

8-7-2011

Business Intelligence Excellence: A Company's Journey to Business Intelligence Maturity

Paul Hawking

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

Follow this and additional works at: http://aisel.aisnet.org/amcis2011_submissions

Recommended Citation

Hawking, Paul, "Business Intelligence Excellence: A Company's Journey to Business Intelligence Maturity" (2011). *AMCIS 2011 Proceedings - All Submissions*. 63.

http://aisel.aisnet.org/amcis2011_submissions/63

This material is brought to you by AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2011 Proceedings - All Submissions by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Business Intelligence Excellence: A Company's Journey to Business Intelligence Maturity

Paul Hawking

Institute of Logistics and Supply Chain Management
School of Management and Information Systems
Victoria University
Australia

Paul.Hawking@vu.edu.au

ABSTRACT

This paper is a case study which describes a company's Business Intelligence (BI) journey. Although Business Intelligence is seen as priority by many companies the level of benefits achieved varies significantly. Often this is dependent on the level of Business Intelligence maturity. This paper documents a company's trials and tribulations with their BI implementations. The paper maps and discusses the company's Business Intelligence maturity and documents Business Intelligence best practices.

Keywords; Business Intelligence, Maturity Model, Case Study

INTRODUCTION

Companies today have all come to realise the importance of providing accurate, relevant and timely information—information that allows their organizational personnel to engage in effective decision-making practices. Aristotle Onassis, the famous Greek shipping tycoon once commented 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).

Accenture interviewed 163 executives from large enterprises around the world to identify how companies were using Enterprise Resource Planning (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 companies realized far more comparable benefits than others. A more extensive follow up study in 2006 involving 450 executives from 370 companies identified 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 improved decision making was the most desired benefit. Related to this finding was that the top performing companies aggressively used information and analytics to improve their decision making. These findings are supported by Gartner, a leading business analyst firm, who conducted a worldwide survey of 1,500 Chief Information Officers and identified Business Intelligence (BI) as the number one technology priority for companies, followed by ERP systems (Gartner, 2008). In a Cutter Consortium Report (2003), a survey of 142 companies it was found that 70% of the respondents had implemented data warehousing and Business Intelligence initiatives. The increased focus on BI is reflected in the forecasted BI vendor revenue expected of \$7.7 billion by 2012 (Sommer, 2008).

Although BI is seen as a priority for many companies to survive in a competitive market there is uncertainty as to the path to follow. Researchers have identified that companies utilize BI in different ways, with varying levels of success. A review of literature indicates that a number of companies often fail to realize expected benefits of Business Intelligence 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

Business Intelligence 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 Business Intelligence project failure and only 15 percent of respondents believed that their BI initiative was a major success (Cutter Consortium Report, 2003). Moss and Atre (2003) indicated that 60% of Business Intelligence 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 the user's needs or indeed, delivered too late to be useful (Ballou and Tayi, 1999; Strong et al., 1997).

Researchers have attempted to map Business Intelligence usage and best practices to provide a roadmap for companies to move forward in an attempt to maximise the benefits of their Business Intelligence initiatives. One approach for this roadmap has been the development of Business Intelligence Maturity Models (Watson et al, 2001; McDonald, 2004; Hamer, 2005; Eckerson, 2007, ASUG, 2007; Hewlett Packard, 2007). The purpose of these models is to provide companies with a roadmap to improve the management of their corporate data, as well as maximise the benefits obtained from Business Intelligence. The Business Intelligence Maturity Models identify different stages incorporating practices which are associated with a company's Business Intelligence progress and growth. Although there are many Business Intelligence Maturity Models they each differ in the practices and stages characterizing different levels of maturity. This case study will discuss one of the Business Intelligence Maturity Models and its applicability to a company's Business Intelligence practices.

