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The Evaluation of Business Intelligence: A Case Study in a Major Financial Institution

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Abstract

Business intelligence (BI) is the current industry movement that addresses the use of IT to support management decision making. Unlike previous approaches to decision support, BI systems are large-scale information systems. Whereas the development of small-scale personal decision support systems (PDSS) and executive information systems (EIS) may be authorised and funded at an individual executive's discretion, BI systems require evaluation and approval processes more like those used in large-scale operational IT projects. This paper presents a framework for BI and proposes that Symon's Context-Content-Process model is useful for understanding BI projects. A pilot case study of BI evaluation in a major bank is described and analysed in terms of the Context-Content-Process model. The findings include the recognition of the importance of non-financial intangible factors in BI evaluation, the use of operational justification for strategic BI systems, and the varying perspectives of different stakeholders in BI systems. The framework and case findings provide part of the foundation for a larger project concerning the development of a BI evaluation method.

Keywords

Business intelligence, evaluation, decision support, return on investment, case study.

INTRODUCTION

Business intelligence (BI) is the current industry movement that addresses the use of IT to support management decision making. Unlike the previous approaches of personal decision support systems (DSS) and executive information systems (EIS), BI systems are typically built upon the large-scale data infrastructure of an enterprise data warehouse (DW) or a functional data mart. These systems often rival operational transaction processing systems in scale and budget. Large scale BI and DW systems require evaluation and approval processes that are common in most large-scale capital projects. This means that BI evaluation is an important process in most organizations. This pilot case forms part of a larger project concerned with the development of a rigorous, defensible, and effective BI evaluation method.

The paper is structured as follows: the first section defines BI and develops a framework for understanding the relationship of the associated technologies and data flows in contemporary management support. The next section presents a theory of evaluation that is useful for BI projects. This theory is then used as a lens to understand the evaluation of a significant BI program in a large financial institution. A number of suggestions for a BI evaluation method arise from the case study. Finally, the paper's contribution to theory and practice, and directions for further work are presented.

A FRAMEWORK FOR BUSINESS INTELLIGENCE

BI is a poorly defined term. Its development has been primarily driven by industry, and BI definitions often reflect a particular vendor's product offering. To define the boundaries of this project, a suggested framework for BI is presented (Figure 1). Essentially, the role of BI is to extract data important to the business, and to manipulate and present information that is useful for managerial decision support. In their simplest form, these systems permit a decision maker to access an up-to-date, often consolidated, view of business performance. A common misconception is that BI is a relatively new term, but Luhn (1958) provided a definition of BI more than 40 years ago with the Selective Dissemination of Information (SDI) technique. Vitt et al (2002) acknowledge that the term is multifaceted and is used by different software vendors to characterize a broad range of technologies, platforms, applications, and processes.

Whilst there exists little academic research on BI (Gray, 2003; Jagielska *et al.*, 2003), there is a growing body of vendor and industry literature. This literature defines BI as the query, reporting and analysis functions of

decision support, although some definitions also include analytical applications. This view is also supported by a number of leading BI vendors (Business Objects, 2005; Cognos, 2005; Microstrategy, 2005). The framework presented in Figure 1 consists of two main stages, separating the front-end and back-end components of management support. These are termed the preparation and presentation stages. Below the conceptual level of stages there are three main layers: (1) the sourcing layer, which represents the operational systems, such as organizational ERP systems; (2) the data layer, linked via a data extract, transform and load process (ETL), is where source data is cleansed and loaded into repositories, such as data warehouses (DW), operational data stores (ODS), or on-line analytical processing cubes (OLAP); and (3) the BI delivery layer, where the cleansed and consolidated data from source systems is presented to users for analysis. Information delivery may take a number of forms (ad-hoc queries, standardised reporting, and OLAP analysis, for example).

