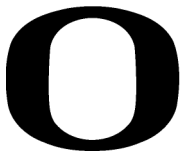

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Business Intelligence Enables Greater Efficiency When Strategically Designed and Tactically Implemented

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Abstract

This annotated bibliography summarizes 32 articles published between 2000 and 2011 that address the question Why should a company adopt a strategic approach to business intelligence (BI) and business analysis (BA)in addition to specific tactical approaches, to achieve potential efficiency gains? Factors are identified related to system design, employee education, and technology to capture, store and analyze high quality data. The goal is to present upper managers a set of key factors for implementation success.

Keywords: business intelligence, implementation methods, strategic planning, tactical planning, efficiency gains

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Introduction to the Annotated Bibliography

Problem

According to Greengard (2010), "the idea of understanding the relationships between bits and bytes of data extends back to the late 1950s, and [business intelligence] has been around in earnest since the late 1980s" (pp 1-2). Greengard makes this statement in relation to a discussion of the significance of business intelligence (BI) and business analytics (BA) as primary tools for guiding business decision making. Watson (2011) extends this idea when he writes:

> . . . [business intelligence (BI)], in particular, has been used as an umbrella term to describe the technologies.., processes…, and applications for supporting decision making. Today, the word analytics is often used as an umbrella term. Some people think of analytics as the data analysis component of BI, and that BI is a larger environment that includes everything needed to support analytics, such as a data warehouse. (p. 2)

As explained by Greengard (2010), reports, spreadsheets and other business intelligence systems that show data are used regularly by most companies, whether big or small, in support of individual and group decision making. Whereas business intelligence (BI) helps find information, business analytics (BA) "taps into statistical and quantitative data for explanatory and predictive modeling. For example, BA can predict which customers are likely to close accounts and can determine the optimal time to repair or replace a piece of equipment" (Greengard, 2010, p. 2). This study uses this explanation of the relationship between business intelligence and business analytics in which business analytics (BA) is defined as a specialized subset of the business intelligence (BI) systems commonly used by companies today.

When companies are trying to determine the best use of business intelligence within their organizations, they have to decide how they are going to design and implement the business

intelligence system and which relevant analytics systems and methods are most likely to directly improve the efficiencies of their company and their business processes (Cooper, 2006). As noted by Alter (2005), since there are so many different ways to set up a business intelligence system, the implementations across companies and even within companies can vary greatly. These variations in setup and implementation can inadvertently limit the amount of efficiency improvements that a company might gain, especially if the business intelligence isn't incorporated "into the day-to-day operations of an organization so that it's routinely applied at all levels" (McCafferty, 2010, p. 2).

There are at two major types or levels of business intelligence (BI) used within an organization: strategic and tactical. "A strategic use of BI, which is BI deployed across a functional department…[gives] a holistic view of the organization and can help…to identify trends and growth opportunities" (Afolabi & Goria, 2005, p. 2). This strategic focus of BI looks at company-wide goals, the company vision and long-term market and business strategies. Afolabi and Goria go on to say that tactical BI is "BI deployed within a functional department. It is usually used for the 'pain' areas within the organization where extra knowledge and insight provided by BI will bring quick and quantifiable results" (p. 2). In other words, tactical BI is focused on a single, specific business process need specific to a defined and restricted group of individuals. Tactical BI also tends to generate silos of information that may never be reconciled with a corporate system, incorporated into the corporate data mart, or mesh common corporate definitions (Ferguson, 2006; Shankar, 2009; Sircar, 2009).

Some people delineate the levels of business intelligence as strategic, tactical and operational, but from the information perspective and a user's ability to access data, tactical and

operational BI can be merged (Nadeem & Jaffri, 2004; Quinn, 2006). However, this study includes operational BI in the tactical level of business intelligence.

Significance

According to Davenport (2006), "organizations are competing on analytics not just because they can...but because they should" (pp. 1-2). Alter (2005) states that "technologists have tried to build systems that can help managers understand what's going on inside and outside their companies, and thus make better tactical and strategic business decisions" (p. 1). Holmes (2010) notes that understanding the possibilities of things that may happen both inside and outsie an organization is vital to the ability to operate profitably (The New Role of IT, 2010). "The current push is to incorporate BI/BA into the day-to-day operations of an organization so that it's routinely applied at all levels…it's about maximizing the value of data throughout the enterprise" (McCafferty, 2010, p. 2). In addition, Babcock (2005) describes how users are consuming and accessing this sophisticated view of data more and more frequently using mobile devices such as cell phones, which give users instant access to data, no matter where they are, enabling faster decision-making.

However, according to the research, it is rare that the implementation of a BI system meets the criteria of being broad in scope, strategically linked and championed and pervasively used to a company's tactical advantage within each departmental organization (Alter, 2005; Davenport, 2006). Watson (2011) suggests a reason for this poor rate of successful implementation when he says "there are more data sources, and the data is arriving at higher velocity. This vast amount of data contains a wealth of potentially useful information but creates challenges for capturing, storing and analyzing it" (p. 3). Other reasons for less dramatic efficiency improvements with the implementation of business intelligence systems include (a)

lack of training or business knowledge, especially for analytical resources (Davenport, 2006; McCafferty, 2010; The new role of IT, 2010; Watson, 2011), (b) company culture (Elbashir, Collier, & Sutton, 2011), (c) conflicting definitions of data (Goodwin, 2010; Shankar & Menon, 2010) and (d) limited rollout of the system (Greengard, 2010).