BUSINESS INTELLIGENCE MATURITY MODEL

The Americas SAP User Group (ASUG) is the largest SAP user group in the world with more than 85,000 members from 4,000 companies (ASUG, 2008a). ASUG developed a series of benchmarking studies to assist its members to better understand the implementation and usage of ERP systems and associated solutions such as BI. In 2007, ASUG in conjunction with SAP developed a Business Intelligence benchmarking initiative with more than 100 companies participating in the initiative (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 Business Intelligence to drive business performance?
- For which business process is Business Intelligence most critical?
- What are the key performance indicators of an effective Business Intelligence environment?
- How much do top performing companies invest in Business Intelligence?
- What are the best practices that companies can adopt to drive effectiveness and efficiency of their Business Intelligence environment? (ASUG, 2008b)

Key metrics were designed to capture information to answer these questions. The web site was designed to capture enough information from different company's Business Intelligence experiences to enable relevant comparisons. These details were compared to details from other companies as well as industry standards, allowing a range of Business Intelligence benchmarks to be created. Part of the benchmarking derivation process was the mapping of companies to a maturity model. The ASUG Business Intelligence Maturity Model (Table 1) allows BI maturity to be classified as per practices related to Application Architecture, Standards and Processes, Governance, and Information and Analytics. Each of these practices is made of a number of stages which describe different aspects of Business Intelligence maturity.

Stage	1 Information Dictatorship	2 Information Anarchy	3 Information Democracy	4 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

It would be expected to find many companies in the early levels of Business Intelligence maturity. This would provide verification for the practices and associated stages. But are the higher levels of maturity reflective of Business Intelligence best practices? Each year Gartner identify companies for Business Intelligence Awards of Excellence. It would be reasonable to expect that a company which achieved such an award would be very mature as per the model. The remainder of the paper contains a case study documenting a company's BI journey. This same company was a recent of the Gartner Business Intelligence Award of Excellence, (alias CompPack).

CASE STUDY

A case study research methodology was used for an exploratory look at how a company utilised Business Intelligence to support their overall business strategy. The case study focused on a large company involved in the process packaging industry. The data collection process included the examination of existing documentation, and interviews of key personnel. Yin (1994) suggests that a single, in-depth case study is an appropriate research approach under a number of conditions one of which being that it is a critical case whereby it meets all the necessary conditions for testing a theory.

CompPack is a global food packaging and processing company which has been established since 1929. This private company has 20,000 employees, 50 factories and sales operations in 150 countries. In 2008, CompPack produced 141 billion packages worldwide resulting in total sales of Euro 8.8billion.

ComPack decided to implement SAP's ERP system in 1994 to support their business. Similar to many other companies, ComPack's ERP system implementation was not as successful as they would have liked. In 1999 ComPack was faced with a number of issues. The value chain was consolidating placing increased pressure on prices and margins throughout the value chain. There was increased competition from other package suppliers. There were the issues of the impending Y2K and the impact this would have on the company especially when some of the legacy systems were almost than twenty years old. In addition ComPack's business had grown globally and the ERP system needed to support these new markets and associated operations. It was decided to undertake a Process Globalisation Project supported by SAP solutions.

The SAP implementation, which included the implementation of a data warehouse, adopted a phased approach based on geographical locations. The first two phases involved geographic locations associated with ComPack's smaller markets and thus minimising the risks. The third phase involved implementing SAP in Germany and United States which represented the majority of ComPack's markets and thus the highest risk. This implementation was not without its problems. The project took 12 months instead of the planned 6 months and incurred a 300 percent budget overrun. Despite these setbacks the project delivered standardized business processes automated by SAP solutions in two major markets.

The implementation of the data warehouse was a relatively small component of the overall SAP implementation. The project overruns limited the scope of the of the data warehouse implementation. The data warehouse was designed to be a large repository of business data based on the premise that if data was collected and stored in one location then the business users would access it for their business needs. This expectation did not occur. A major reason for this was the lack of performance associated with making the data available to the business users. The performance issues were related to the technical design and infrastructure. Data was extracted from the ERP system into the centralised data warehouse every night. The data was then aggregated, synchronized and extracted into geographic based data warehouses (data marts) and in some cases the data was further extracted to power users' personal computers to refresh reports. This series of data extractions resulted in delays in performance in delivering relevant data to the intended users. Accordingly there was a lack of confidence in the centralized data warehouse solution by middle managers.