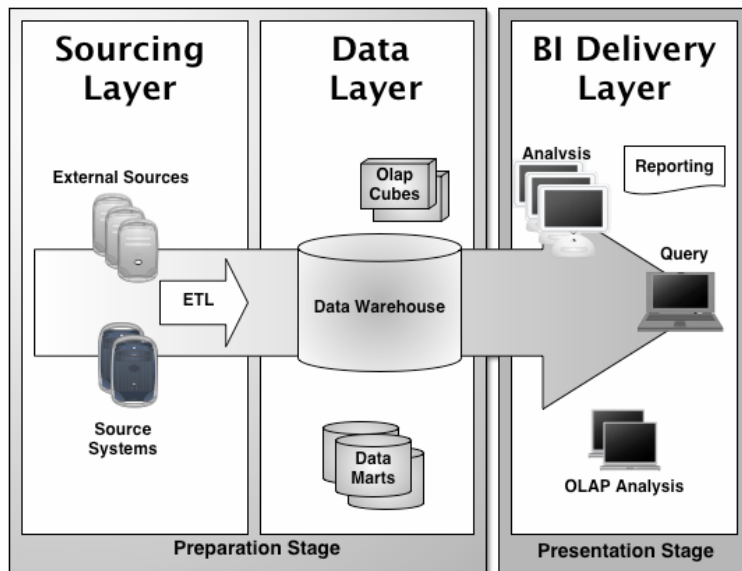


Figure 1: A Framework for Business Intelligence.

Early IT systems were introduced to provide benefits of an operational nature. A business was able to save on manpower by performing repetitive tasks more efficiently. However, as technology has evolved and the benefits of technology have become more widespread, the evaluation process has become increasingly complex. Although there is consensus on the need to evaluate capital projects, computer-based information systems are difficult to assess effectively (Symons 1990). These problems have led to phenomena such as the 'IT catch 22' (Willcocks, 1992); a situation where many senior managers believe that for competitive reasons their business must invest into IT, yet financially they are faced with difficulties in finding sufficient justification. This suggests that current evaluation practices do not provide adequate measures to accurately reflect what is required in an effective justification or evaluation process.

The increasing investment in BI technology and services helps to stress the importance of more effective evaluation techniques. Unless justified as a research and development investment, organizations will rarely invest in technology that will not provide a clear benefit to the bottom line. Improved evaluation methods are needed in order to effectively demonstrate the value of these systems. There have been repeated calls for the evaluation of information systems to be more relevant (Smithson & Hirschheim, 1998; Symons, 1991; Walsham, 1993, 1999).

THE CCP MODEL FOR ANALYZING BUSINESS INTELLIGENCE EVALUATION

The evaluation of information systems 'is a thorny problem' (Smithson & Hirschheim, 1998). Conceptual and operational difficulties in the evaluation process have led to the development of a number of different tools and techniques to assist in the evaluation process. Whilst evaluation is generally taken to mean the identification and quantification of the costs and benefits of an IT investment (Symons, 1991), it is often argued that traditional methods used to measure success, or to justify a new investment, are far too narrow in their focus, and often fail to address important issues. Evaluation in this paper may be taken to mean either pre-investment evaluation or benefit realization activities.

This project uses Symon's (1991) theory of content, context and process (CCP) as a lens to address the nature of business intelligence evaluation. Originally developed to help analyse leadership behaviour in organizations undergoing strategic change (Pettigrew, 1987), this framework has been widely accepted in information systems research (Farbey *et al.*, 1993; Serafeimidis & Smithson, 2000; Smithson & Hirschheim, 1998; Walsham, 1999).

The CCP approach allows for a wide range of factors to be addressed, in a number of different evaluation environments. Each factor complements the other, and to consider one in isolation would hamper the rigor of the approach. The CCP approach permits the analysis of a number of elements that are often excluded from traditional, financially oriented metrics. Factors such as the organization's economic environment and internal political factors may be addressed using the CCP approach.

In the CCP model there is a division between *what* is being measured (the content), *why* it is being measured (the context), and *how* the measurement is being performed (the process) (Symons, 1990, 1991). This is shown in Figure 2. It is believed that the interactions between the three areas allows for a rich understanding of the intricacies involved in BI evaluation, and fosters a reflective view on the nature of evaluation.

