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Paul Hawking
*Institute of Logistics and Supply Chain Management Victoria University, Melbourne*, Paul.Hawking@vu.edu.au

Robert Jovanovic
*Institute of Logistics and Supply Chain Management Victoria University, Melbourne*, Robert.Jovanovic@vu.edu.au

Carmine Sellitto
*Institute of Logistics and Supply Chain Management Victoria University, Melbourne*, carmine.sellitto@vu.edu.au

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**Paul Hawking**
Institute of Logistics and Supply Chain Management
School of Management and Information Systems
Victoria University
Australia
Paul.Hawking@vu.edu.au

**Robert Jovanovic**
Institute of Logistics and Supply Chain Management
School of Management and Information Systems
Victoria University
Australia
Robert.Jovanovic@vu.edu.au

**Carmine Sellitto**
Institute of Logistics and Supply Chain Management
School of Management and Information Systems
Victoria University
Australia
Carmine.Sellitto@vu.edu.au

**ABSTRACT**

Effective Business Intelligence (BI) is essential for companies in today's business environment. The benefits from the adoption and use of BI vary from company to company. It has been suggested that the level of BI success is associated with a company's level of BI experience or maturity. Researchers have attempted to map the various BI practices to BI Maturity Models. This paper investigates the applicability of a BI maturity model to capture the BI practices of Australian companies. The research indicates that BI is well established in large Australian companies.

**Keywords Business Intelligence, Maturity Models**

## INTRODUCTION

Companies today have realised the importance of providing accurate, relevant and timely information that allows their organisational personnel to engage in effective decision-making practices. Aristotle Onassis, the famous Greek shipping tycoon once proposed that "*the secret of business is to know something that nobody else knows*" (cited Lorange, 2001 p.32). Evans and Wurster (1997, pp.72) in their paper on Information Economics stated that *"… information is the glue that holds business together*". Clearly, the consequences of treating information as a strategic resource and corporate investment can result in companies gaining industry-wide advantages that are reflected through increased reputation and profitability (Loshin, 2003, pp. 11).

Companies have developed and implemented information systems to facilitate the collection, processing, storage and dissemination of information. One such system, Enterprise Resource Planning (ERP) system, has enabled companies to gain efficiencies in their business processes and associated transactions through the high degree of integration of their company-wide business activities and diverse data types (Davenport et al, 2003). ERP systems are an essential element of the corporate information systems infrastructure allowing a business to be competitive in today's world, as well as providing foundation for future growth (Chou et al, 2005). A survey of 800 top US companies showed that ERP systems accounted for 43% of their information technology budgets (Somers and Nelson, 2001). The ARC Advisory Group (2006) estimated that the worldwide market for ERP systems was $USD16.67 billion in 2005 and is forecasted to surpass $USD21 billion in 2010.

Accenture interviewed 163 executives from large enterprises around the world to identify how companies were using ERP systems to improve business performance and the specific practices that resulted in sustained value creation (Davenport et al, 2003). They found that the implementation of an enterprise-wide information system resulted in sustained value creation however; some corporations realized far more benefits than others. This is reflected by Geoffrey Moore' s (2007) observations in that some companies are focussed on using these systems to automate, consolidate, to reduce costs. Alternatively, other companies are increasing their investment and opening the systems to facilitate engagement with various stakeholders.

Accenture conducted a more extensive follow up study in 2006 involving 450 executives from 370 companies to identify the factors that drove value from their ERP system, as well how companies used these systems to enhance competitiveness and differentiation (Harris and Davenport, 2006). One of the key findings from this study was that a primary motivation associated with these systems was to improve decision making. The study also identified that top performing companies aggressively used information and Business Intelligence (BI) as a precursor to improving the decision making capacity of their managers. ERP systems are used to ingrate, automate and mange core business processes while BI utilises data from ERP systems to analyse the performance of these business processes. Accordingly ERP vendors have extended their solution offerings to incorporate BI functionality.