In 2005, the staff responsible for the data warehouse, Finance Global Business Process Owner, VP group Financial Control and the IT Delivery Director, realised that after spending 20 million euro that the current system was not providing the expected benefits and arranged a meeting with the Chief Financial Officer (CFO) to discuss the various options. The CFO agreed there needed to be a change of direction and in 2006 the data warehouse project was stopped and a new Business Intelligence initiative was commenced. The project was referred to as "Business Warehouse" to differentiate it from the previous project

It was decided to reduce the complexity of the current BI environment that the new project would standardize the Business Intelligence infrastructure across ComPack to SAP's Business Information Warehouse (SAP BW) including Business Explorer (Bex) web component for the presentation of reports. This reduced the number of extractions required as per the previous implementation and thus improved overall performance in the providing business data to the users.

The Business Warehouse project had two major milestones. The first was to replace a legacy financial consolidation system by getting the global legal financial accounting data into the SAP BW system and ensure its correctness. The second milestone was associated with loading the management accounting data into the BW system as well ensuring that the correct data was available to report on the key performance indicators (KPI's) of ComPack's core business processes. This meant that the ComPack had evolved from having legal financial accounting view of the company to a management view of company involving budgets and core business process performance. This availability of key data via the BW system resulted in greater support and acceptance by business users. The BI team started to develop standardized processes to enable the provision of more and more key information to support the business.

SAP, in conjunction with hardware partners, IBM and HP, developed a "bolt on" infrastructure solution to improve the performance of reporting. The Business Intelligence Accelerator (BIA) utilizing blade computing technology has been reported to improving reporting by up to one hundred times faster (Lewis, 2009). In early 2009, ComPack implemented the BIA to improve their reporting performance. The reporting response time was reduced from an average of twenty seconds down to five seconds. The availability of financial and management data in conjunction with improved reporting performance resulted in greater support and acceptance of the BW system gained by the business users.

As part of the Business Warehouse project, ComPack considered there were three important phases to their Business Intelligence journey. The first phase involved getting the necessary infrastructure and data in place to provide some quick wins while at the same time providing a foundation for future development. Prior to the implementation of the Business Warehouse project ComPack had a fragmented corporate reporting applications environment. The second phase involved the governance of Business Intelligence in terms of the processes related to the collecting requirements to the development of reports. A standardized reporting template was developed which included charts, data tables, filters and the ability to change the dimensions for analysis. All reports were developed based on this template and thus once a user was familiar with the functionality and navigation of one report they could then apply this knowledge to any other report. The only training that was required was in relation to the business content of the report and its applicability. The governance standardization enabled a best practice approach to ensure a successful Business Intelligence solution. The final phase was to build upon the foundation laid down by the first two phases to extend the coverage and usage of Business Intelligence to support management and the business.

A major factor of the Business Intelligence initiative's success was due to the agreement by senior management as to the role of Business Intelligence within ComPack. There was agreement that to improve business performance that there needed to be three things in place. There needed to be the right business processes and people needed to be trained how to execute these business processes and finally the correct tools in needed to be available to support the people and processes; "*Business Performance = Process X People X Tools*".

ComPack developed a strategy map and balanced scorecard, including relevant KPI's, to implement and monitor their strategy. The monitoring of business processes through the associated KPI's was integral to the company's performance and this was the main priority for Business Intelligence. Another business priority for BI was the need for a single version of truth about the business. This included consistent facts about customers, products, suppliers, past performance and future forecasts. ComPack's Process Globalization Project was the single largest investment in the company's history and Business Intelligence enabled the company to realize many of the benefits from this investment.