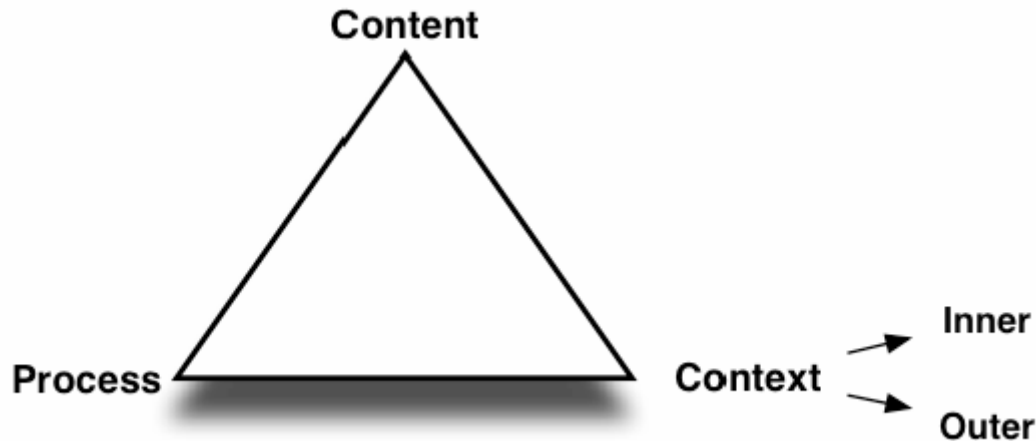


Figure 2: Content, Context and Process in Information Systems Evaluation

Content

Content is largely concerned with the subject of the evaluation exercise; *what* is being evaluated. This involves the process of setting the boundaries of evaluation. The choice of the criteria will determine the content of the evaluation. Traditional evaluation techniques have focused largely on financial criteria, with cost/benefit analyses serving as popular tools. Inflexible, financially-based views of evaluation have undergone serious criticism in recent years (Clemons, 1991; Counihan *et al.*, 2002; Hochstrasser, 1990).

Early methods of IT evaluation were often focused on the technical components of a system, or what we may refer to as the functional view. This view is often concerned with efficiency and the relationships between inputs and outputs. These techniques are interested in software performance measurements, improved capacity, fewer errors, and greater software reliability. Early IT systems were designed to improve efficiency by performing clerical tasks faster than previous methods. Cost savings were made by the significant reduction in operating costs. This was the focus of IT for many years, and many of these types of systems still exist, along with methods developed for their evaluation. Because the primary focus of objective technical evaluations are on efficiency and the technical system itself, the people involved in these evaluations tend to be from technical backgrounds. Business users are most often limited to the sign-off of the business case, and technical staff perform the majority of the evaluation process. The focus on efficiency, reliability and the need for quality systems may be witnessed in software metric research, (Fenton & Pfleeger, 1997; Kan, 1995). This is part of the attempt to produce high quality software using efficient software engineering processes.

Economic views of evaluation often focus on one of the most widely used evaluation tools, return on investment (ROI)(Radcliffe, 1982). ROI approaches make use of a number of financial techniques. One of the most popular methods is to measure the current value of future estimated cash flows, with the assumption that money held now is worth more than the same amount received in the future. The future cash flows undergo some level of discounting. Cost/benefit analysis uses traditional accounting practices to ascertain a quantifiable measure of system value. The fundamental principle of cost/benefit analysis is to estimate the costs of developing, implementing, and maintaining a system with the anticipated benefits that the system will generate to the organization. The use of cost/benefit-style analysis is popular because it is easily understood by upper management, especially as it gives a definite value to a proposal.

There are numerous approaches aimed at overcoming the shortcomings of financial evaluation methods. One interpretive method is the concept of critical success factors (CSF) (Rockhart, 1979). CSFs are the few essential factors that need to go right for a project to be successful. CSF analysis helps to avoid a number of the challenges in attempting to accurately measure the costs and benefits of a system, by addressing the system's contribution in terms of how it contributes to the organization's targets and objectives.

Although the importance of recognising information systems as both social and technical entities is now well understood, the methods on how to carry out IS evaluation are far from clear. Much evaluation has been ill-conceived and is dysfunctional, concentrating on the means, to the detriment of the ends (Symons, 1991). It appears that researchers have focused too heavily on efficiency criteria, rather than effectiveness. Hirschheim and Smithson (1998) note the importance of both sets of criteria, but also include a third criteria for improving evaluation - understanding. The CCP framework assumes that any evaluation should analyse the interplay between the content of the evaluation, the context in which it occurs, and the process used.

Context

Context addresses the environment surrounding the evaluation process. It also confronts the variety of reasons that an evaluation may take place, and what purpose it serves. An evaluation may test a business case, choose between a number of software packages, or assess the success of an implementation. *Ex-ante* or *ex-post* evaluations will also affect the people, techniques, and timeframes required for the assessment. Summative evaluation (Legge, 1984), *ex ante*, concerns the decision about a path of action, or about a design from a range of possible alternatives. Formative evaluation, *ex post*, is more centred on assessing the performance of a system that has already been implemented. Other likely reasons why an evaluation takes place may be of a more political nature. Understanding the context in which evaluation occurs is essential, particularly in instances where systems are justified using 'back-door' routes (Farbey et al., 1993), and where politics play a key role in system adoption. Context may be classified in two different ways, that is, inner context and outer context (Pettigrew, 1987; Symons, 1990, 1991). Inner context is the organizational culture and structure, political context and social processes in which ideas for change are to proceed. Outer context is the social, economic, competitive, and political environment in which the organization operates, including market structures, globalisation, privatisation, and technological improvements. The outer context of IS evaluation has been addressed by a number of authors who have attempted to chart the impact of IT at both the firm and industry level (Symons, 1991). The importance of addressing *who* in evaluation, the people involved, has been accepted as an area of importance while the social nature of evaluations and their subjectivity have been highlighted by a number of researchers, such as Hirschheim and Smithson (1998), Symons (1991), and Walsham (1993). This people-aspect of evaluations includes the people involved both directly (for example, users), and those indirectly involved (for example, senior corporate champions). Both stakeholder groups may play key roles in the political nature of the evaluation.