The importance of BI is supported by Gartner, a leading business analyst firm, who conducted a worldwide survey of 1,500 Chief Information Officers (CIO) and identified that BI was the number one technology priority for companies, second only to ERP systems (Gartner, 2008). In a survey of 142 companies it was found that 70% of the respondents had implemented some form of data warehousing and BI initiatives (Cutter Consortium, 2003),. Clearly, such findings underpin the forecasted BI vendor revenue that is expected to be $7.7 billion by 2012 (Sommer, 2008).

The increased expenditure on BI reflects the level of impact these systems can potentially have on a company's performance. IDC, another technology analyst firm, found in a survey of 62 companies that there was an average a 401 percent ROI over a three year period (IDC, 1996). The Data Warehousing Institute (TDWI, 2005) identified that the use of BI in a number of organisations such as Hewlett Packard and the US Army had a significantly positive impact on their performance. Hewlett Packard found, in 2004, that due to their BI initiative, the value of worker productivity increased by approximately USD$10.6 million, whilst the company's reporting costs were reduced by some $8.6million. The US Army found that as a result of their BI implementation, 10 trained analysts could complete as much work as 200 traditional analysts. In another example of the value of BI, Harrah's, a major hotel and casino owner in America, found that BI contributed to their improve business performance which was associated with their $235 million profit in 2002. Harrah's spent $10million building a 30 terabyte data warehouse (Lyons, 2004) and used BI to better understand their customers and their gambling habits (Williams and Williams, 2006). The IDC group collected data from forty three companies in North America and Europe that had implemented a BI and found that twenty companies achieved a ROI of less than 100 percent, fifteen achieved an ROI between 101 and 1000 percent, whilst eight achieved an ROI greater than 1000 percent (Morris, 2003).

**What is Business Intelligence?**

The desire by companies to collect, store and analyse data to support organisational decision making activities, coupled with the availability of appropriate computing technology has resulted in the evolution of existing IT systems and the emergence of new powerful analytical solutions. These included Decision Support System (DSS), Executive Information System (EIS), Data Warehousing (DW), Knowledge Management (KM), Data Mining (DM), Collaborative Systems (CS), Corporate Performance Management (CPM), Knowledge Discovery (KD) and Analytics, with the term Business Intelligence (BI) tending to be used to encompass all these systems (Gibson et al, 2004; Gray, 2003; Olszak and Ziemba, 2007). Gray (2003) believes that BI is not a new technology but an evolution of previous systems used to support decision making.

Some researchers (Vitt et al, 2002) consider the actual term "business intelligence" to be relatively new with Howard Dresner, from the Business Intelligence vendor Hyperion, claiming ownership of the term (Smalltree, 2006). However, Luhn (1958 p.314) used the term more than 50 years ago when explaining his dissemination of information technique. Although it is possible to narrow down the origin of the term, a common definition is more elusive. Vitt et al (2002, pp.13)

refer to BI as "an approach to management that allows an organization to define what information is useful and relevant to its corporate decision making." Howson (2007, pp.2) defined BI as allowing "…people at all levels of an organization to access, interact with, and analyse data to manage the business, improve performance, discover opportunities, and operate efficiently". These definitions appear to ignore the role that information technology (IT) plays in the applicability of BI. Golfarelli et al (2004, p.1) defines BI "as information systems which processes data into information and then into knowledge to facilitate decision making". Loshin (2003, p.4) believes that it is "a set of tools and methodologies designed to exploit actionable knowledge discovered from the company's information assets".

## BUSINESS INTELLIGENCE MATURITY MODELS

Similar to ERP systems, various researchers have identified that companies utilise BI in different ways, with varying levels of success. Indeed, some researchers have attempted to map BI usage and benefits through maturity models (Watson et al, 2001; McDonald, 2004; Hamer, 2005; Eckerson, 2007, ASUG, 2007; Hewlett Packard, 2007). The purpose of these models is one of providing companies with a roadmap to improve the management of their corporate data, as well as to maximise the organisational benefits as a result of better understanding BI systems. Each BI maturity model identifies distinct stages associated with a company's BI progress and growth.