As part of the Business Warehouse project ComPack consulted with Gartner in an attempt to identify "best practice". One recommendation was the establishment of a Business Intelligence Competency Centre (BICC). A BICC is responsible for developing the overall strategic plan and priorities for Business Intelligence. It defines the requirements (including data quality and governance), and helps the organization to interpret and apply the insight to business decisions (Gartner 2006). ComPack considered that a BICC was essential if it was to achieve an enterprise view of the data and reporting requirements. To fully capture the company's requirements ComPack's BICC was comprised of two structures. The first structure consisted of:

Business Information Management (BIM): This consisted of 5 full time senior business analysts who had a good understanding of the business and the capabilities of Business Intelligence.

Global Information Management (GIM): This project team consisted of between 15 to 25 people and provided the technical Business Intelligence expertise. The BIM and GIM worked closely together with common goals.

Global Information Management Service Delivery Team (GIM SDT): This group involved approximately 12 people and were responsible for ensuring the availability and an ongoing support for reports once they were developed.

Global Process Owners/ Global Process Drivers (GPO/GPD). This group were responsible for key business processes. ComPack decided that these people were the only people who were allowed to request IT related projects. This resulted in IT having a very focussed business role.

The other structure, which was referred to as the "Extended BICC", consisted of the MIS coordinator from each of the business areas that utilise Business Intelligence. Their role was to act as change agents and encourage the adoption and use of the BI solution.

The BICC is overseen by a steering committee made up of senior management and their ongoing support is considered essential to the success of the BI initiative.

A priority of the BICC is not just to gather requirements and develop reports but also the deployment of those reports and the realization of their value. The process of gathering requirements, developing reports, deployment and report value realization has been documented to ensure that the process is standardised, repeatable and clearly understood across the company. This has enabled the process to be refined and improved. A timeline for the report development and deployment process was developed and publicized. This facilitated business areas planning and scheduling their reporting requests. Reports are rolled out quarterly.

ComPack's approach to Business Intelligence has enabled them to gain a high level of success in relation to their BI initiative. In December 2008 they had approximately 1800 active users representing about 9% of the employees. By June 2009, the number of active users had increased to 2,600 (12.5%). ComPack believes that this level of usage could not be achieved unless the users perceived the Business Intelligence system to be of value.

To ensure that ComPack's approach to BI is best practice they developed a "Business Intelligence Effectiveness Scorecard". This scorecard consists of a number of assessable components including;

- Business Case and Vision: 1) Single source of truth, 2) business analysis across borders, processes, businesses, 3) Analysts move from data gathering to real business analysis, 4) reduce total reporting cost.
- Executive Support: CFO provides visible public support
- Alignment to Business Strategy and Business Processes: Only Global Business Process Owners can request BI or CPM projects
- Alignment and Working Practices, Business and IT: Business Transformation Process aligns strategy, process and organisation. Business owns scope prioritisation and outcomes
- Extended BICC: Central team with both business and technical expertise. Network from the center Business Transformation Officers and Market MIS Coordinators provide the link to adoption

- Predictability – Robust and Effective Delivery Methodology: Compliance to IT Project and Service processes as a subset of Business Transformation process

ComPack believe that their Business Intelligence approach has satisfied the above criteria. However the above scorecard only reinforces that the correct approach has been implemented. A further scorecard, “Business Intelligence Value Scorecard” was developed to quantify the Business Intelligence impact on the business. This scorecard including measures is displayed in Table 2

Measure	Score	Comment
Global Enterprise-wide Adoption – the ultimate measure of BI success – % of employees as active BI users	> 10%	More than 10% of employees are active users, expect to reach 15% in 2009. More than 30000 navigations per day. 20% of employees are registered users.
% coverage in BI of business processes and business performance measurements Single source of truth across borders, processes, businesses	100%	Business performance measurements are available for all business processes and all business units. Expanding coverage within processes and units. Used in all Markets and in the center.
Response time	5 seconds	Worldwide: all management reports in 15 seconds or less, average navigation step below 5 seconds
Reliability, Consistency & Quality	7AM	All managers have fresh data at 7AM their time worldwide. Information is correct and broadening. Adoption makes sure it stays correct.
Easy to use – low training cost	High user adoption	Information portal based on geography, business roles and business processes; standard layouts make it easy to understand and use
Enables next steps – new major business information initiatives	Global Information Projects	Successful major new information projects – brand information back to our customers, worldwide alignment on Sales Forecasting

Table 2 Table 2 The Business Intelligence Value Scorecard.