Process

Process is concerned not only with the results of the evaluation, but how the evaluation took place. Process addresses the social role of the evaluation, and how it is played out over time. This area has also been called 'meta evaluation' (Farbey et al., 1993, pg. 82), where the success of the evaluation is acknowledged, as well as the impact it has on the organization. As mentioned before, there has been heavy criticism of appraisal techniques that focus strictly on cost/benefit and financial measurement techniques. Traditional capital budgeting techniques are regarded as the principal means of evaluating IT investments. These techniques, particularly when used to measure what are essentially 'non-traditional' benefits, possess a number of shortcomings (Counihan et al., 2002). Intangibles and the dispersion of system costs and benefits can make it difficult to accurately measure the value of information systems.

A CASE STUDY OF BUSINESS INTELLIGENCE EVALUATION

Method

This study used a single case method, which allows the investigation of business intelligence evaluation within a real-life context. The CCP model was used as a lens to analyse BI evaluation in the participating organization. The case study concerns a major international financial institution, referred to here as 'OzBank'. Information and reporting capabilities are vital to the financial services sector and business intelligence systems are an important component of that capability. The financial institution chosen for the case study has had significant exposure to business intelligence projects.

Case study research is well-suited to exploratory research in information systems (Benbasat et al., 1987; Darke et al., 1998; Myers, 2005). Yin (1994, chapter 1) suggests that the ability to study an organization within its

real-world context is a major benefit of case research. The case study was carried out during 2004 and early 2005. Data was collected from a number of sources including semi-structured interviews, annual reports, evaluation matrices, and technical policy documents. Five bank employees were involved in semi-structured interviews that ranged from 60 to 90 minutes in length. All of the participants had recently been involved in a business intelligence initiative, and consisted of both business and IT functions. The interviewees included two managers, a solutions architect, the head of group information (a very senior executive), and the head of risk technology. Table 1 summarizes information about the OzBank interviewees. A case study protocol was developed, as suggested by Yin (1994, Chapter 3), to be used as an instrument to guide the data collection, and to keep the line of questioning consistent and reliable. The interview questions encompassed the elements of the CCP and related to the participant's background and system nature. Context and motivation behind the implementation, and the nature of the evaluation or benefit realisation process was also addressed. All of the interviews were recorded, transcribed, and then sent to the participants for correction and validation. Further to the formal, semi-structured interviews, there were a number of open interviews with various participants amounting to 10 hours of discussion. The open sessions were informal and were ad-hoc in nature. Although a rich source of information, interviews are subject to problems of recall bias and poor or inaccurate articulation (Yin, 1994, Chapter 4). The researchers were cautious about relying on key informants too heavily, and sought contrary evidence when possible. Attempts were made to corroborate emerging findings and issues from multiple sources, such as other informants and available documentation.

Role	Primary Orientation	Organization Level	Years at OzBank	Past Experiences	Context
Manager	Business	Management	5	Translator, business analyst, project manager, risk consultant	Manager (Project Quality) and quality assurance, risk projects focusing on compliance. Situated in the business demographic of the bank.
Manager	IT	Management	3 ½	IT consultant	Head of Information Management Systems group. Resides in the IT function. Responsible for the development of systems for the effective use of information by the bank.
Solutions Architect	IT	Professional	12	Sports administration, application developer, frontline banker,	Resides in the IT function. Responsible for the development of enterprise technology architecture standards within the bank, and documenting current and future technology environments.
Group Information Head	Business	Executive	20	Frontline banker, corporate lender	Head of OzBank's group information area, providing management information to various parts of the business. Resides in both business and IT functions. Area includes business people along with a heavy technical capability.
Risk Technology Head	Business	Executive	16	Risk analyst, debtor analyst	Head of Risk Technology group. The group has recently merged the business and technology functions of risk.

Table 1. Overview of OzBank Interviewees.

