing countries adopting an information system. The common base for IS development assessment models is Leavitt diamond model [9]. The major theme for assessment is one of ‘dimensional fit’, i.e. the need for one or more different dimensions of an organisation and/or environment to be brought into congruence at the same time. Where the Design-Reality gap model adds value is that it takes into consideration organisational change. Heeks [9] states that the greater the degree of change the greater the degree of risk of failure. For dimensional fit, “requiring different dimensions to be congruent at the same time, is too static a model to handle the process of change” [7]. Instead, a more temporal conception of fit is required, where the same dimensions are congruent at different times.

Heeks [9] suggests that modularity and incrementalism in IS projects yields better outcomes for developing countries. This allows for local improvisations through design divisibility, i.e. learning earlier from relatively small failure during implementation, and taking into account intended and unintended outcomes as well as desired and undesired outcomes. Basically, high divisibility increases the opportunities for successful local improvisations.

6.1. Factors to Consider for BI Adoption

Certain organisational factors and perceived benefits can be seen to enable adoption. However, the absence of enablers can sometimes present themselves as obstacles or challenges. In this section the Design-Reality gap model is used as a lens to review the literature and identify obstacles and enablers for BI adoption in public sector organisations.

6.1.1. Information

The measurements of outcomes in public sector environments are typically more qualitative and less structured than resource inputs or delivery activities [18]. The mixture of structured and unstructured aspects of real-life processes is acknowledged and facilities to organise these two dimensions are known to exist [3]. To handle structured and unstructured information there is a growing interdependency between BI and portal technologies. “As unstructured information is in many cases represented by

![Figure 2. Design-Reality Gap Model](image-url)
emails, contracts, manuals, and other types of documents, a central access point is of key importance in order to get unstructured process under control" [3]. Structured information can be more easily supported by BI technology.

The other concern regarding information is the data architecture of BI/PMS. The proposed PMS can only function if there is credible, timely information on outcomes and other related elements of the results chain: inputs, activities, outputs, budgets, etc. It is also important that data used by a PMS is accurate and trustworthy. The South African Statistical Quality Assurance Framework outlines the criteria used for evaluating quality of data against eight dimensions of relevance, accuracy, accessibility, interpretability, coherence, methodological soundness and integrity [18].

6.1.2. Technology
The technology aspect is considered a major input to implementing a PMS. If the relevant technology is not available to support the major features of a PMS, the system will not develop as efficiently or not even develop at all depending on the nature of PMS.

The following were some of the findings by the South African Presidential Review Commission (PRC) [15]
- Government systems were largely not interoperable
- Procurement of IT products and services were not appropriately co-ordinated. Departments were purchasing what they want and not what they need.

There are currently many information system projects underway in government, which focus on BI. There are examples of BI tools and applications being implemented to improve public service delivery in South Africa. The South African Revenue Services (SARS) has an implementation of BI. SARS has recently won a BI award from ITWeb [8]. Another implementation is that from the City of Cape Town, which also won an award for rolling out SAP, an enterprise resource planning system, including the SAP BI module [7] & [11]. The Independent Electoral Commission has also won the Smithsonian award for most outstanding programme in government. These examples demonstrate that there are cases of successful information system adoption within South Africa. For future improvement, it is noted that technology development should focus particularly on the standardisation, securing, integration and expansion of data systems [6].

6.1.3. Processes
Service delivery processes contain elements that indicate overall process performance. When reporting on these elements, critical areas of service delivery may be highlighted. It is therefore crucial that senior officials determine which processes to monitor given the conditions of the local environment. This will result in deriving better use of a BI system. Processes in most cases may be monitored by assigning a metric to ascertain its effectiveness. Processes can be categorised in two levels [3]
- Operational processes – support processes and business processes
- Management processes

Structured processes can be better supported by BI than unstructured processes. Furthermore, operational processes tend to be more structured than management processes [3].

The PRC found that there was duplication in processes and systems across government [15]. To mitigate the issue of duplication, improving communication, co-ordination, and support among governmental bodies is required [15].

6.1.4. Objectives and Values
As described by [15] and [12], South African public sector requires a change in attitude. Pretorius and Schurink [16] indicated that the only way to progress producers of service delivery, is to change the administrative mentality of the public sector organisation to that of a developmental mentality. Thus, less of an administrative attitude is needed and more emphasis must be placed on project implementation and delivery of services to the community, especially disadvantaged communities.