ComPack has noticed that due to their approach to Business Intelligence and the value generated that different areas of the business are placing greater demands on the Business Intelligence group for new initiatives. This increased demand for Business Intelligence is reflected by the last measure in the above scorecard.

Business Intelligence has enabled ComPack to refine their business processes as they move towards a business transformation. Business Intelligence is used to gauge the performance of business processes and thus essential to understanding the impact of business process redesign. Since the introduction of Business Intelligence, ComPack has seen significant improvements many of their core business processes. For example ComPack focused on reducing the time between the ordering and implementation of their packaging equipment at a customer’s site. Through the revision and refinement of the associated processes they were able to reduce this time from 140 days down to 47 days. The process of

taking a customer’s packaging design and manufacture it was reduced from 15 days to 5 days. Accordingly Business Intelligence is considered essential to business sustainability and growth at ComPack.

BUSINESS INTELLIGENCE MATURITY MODEL APPLICABILITY

ComPack’s Business Intelligence implementation and usage would be considered a very mature company as per the ASUG Business Intelligence Maturity Model. KPI’s and analytics are used extensively to manage the entire business. The BICC has enabled the company to develop enterprise wide governance and Business Intelligence leadership while at the same time implementing standardized processes and standards to support the Business Intelligence initiative. This standardization also applies to their Business Intelligence architecture. These Business Intelligence practices are aligned with the highest level of maturity in the ASUG model, Information Collaboration. This level of maturity is further supported by ComPack achieving a Gartner Business Intelligence Award of excellence in 2009. Table 3 classifies ComPack’s BI practices as per the Information Collaboration stage of the ASUG Business Intelligence Maturity Model.

Stage	4 Information Collaboration	ComPack Practices
Information and Analytics	KPI’s and analytics are used to manage the full value chain	<ul style="list-style-type: none"> • Implementation of Strategy map and balanced Scorecard • Globalisation Process Project
Governance	Enterprise wide BI governance with business leadership	<ul style="list-style-type: none"> • Establishment of an enterprise wide Business Intelligence Competency Centre supported and promoted by senior management.
Standards and processes	Uniform, followed and audited	<ul style="list-style-type: none"> • The implementation of the Business Intelligence Competency Centre. • Introduction of BI Effectiveness Scorecard
Application Architecture	Robust and flexible BI architecture	<ul style="list-style-type: none"> • Business Intelligence Accelerator • SAP Business Intelligence • Business Explorer web reporting

Table 3 Table 3 The ASUG (2007) Business Intelligence Maturity Model and ComPack

CONCLUSION

This paper describes a company’s Business Intelligence journey. It documents a number of the Business Intelligence “best practices”. The value of these “best practices” is validated through the company being awarded the Gartner Business Intelligence Award of Excellence. In terms of Business Intelligence maturity Compack can be mapped to the Information Collaboration stage of the ASUG Business Intelligence Maturity Model. This paper provides a resource to companies attempting to understand how to maximize their Business Intelligence benefits and includes a Business Intelligence Value Scorecard. Compack has a very clear role for how Business Intelligence can support their overall corporate performance

REFERENCES

1. Adelman, S. and Moss L. T. (2002), *Data Warehouse Project Management*, Addison Wesley, Boston
2. Atre, S. (2003). “The Top 10 Critical Challenges For Business Intelligence Success”, C. C. Publishing: 1-8. located at <http://www.computerworld.com/computerworld/records/images/pdf/BusIntellWPonline.pdf> accessed June 2007
3. ASUG, (2008a), ASUG 2008 Annual Report, located at www.asug.com accessed August 2009