CASE CONTEXT

External Context

Australia possesses a strong financial services sector. In less than 20 years, coinciding with major financial deregulation, the value of the finance and insurance industry, in volume, has grown 142%. This is compared to economy-wide growth of 82% during the same period. By 2000–01 the industry's share of GDP had increased to 6.3%, which is up 33% on its share 17 years ago (Trewin, 2001). By the end of June 2001, Australia had 50 banks in operation. Four major banks: the Australia and New Zealand Banking Group, National Australia Bank, Westpac Banking Corporation, and the Commonwealth Bank of Australia, account for over half the total assets

of all banks. These four banks provide widespread banking services and an extensive retail branch network throughout Australia.

The Australian Prudential Regulation Authority (APRA) imposes a number of reporting requirements for banks. Regulatory reporting has become an important issue in the financial sector in recent years. Regulations such as the US Sarbanes Oxley Act and International Financial Reporting Standards have stressed the importance of a strong focus on corporate governance.

Internal Context

The internal context of OzBank may be considered from both business and IT perspectives. OzBank is one of the largest companies operating in the Asia Pacific region and is a major financial services provider. The bank employs over 20,000 people and has a history spanning more than 100 years; it is a large bank by world standards. Recent years have seen OzBank produce record profits, high shareholder dividends and build a strong capital position. Recent acquisitions have given the bank a stronger domestic business base, and have helped to highlight the importance of business growth to the organization. Although the costs associated with regulatory compliance are significant, OzBank's management feels that the satisfaction of these requirements is an opportunity to gain business advantage.

In the IT context, OzBank has a complex information management environment, but a complexity not uncommon to organizations of this size. Figure 3 represents a high-level view of OzBank's BI architecture. The architecture is divided into three layers. *Source data* represents the bank's transactional storage for the applications that facilitate banking and other services. There are more than 100 source systems. The *information environment* is responsible for the extract, transform and load of raw data from the source systems into the data warehouse. Data is fed into a staging environment, primarily the data warehouse, and managed by a data integration product. OzBank's data warehouse is more than 10 years old and is a collection of database tables and files of operational system data. The warehouse has slowly evolved over the years to adapt to the banks changing business needs. OzBank is reliant on the data within the warehouse. The main purpose of the data warehouse is to streamline the data gathering from source data systems and to distribute the data to downstream data marts, and other information users. This is a pragmatic approach to providing a BI capability. The data transformations may be defined for a specific purpose, in an ad-hoc fashion, or for repetitive, pre-defined tasks. The information environment operates as a link between the data held in the source data systems and the business process-specific data marts downstream. Final delivery of information occurs in the *business intelligence* layer. Users obtain information from data marts populated using flat-files, which are provided by the data warehouse. Specialised software at the end-layer may connect to the marts directly, or as a view via an intranet.

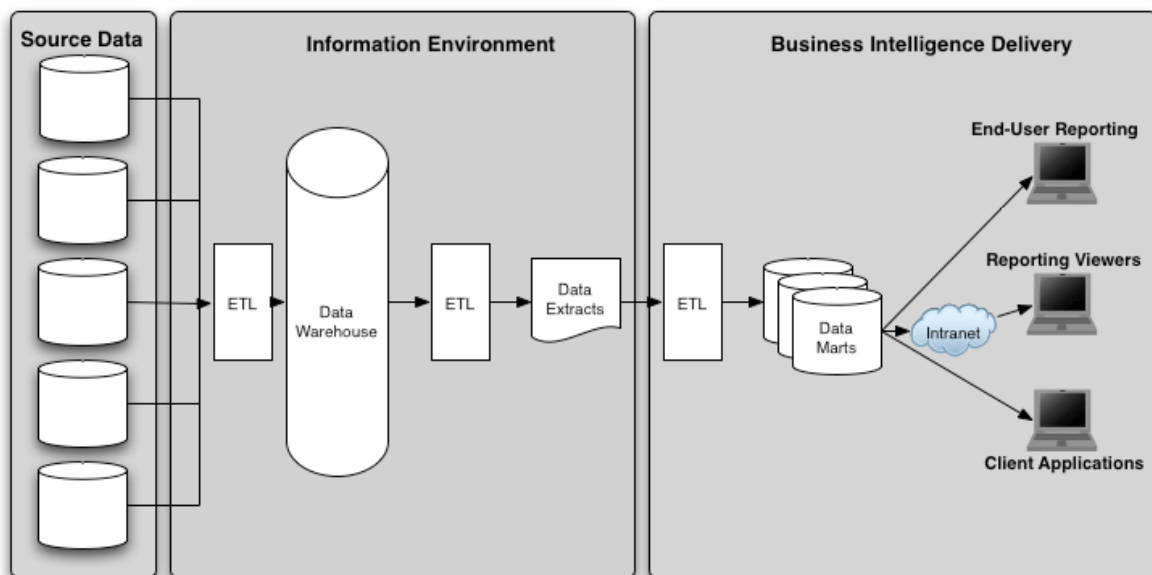


Figure 3: OzBank's High-level BI Architecture.