The Americas SAP User Group (ASUG) developed a series of benchmarking studies for its members to better understand the implementation and usage of ERP systems and associated solutions such as BI. ASUG is the largest SAP user group in the world with more than 85,000 members from 4,000 companies (ASUG, 2008a). In 2007, ASUG in conjunction with SAP developed a BI benchmarking initiative and has had more than 100 companies participate in the study (ASUG, 2008b). A website was developed to capture the benchmarking information and a series of presentations was conducted to introduce customers to the initiative. The key questions which the study was intended to answer were:

- How do companies leverage BI to drive business performance?
- For which business process is BI most critical?
- What are the key performance indicators of an effective BI environment?
- How much do top performing companies invest in BI?
- What are the best practices that companies can adopt to drive effectiveness and efficiency of their BI environment? (ASUG, 2008b)

Key metrics were designed to capture information to answer these questions. The website was designed to capture pertinent information about a company's BI experiences allowing relevant comparisons to be made between firms. The gathered information was also used to highlight various industry standards, allowing a range of BI benchmarks to be created. Part of the derivation process associated with benchmarking was to map companies to a maturity BI model. The ASUG Business Intelligence Maturity Model (Table 1) allows BI maturity to be classified into the stages of Application Architecture, Standards and Processes, Governance, and Information and Analytics. Within each of these stages are a number of categories which describe different aspects of BI.

| Stage | 1<br>Information Dictatorship | 2<br>Information Anarchy | 3<br>Information Democracy | 4<br>Information Collaboration |
|---|---|---|---|---|
| **Information and Analytics** | Requirements are driven from a limited executive group | KPI's and analytics are identified, but not well used | KPI's and analytics are identified and effectively used | KPI's and analytics are used to manage the full value chain |
| **Governance** | IT driven BI | Business driven BI evolving | BI Competency Centre developing | Enterprise wide BI governance with business leadership |
| **Standards and processes** | Do not exist or are not uniform | Evolving effort to formalise | Exist and are not uniform | Uniform, followed and audited |
| **Application Architecture** | BI "silos" for each business unit | Some shared BI applications | Consolidating and upgrading | Robust and flexible BI architecture |

**Table 1 The ASUG (2007) Business Intelligence Maturity Model.**

Generally maturity models are designed to provide a roadmap for companies to move forward and maximise the benefits of their BI initiatives. A review of the literature indicates that a number of companies often fail to realise expected benefits of BI and sometimes consider the project to be a failure in itself (Chenoweth et. al., 2006; Hwang et al., 2004; Johnson, 2004; Arte 2003; Adelman and Moss 2002). Gartner predicted that more than half of the Global 2000 enterprises would fail to realise the capabilities of BI and would lose market share to the companies that did (Dresner et al, 2002). A survey of 142 companies found that 41 percent of the respondents had experienced at least one BI project failure and only 15 percent of respondents believed that their BI initiative was a major success (Cutter Consortium, 2003). Moss and Atre (2003) indicated that 60% of BI projects failed due to poor planning, poor project management, undelivered business requirements, or of those that were delivered, many were of poor quality. A number of authors believe that in many BI projects the information that is generated is inaccurate or irrelevant to user needs or indeed, delivered too late to be useful (Ballou and Tayi, 1999; Strong et al., 1997).

Maturity models are designed to provide a BI roadmap of best practices for companies. So are companies able to adequately map their BI practices to the ASUG Maturity Model? It would be expected that if the model was a true indication of BI maturity then there would be a relationship between the stages of the model. Can companies easily identify which stage applies to their BI practices? The increased adoption and usage of BI requires research into the various maturity models and their applicability.

## RESEARCH METHODOLOGY

The primary objective of the research was to survey a range of information system professionals and seek responses to how they perceived the maturity of their company's business intelligence initiative as per the ASUG BI Maturity Model. In addition more specific research questions considered include:

- What is the Business Intelligence maturity of Australian companies?
- Can companies easily use the maturity models to classify their BI usage?