4. ASUG, (2008b), "ASUG and SAP Benchmarking and Best Practices" located at www.asug.com accessed June 2009.
5. ASUG, (2007), "ASUG/SAP Benchmarking Initiative: Business Intelligence/Analytics" presentation at American SAP User Group Conference, May, Atlanta
6. Ballou, D.P. and Tayi, G.K. (1999), "Enhancing data quality in data warehouse environments", *Communications of the ACM*, 42(1), 73-78.
7. Chenoweth, T., Corral, K. and Demirkan H., (2006), "Seven key interventions for data warehouse success", *Communications of the ACM*, 49(1), 114-119.
8. Cutter Consortium Report (2003) "Cutter Consortium Report on Corporate Use of BI and Data Warehousing Technologies". at http://www.dmreview.com/article_sub.cfm?articleid=6437 accessed August 2008
9. Davenport, T., Harris, J. and Cantrell, S., (2003), "The Return of Enterprise Solutions: The Director's Cut", Accenture.
10. Eckerson W, (2007), *Performance Dashboards: Measuring, Monitoring, and Managing Your Business*, Published by Wiley-Interscience, NYC.
11. Dresner H. J., Buytendijk, F., Linden, A., Friedman, T., Strange, K. H., Knox, M and Camm, M., (2002), "The Business Intelligence Competency Center: An Essential Business Strategy", *Gartner Research*, ID R-15-2248, Stamford.
12. Evans, P and Wurster, T., (1997), "Strategy and the new economics of information", *Harvard Business Review*, September-October, 70-82.
13. Gartner, (2006), BI Competency Centers: From 'Should We?' to 'How Should We?', presentation at the Gartner Symposium, ITExpo, Sydney.
14. Gartner (2008), 2008 Gartner Executive Programs CIO Survey, available at www.Gartner.com accessed June 2008.
15. Harris, J. G. and Davenport, T. H., (2007), "Competing on Analytics: The New Science of Winning", *Harvard Business School*, Massachusetts.
16. Harris, J. and Davenport, T., (2006), "New Growth From Enterprise Systems". *Accenture*.
17. Hamer, P. den, (2005), "De organisatie van Business Intelligence", Den Haag: Academic Service. cited in Hindriks, C. (2007). *Towards chain wide Business Intelligence*, University of Twente.
18. Hewlett-Packard, (2007), "The HP Business Intelligence Maturity Model: describing the BI journey", *Hewlett-Packard*.
19. Hwang, H.-G., Ku, C.-Y., Yen, D. C. and Cheng, C.C., (2004), "Critical factors influencing the adoption of data warehouse technology: a study of the banking industry in Taiwan", *Decision Support Systems*, 37(1): 1-21.
20. Johnson, L.K., (2004), "Strategies for Data Warehousing", *MIT Sloan Management Review*, (Spring), 45(3), 9
21. Lorange, P., (2001), "Strategic re-thinking in shipping companies", *Maritime Policy & Management*, 28(1), 23-32
22. Loshin, D., (2003), *Business Intelligence: The savvy manager's guide*, Morgan Kaufmann, San Francisco.
23. McDonald, K., (2004), "Is SAP the Right Infrastructure for your Enterprise Analytics" Presentation at *American SAP User Group Conference*, April, Atlanta
24. Moss, T., L. and Atre, S., (2003), "Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-support Applications", *Addison-Wesley*, Boston
25. Sommer, D., (2008), "Gartner Says Worldwide Business Intelligence Spending to Grow 11 Percent in 2008", located at www.gartner.com, accessed February 2008.
26. Strong, D.M., Lee, Y.W. and Wang R.Y., (1997), "Data quality in context", *Communications of the ACM*, 40(5), 103-10
27. Watson, H., Ariyachandra, T. and Matyska, r. J., (2001), "Data Warehousing Stages Of Growth", *Information Systems Management*, 18(3): 41-50.
28. Yin, R., (1994), *Case Study Research, Design and Methods*, 2nd edition, Newbury Park, Sage Publications