Case Study Discussion and Analysis

Finding #1: Lack of a Formal BI Evaluation Strategy.

The interview data failed to identify any formal process being employed within OzBank to rigorously evaluate the success of their BI investments. Although it was suggested by one participant that OzBank did use a standard evaluation method for software purchases, this came as a surprise to other participants; as one stated 'there wasn't actually a huge amount of choice to be honest...there was very much a push towards (software X)'. Although post implementation reviews (PIRs) are performed on some of the bank's investments (the project manager noted 'we certainly did a PIR'), there was no demonstration that any focused specifically on the BI projects. One participant noted 'I'm going to suggest there's been no such thing, and we're paying the price now in production and support, and I think what we're finding now is we're going to take some initiatives out of production and support to redress problems that should have been picked up in PIRs'. As part of OzBank's commitment to a shared service infrastructure, an enterprise-class end user reporting environment has been established. This has been based on a single vendor's product offering.

The data revealed some interesting discrepancies in the process that the bank followed when choosing the standard BI layer. Whilst a number of other BI initiatives had defaulted to a standard package, participants had difficulty articulating precisely how this package came to be the standard BI reporting layer. One participant noted 'there was formalization done, but I think it was done after the event.' It was unclear if there was any formal, linear process performed when deciding on which product to make the bank's standard BI reporting layer. There was however an implicit understanding of the need for a BI layer at the bank. There was also evidence that the decision to choose the standard BI layer within the bank relied heavily on the personal relationships between the key decision makers and the BI vendor.

There was little evidence of *ex post* evaluation of BI systems. Despite PIRs occurring, they generally had a broader focus than BI. There was an attitude that formal evaluations of the BI systems were not necessary, because customers would inevitably complain if something was wrong, and that this was a sufficient mechanism for taking action.

Finding #2: The Compliance Catalyst.

Regulatory compliance is an important issue in all financial service organizations. As mentioned before, the need to comply with requirements such as the US Sarbanes-Oxley (SOX) legislation and BASEL II risk regulations, have forced companies to reengineer business processes. SOX is important legislation which addresses financial transparency and control. It aims to ensure organizations have adequate internal controls in place to prevent financial fraud, and that they certify financial statements are appropriate, and that material events are reported in a timely manner. Many large public companies are undergoing their first annual audits under the provisions of SOX.

OzBank is using the momentum of regulatory compliance to help drive their BI capability. One participant noted '...things that are coming out of the compliance regulations are the things that we've been wanting to do for ages, but for one reason or another never really make it to the priority queue.' There are many examples in the literature, such as Fitzgerald (1998), that suggest IS evaluation methods are failing to provide adequate methods for business case justification. This problem is more prevalent when projects are aimed at improving organizational effectiveness, rather than efficiency. At OzBank, regulatory compliance may be seen not only as an important driver for increasing BI capability, but also as a suitable 'coat-tail' on which other initiatives may ride, initiatives that may not have otherwise been justified. One manager expressed 'certainly when you're complying with regulations, you're looking for other ways to benefit the bank at the same time. And I think it's true to say that (project X) was something that Risk (*Risk Technology Group*) wanted to do anyway. The Basel requirement drove the project actually getting approved.'

Finding #3: Intangible Benefits.

The past few decades has seen the emergence of a knowledge-based, technology-intensive economy. Essential in providing (and maintaining) competitive advantage are investments in human resources, research and development, and information technology. The source of economic value of an organization is no longer simply the production of material goods, but the creation of intangible assets. Information systems, including BI, can offer intangible benefits and this can make the prospect of clearly identifying benefits a difficult challenge for systems evaluation.

It is not surprising that many traditional evaluation techniques continue to fail, or provide misleading information (Clemons, 1991; Counihan *et al*, 2002; Saarinen, 1996), particularly when used to measure non-traditional benefits. Examples of intangible benefits include greater business knowledge, improved work

processes, and more effective relationships. Intangibles are difficult to quantify. They are however, important sources of business value, particularly in regard to the use of information technology. When calculating profits and income, most generally accepted accounting principles place a great focus on material goods. In fact, years of debate in accounting fields have failed to reach consensus on accounting for intangible assets. As a result accounting principles fail to acknowledge organizational investments that fall into the intangible category and are the source of significant benefits. BI is one area in which traditional evaluation techniques perform poorly, as many of the benefits are strategic, and consequently not easily quantifiable (Irani & Love, 2001).