In order to study the maturity of business intelligence usage in Australia we used the ASUG (2007) BI maturity model. A survey was developed where respondents were asked to identify which stage of the model best described, or corresponded to their company's BI usage. The survey was piloted with a group attendees at a BI customer presentation organised a by the

SAP Australian User Group (SAUG). The amended survey was then distributed via the internet. The SAUG sent an email to its members to direct the respondent to a web site that incorporated a web based survey delivery platform. Several studies (Simsek, 2000; Stanton and Rogelberg, 2000) have compared email and Web based survey methods versus mail information collection methods and have proposed that email surveys compare favourably with postal methods in the areas of cost, speed, quality and response rate.

## RESULTS/DISCUSSION

### Sample

The SAUG has approximately 300 corporate members who are representative of many of Australia's leading companies. SAP is the leading vendor of ERP systems in Australia with approximately 70% of the market (McBride 2003) and the user group is representative of approximately 65% of the SAP customer base. The sample was made up of the BI contacts for each company, which are members of the SAUG. A total of 355 emails were sent out resulting in 64 completed surveys and a response rate of 18%.

### Demographics

Background data was collected to provide background information on the respondent companies. The data was analysed by: business activity, company size as measured by annual revenue and fulltime employees.

Business Activity

The respondents came from a number of industries including Public Sector (31%), Manufacturing/Distribution (33%), Utilities (14%), Retail/Wholesale Trade (11%), Finance (8%) and Mining (3%).

Annual Revenue

Respondents were asked to indicate the annual revenue of their organisation in the last financial year. The majority of the respondents (59%) indicated that their organisation's revenue was greater than $AUD1billion. Approximately a quarter of respondents had revenue below $AUD500million with 14% falling between these two revenue levels. Many of the Public Sector organisations did not list any revenue amount.

Employees

Respondents were asked to indicate the number of Full Time Equivalents (FTE's) working in their organization. The majority of the responding organisations (45%) had between 1,000 and 10,000 employees. Just over a quarter (28%) of organisation had less than 1,000 employees. The remaining organisations had more than 10,000 employees with 8% having more than 100,000.

Respondents

Respondents were asked to identify their role in the organisation and the years of experience that they had with BI. The majority of respondents (66%) indicated that they held a senior or managerial role within their company while 20% indicated that they were different type of analysts. Many of the respondents listed different aspects of BI in their job role such as BI analyst or senior BW developer. In terms of experience of the sample it ranged between .5 to 24 years with 38% of the sample having less than 5 years BI experience.

### BI Maturity

Respondents were asked to identify which BI practice in each category best described their current practices. These categories were then consolidated to identify which maturity stage was applicable to each company. An analysis of the results revealed that many respondents (92%) struggled to classify their BI usage entirely in one stage of the model. We decided to classify organisations to a BI maturity stage if three or more of their BI practices fell within one particular stage. Just over half of the organisations (56%) could be classified as per this method with the majority of organisations falling in the Information Anarchy maturity stage (Table 2).

| Stage | 1 Information Dictatorship | 2 Information Anarchy | 3 Information Democracy | 4 Information Collaboration |
|---|---|---|---|---|
| **Companies** | 8 | 20 | 4 | 4 |

**Table 2 Companies per maturity stage**

To gain a better understanding of BI maturity practices of Australian organisations the frequency of each practice was calculated. Table 3 includes the frequency of BI practices for the ASUG (2007) model.