The objectives and values of public sector organisations are well defined in the Batho Pele principles. Batho Pele was initially launched in a White Paper on Transforming Public Service Delivery, branded as the “Batho Pele White Paper” [19]. The main aim of the Batho Pele White Paper was integrated and seamless public service delivery. The policy paper establishes the goal to radically transform the previously dysfunctional Apartheid system into an inclusive and participatory service delivery. Batho Pele aims to guide public workers with nine principles; “consultation with citizens, setting service standards, increasing access to information, ensuring courtesy, providing information, openness and transparency, redress and value for money” [21].

6.1.5. Staffing and Skills
The PRC found that there is high IT staff turnover in public sector organisations [15]. Government trained people and lost them to industry due to higher salary offers, career development prospects, etc. At the same time South Africa is experiencing a shortage of skilled workers, particularly IT staff. Possibly, an improved incentivised system increase staff retention.

6.1.6. Management Systems and Structure
The PRC outcomes also found that IT departments in government were transforming very slowly [15]. Part of the PMS, directs attention to Key Performance Areas (KPA) of public sector staff members. The PMS integrates service delivery KPIs with staff KPAs. Thus the PMS attempts to handle the complex balancing of KPIs and KPAs. The other aspect to note is that the PMS will only take effect if there is a mechanism to hold the responsible person accountable. The Presidency notes that the PMS currently requires reform, as there exists misalignment between executive authority and heads of department.

6.1.7. Other resources
Heeks [9] suggests that other resources such as time and money need to be taken into consideration as well. In this case, the PRC also noted that the South African government is a large consumer of IT goods and services and is not achieving economies of scale [15]. The South African public sector organisations operate under tight budgets [16], which put further constraint on service delivery to improve to citizens lives.

7. CONCLUSION
Having reviewed the available literature on public services and public sector organisations, it was found that the public sector organisations are in need of reform. The different levels of government do admit that there is opportunity for BI technology supported solutions to service delivery in South Africa.

There are currently BI projects underway that have made inroads into improving service delivery (E.g, SARS, City of Cape Town). The successful adoption of BI in the public sector
in South Africa depends on the technology used, its integration into PMS frameworks and other organisational aspects as mentioned by [9].

Investigating the factors considered by public sector organisations in the adoption of BI as an enabler of a PMS, suggests the use of an Information Systems assessment model. In order to identify enablers and obstacles which a public sector organisation might encounter when adopting BI, this paper derived a framework from a review of the literature, and through the use of the Design-reality gap model by [9] as a lens to analyse key findings.

The resultant framework in Table 1 summarises the factors that could influence the decision to adopt technology, such as BI, into a public sector organisation. It is hoped that this framework could be validated in future studies of BI in developing countries, particularly in South Africa.

<table>
<thead>
<tr>
<th>Category</th>
<th>Theme</th>
<th>Literature sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Data Quality</td>
<td>[3, 17]</td>
</tr>
<tr>
<td></td>
<td>Structured and Unstructured</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>Interoperable Systems</td>
<td>[3, 18]</td>
</tr>
<tr>
<td>Processes</td>
<td>Structured and Unstructured</td>
<td>[3, 18]</td>
</tr>
<tr>
<td>Objectives and values</td>
<td>Strategy</td>
<td>[14, 16, 19]</td>
</tr>
<tr>
<td></td>
<td>Batho Pele Principles Leadership</td>
<td></td>
</tr>
<tr>
<td>Staffing and skills</td>
<td>High IT Staff turn over</td>
<td>[14]</td>
</tr>
<tr>
<td>Management Systems and Structures</td>
<td>Departmental transformation</td>
<td>[15, 18]</td>
</tr>
<tr>
<td></td>
<td>Performance Management System</td>
<td></td>
</tr>
<tr>
<td>Other resources</td>
<td>Achieve economies of scale</td>
<td>[9, 15, 16]</td>
</tr>
<tr>
<td></td>
<td>Limited funding</td>
<td></td>
</tr>
</tbody>
</table>

8. **FUTURE WORK**

The authors wish to recommend future research investigations that could be useful within the scope of this study. Case studies will provide a good basis to validate the framework developed in this paper. It should also be noted, that public sector organisations operate at different levels, i.e. National, Provincial and Local. Each level of government, besides the organisation, thus has its environment and context.

This paper is part of ongoing work. The authors are currently analysing multiple case studies at each level of government to provide better insights to a PMS of service delivery. Another consideration is to study a particular sector of government and to investigate it at each level of governance, e.g. focusing on economic growth, by studying the Local, Provincial and National organisations and how information is collated and integrated at each level.

9. **REFERENCES**