A number of participants from OzBank demonstrated an understanding that intangible benefits were important to the business. It was also acknowledged that although important, they are very difficult to accurately measure. One participant noted 'my view is that intangible benefits are still valuable, and you shouldn't have to pretend they're not. Just because you can't measure something, doesn't mean that it doesn't have any value.' They went on further to stress that project approval processes are driven through finance areas within the bank, and as a result, financial figures are fundamental. The difficulties associated with expressing intangible benefits in dollar figures were also addressed. Intangible benefits were acknowledged, however projects tended to be driven by other issues, such as economies of scale. One participant acknowledged the importance of intangible benefits, and that measuring them was 'the difficulty in a lot of this space' but stressed that the important thing was to establish strong links with project sponsors. 'We've been able to link ourselves so heavily in with the business and build up the necessary trust, and if we say that we need to go and spend a couple of extra million dollars on a certain initiative...generally we get the support that we need nine times out of 10.' This suggested that developing business relationships and trust held more weight than attempts at quantifying intangibles in a business case.

Finding #4: BI Governance and Engagement models.

As organizations become progressively more reliant on accurate information, it is essential to have effective IT governance structures and processes in place to ensure system quality (Korac-Kakabde & Kakabde, 2001). A major focus of IS researchers has been whether governance activities for DW should be regulated by the business units concerned or a central body (Brown, 1997). Key governance activities include the development and maintenance of the infrastructure, deciding on the technology to be used, and project management (Watson *et al.*, 2004). OzBank has begun development on a BI competency centre, which is intended to be the governing body for all BI initiatives at the bank. The centre involves participants from a number of business areas and includes BI vendors. The aim is to develop resources in development, production support, training, even recruitment. One manager expressed wanting to avoid the situation where there was a 'scattering of well-meaning amateurs everywhere.'

One challenge OzBank faces is in the area of BI engagement. The bank is confronting issues about how BI is best delivered as a service. Both users and providers of BI services at OzBank have expressed concerns with the engagement process. One participant noted '...it's all a bit hazy. The engagement model is shaky.' The case data revealed a diverse range of stakeholders surrounding BI within OzBank, each pursuing their own individual agendas. This has created an environment in which the engagement of BI resources can become problematic. For instance, when a client wishes to put together a new BI initiative, the process that they follow is confusing. 'You get a kind of demarcation dispute,' as one interviewee put it - stressing the challenges associated with conflicting business units, each pursuing different political agendas. BI engagement models may be of even greater importance as OzBank continues to increase its off-shoring capabilities. High quality engagement processes may help improve development effectiveness when language and cultural differences further complicate the environment.

There was a feeling amongst certain employees, particularly from IT, that BI has been marketed primarily as a business tool. This appeared to translate into some business areas failing to acknowledge the level of IT support that was required to effectively provide a BI capability. 'I think when the business gets hold of that idea they latch onto it without wanting to hear the rest of the story,' as one employee noted. Although there was no suggestion that IT wasn't needed, there did appear to be a limited comprehension of the IT implications when implementing BI. In order to effectively implement a BI strategy, the IT department must be included from the start of the project. This will enable IT staff to develop an understanding of the inner workings of the system, before they are called to fix a problem.

There was a feeling from one employee that IT areas were being kept at arms length, and that the bank's BI capabilities had suffered because of it. The insinuation was that some areas of the business felt that they could build, manage and operate the entire infrastructure themselves. Much of the marketing material promoting BI products and services talks about empowering business users. This may have in fact been misinterpreted by business people and contributed to the current governance challenges.

Finding #5: BI Shared Infrastructure.

A shared service is the standardisation and consolidation of business functions, in order to reduce process duplication and at the same time centralise controls and processes. This allows a company more controls over the quality of their processes, increasing efficiency and achieving benefits of scale. An important consideration when implementing BI at OzBank is the enterprise shared service business model that the bank manages. OzBank has focused considerable attention on establishing a shared service environment which provides databases, file transfer mechanisms, and email services.