| Stage | 1 Information Dictatorship | 2 Information Anarchy | 3 Information Democracy | 4 Information Collaboration |
|---|---|---|---|---|
| **Information and Analytics** | Requirements are driven from a limited executive group **(19)** | KPI's and analytics are identified, but not well used **(28)** | KPI's and analytics are identified and effectively used **(13)** | KPI's and analytics are used to manage the full value chain **(4)** |
| **Governance** | IT driven BI **(16)** | Business driven BI evolving **(36)** | BI Competency Centre developing **(6)** | Enterprise wide BI governance with business leadership **(6)** |
| **Standards and processes** | Do not exist or are not uniform **(9)** | Evolving effort to formalise **(25)** | Exist and are not uniform **(23)** | Uniform, followed and audited **(7)** |
| **Application Architecture** | BI "silos" for each business unit **(11)** | Some shared BI applications **(22)** | Consolidating and upgrading **(20)** | Robust & flexible BI architecture **(11)** |
| | **54** | **111** | **62** | **28** |

**Table 3 Companies per maturity factor**

The frequency of the different category practices indicates that a large number of practices (44%) were selected in the Information Anarchy stage followed by the Information Democracy Stage (24%). This implies that the majority of companies have a reasonable level of BI maturity. Previous research identified that companies in Australia are considered mature in their ERP usage (Stein et al, 2006). It is not unreasonable to expect that the governance skills and processes associated with the ERP implementation in these companies would be applied to the implementation and use of other technologies such as BI. However the effectiveness and standardised use of BI enterprise wide is only a relatively recent occurrence.

The results reveal that the reporting of key performance indicators (KPI's) is a major driver for BI reporting practices for Australian organisations. BI by definition is involved in facilitating decision making and improving corporate performance (Howson, 2007). Accordingly, the identification, recording and monitoring of key metrics such as KPI's is an essential requirement for this improved corporate performance. The role these metrics have on business performance is reinforced by the majority of respondents.

In terms of the Application Architecture category it would be expected that companies would be moving away from the business unit based BI architecture. The sampled companies are SAP customers which in many cases have implemented their ERP system across the entire firm (enterprise-wide). Previous research (Stein et al, 2006) of Australian companies found that SAP solutions were used extensively across business areas by large numbers of employees. Harris and Davenport (2006) found that increased adoption of ERP system functionality within a company had a positive impact on the performance of that company. This enables companies to become more business process focussed. The implementation and use of BI solutions at the business unit level limits the capturing and analysis of key metrics associated with business processes especially when these business processes extend beyond business unit boundaries. SAP BI is designed to be an enterprise wide solution sourcing much of its data from the SAP ERP system. Due to these capabilities the business unit based BI solutions tend to be retired. This is reinforced in the maturity model through many of the companies (65%) sharing or consolidating their BI solutions. This might also reflect one of the consequences of the amalgamation of various vendors of BI solutions in recent times.

The sharing and or consolidation of BI solutions can lead to a standardisation of processes and procedures. The enterprise wide approach necessitates this standardisation. The findings potentially reflect this with 75% of respondents indicating that standards and processes associated with BI usage are evolving or already exist. However, these are yet to be consistent throughout the company.

Normally the benchmarking key metrics and information collected online would be used to classify companies as per the maturity model. In this study companies were required to self administer the model. An issue with this is that the descriptors for each category component is limited and therefore allows for different interpretations— hence, one of the limitations of the study. More investigation is needed to determine the accuracy of the model in terms of grouping of category factors in each stage. However the model does include a number of BI related practices which can help companies map their BI evolution. It is interesting to note that the model does note make reference to any specific BI technology such as dashboards or data mining.

Further research is required to investigate the various BI practices in each category. A shortcoming of the research is the limited description of each practice which allows a lot of interpretation of the respondents. Characteristics of each practice need to be identified and thus adding rigor to the classification.

## CONCLUSION

Business Intelligence systems are a priority for many companies however, as with the adoption of any new idea, technology or innovation— BI has its early adopters and late-adopters of such systems. A number of maturity models have been developed to identify usage and provide a roadmap for companies to maximise the benefits from their BI initiatives. In this study we used the ASUG Business Intelligence Maturity Model to determine the standing of a number of Australian companies that had implemented BI activities. The model allowed us to use a range of factors that can be used to characterise BI usage. The findings provide a foundation for further research into BI adoption and use in Australia

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