An example of this may be witnessed in a large project currently undergoing testing. Focused around the risk area, the implementation will service a number of risk reporting requirements. The project is however being scoped with the intent of rolling it out to a shared infrastructure so it may be utilised across the group. This will allow other business units to migrate to that new capability and benefit from the IT economies of scale. The cost efficiencies of building in this environment are intended to allow other business units to benefit, particularly if these units are resource poor. The head of the risk project has commented that there are already other departments within the bank wanting to plug into this particular BI capability.

The ability to provide BI as a shared service at the bank is an important driver. The bank anticipates a situation where developers are able to leverage from existing developments. An underlying assumption is that BI development should be more than just a case-by-case initiative; it is actually establishing an architecture from which the entire bank can leverage. Compatibility with this environment was an important factor when selecting a standard BI reporting package.

CONCLUDING COMMENTS

Practical Contribution

For the successful management of IT, a thorough understanding of content, context and process is beneficial (Symons, 1991). Much of the evaluation literature of the past has focused on strict, financially based measures. Measures that do attempt to quantify intangibles are often complex to perform, resource intensive, and open to scrutiny. The case study has established that the CCP framework is a useful lens to address the nature of BI evaluation within organizations.

The CCP framework has highlighted that a focus on technical evaluation processes is too narrow. In order to effectively realise the nature and benefits of a BI program, an evaluation should be concerned not only with the process of the evaluation, but the organizational context, and the content of the evaluation. Evaluation literature often states that for a business to accurately understand the benefits derived from IT, and to effectively justify future investments, proponents need effective evaluation techniques. Although OzBank demonstrated little use of evaluation methodologies for post implementation reviews, or for business case justifications, there appeared an implicit understanding of the value provided by BI systems. This is apparent in the creation of a BI competency centre at OzBank. As the BI capability increases, management realise the value in development, production and training resources for BI.

Although many BI benefits are strategic, and challenging to measure accurately, this doesn't appear to be a major problem for OzBank. This is because BI is being driven largely on operational benefits. Improvements in information dissemination and adherence to compliance regulations have emerged as suitable vehicles in which to drive BI initiatives. Issues such as compliance are also helping to propel other IS improvements that may have otherwise been impossible without an existing underlying shared infrastructure. The interview data also acknowledged that for a BI strategy to be effective, it must be a joint venture between business and IT.

Theoretical Contribution

BI is a major component of many organization's IT portfolio, however the area is significantly under researched (Arnott & Pervan 2005). This paper contributes to the BI literature by developing a general architecture for BI. Figure 1 presents this framework as two high level stages, the preparation and presentation stages. It also outlines three main layers: the sourcing layer, the data layer, and the BI delivery layer. The framework helps to overcome some of the problems associated with what is traditionally a poorly defined area. In order for BI research to advance, there needs to be a consistent vocabulary of the domain. It is important to be concise with the terms used when describing and thinking about BI.

The CCP framework for evaluation was found to be a useful lens to analyse current evaluation practices in a large organization. Although the framework was initially created as a means of performing better evaluations (Symons, 1991), it was also found, in this case, to be a worthwhile lens in which to analyse current evaluation practices in industry. The OzBank case study brings us closer towards developing a framework for the evaluation of BI systems. As the case data demonstrated, an effective evaluation strategy means an

understanding of the varying perspectives of individual stakeholders and interest groups. Addressing the formal evaluation in itself, is too narrow. In fact, were the researchers to address a formal evaluation method in isolation, the case data may have suggested a poor management of BI. The CCP approach helped to identify what was actually a pragmatic approach to BI and benefit realisation. A thorough evaluation approach appears to be one that looks beyond the simple quantification of costs and benefits, and addresses the opportunities presented by the technology. A restricted focus on the content of the evaluation fails to adequately take into account the context in which the evaluation is (or isn't) occurring. Content and context in evaluation should be inextricably bound. Informal procedures, history, architecture, and stakeholder opinion all play an important role in the evaluation process, and should be included if the evaluation is to be effective and the potential benefits of the systems are to be fully realised.

Future Research Agenda

This paper has presented the first results of a project addressing the evaluation of BI systems. The research agenda involves design-science research that will build and test a strategy for the effective evaluation of BI systems. The pilot case study has served as a platform which has provided valuable insights into BI evaluation. It has enabled the researchers to obtain a perspective on current practices in large organizations. This knowledge will be combined with insight from IS evaluation research to develop a BI evaluation method. This method will be the design artifact, or focus of the research. The method will be tested and refined in real projects.

Advances in the effectiveness of information systems, particularly BI, appear to have far outrun our ability to accurately measure their impact. Advancement towards a more comprehensive understanding of the value of these systems is the ultimate goal of the project.

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