Findings of a CIOInsight research study of 290 company executives show that close to 50% of the respondents believe that better aligning the business intelligence systems with their business strategy would be the most effective way to improve the value their companies receive from their business intelligence systems (Alter, 2005). This improved value, according to Greengard (2010) is "as much about missed opportunities as about ones companies tap into" (p. 20). And, according to Davenport (2006), "analytics competitors wring every last drop of value from [their business] processes…as part of an overarching strategy championed by top leadership and pushed down to decision makers at every level" (p.3).

Purpose

The purpose of this annotated bibliography is to provide information that may help companies see the potential to increase organizational wide efficiency by implementing a business intelligence solution that presents both strategic and tactical views of company data, as compared to systems that include only specific, tactical views of the data (Alter, 2005; Davenport, 2006; McCafferty, 2010; Nadeem & Jaffri, 2004). Companies range in size and complexity, which implies that there are differences in efficiency within the ranges of company size and complexity of operational processes. The assumption underlying this study is that it is most valuable to design a business intelligence solution holistically, incorporating a company's strategic goals and long-term plans and then implementing the solution throughout all relevant departments in a company to provide action-oriented, tactical information. This approach differs

in its potential to realize efficiency gains from a business intelligence solution that is designed and implemented only for the potential short term, tactical improvement of efficiency within individual departments of a company.

Research Questions

The research questions are framed to identify the potential efficiency benefits that might accrue as a result of implementing (a) a business intelligence system that is designed at the strategic level and implemented tactically in contrast to (b) a business intelligence system that is designed and implemented at the tactical level only. The goal is to define and explain the most efficient and relevant scope and coverage of a possible business intelligence solution, as framed by the research questions developed within this study. Literature is selected to address the following research questions:

Main question. Why should a company adopt a strategic approach to business intelligence (BI) and business analysis (BA) in addition to specific tactical approaches, in relation to potential efficiency gains?

Sub-questions.

1. How does a strategic design and implementation of a business intelligence system differ from a tactical implementation?
2. How can company efficiency be increased through employee training in the usage of business intelligence systems?
3. What key factors, including requirements, scope and coverage, are required to support successful comprehensive (strategic) implementation of a BI software solution within an organization?

4. How can the technical difficulties related to gathering and incorporating existing database information, corporate process knowledge, and numerous office documents be overcome in order to gain additional efficiency from a business intelligence system?

Audience

The audience for this bibliography is the group of people tasked with defining, approving, developing or rolling out a business intelligence system within their organization. In particular, this paper is directed to business users involved in making broad, company-wide, strategic decisions and upper management executives who evaluate BI projects based on their merit and potential return on investment (ROI) (Armstrong et al., 2010; Davenport, 2006). These projects could range from reporting software product implementations to customizing existing reporting products, to wholly guiding the implementation of a large scale BI/BA software product. The intent is that this information provides value for strategic decision makers as part of their evaluation of the requirements, scope and coverage of a comprehensive data-supported, business intelligence solution with the goal of the greatest efficiency gains for the company.

Delimitations

The research presented within this bibliography is constrained according to the following criteria:

Time frame. Only articles published since the dot-com bubble burst in 2000 are included, in order to avoid the "'growth over profits' mentality" that many companies exhibited (Dot-com bubble, n.d., para. 12) and to expressly focus on current trends in how business intelligence (BI) is being implemented and where the methods and areas of greatest efficiency

improvements are identified. There is no exception to the timeframe criteria for references that provide historical context related to the evolution of business intelligence from original sources.

References. Primary published references are the dominant type of the referenced works, so as to avoid unnecessary quoting of secondary and tertiary sources. By relying on the initial primary references, rather than a second-hand summary or synopsis, the context of the ideas should be more readily and thoroughly understood.

Search strategy. References are included from both academic and professional sources, including peer-reviewed publication databases, websites and industry periodicals. Case reports are included to provide quantitative support for the key points of this study. Company-specific and technology product-specific marketing material and other advertisement-focused publications are purposefully excluded.

Reading and Organizing Plan Preview

This study requires reading a large body of material in order to select a set of references that are most applicable for the chosen topic of this paper, its related background context and the research questions. The following initial steps are followed in order to clarify the process of reading many published references and to identify the points that are relevant to this study. The reading plan involves the following steps for each potential reference:

1. Review the published abstract for each reference to determine if a more thorough reading is warranted.
2. Capture the relevant citation and abstract information for each reference.
3. Briefly skim the reference to see if key words relevant to this study are included.

4. If the abstract hints that the reference is relevant and skimming the article confirms the presence of key words, then continue with these steps. Otherwise, delete the citation and abstract and continue looking for relevant articles.
5. Print out the reference.
6. Read the reference highlighting important sections and including simple phrases describing the point(s) that each highlighted section covers.
7. Capture the key quotes to a Word document, created specifically to identify relevant quotes for each article.
8. Copy the citation and abstract to the main study document and the citation to the References section of the study.

The selected references are presented in this study in the Annotated Bibliography following a thematic organizational plan. Key themes are related to the research questions, which are identified as major headings and relevant references are included under each heading. References that present foundational background and context are included in the Introduction section of the paper.

Definitions

This study refers to a number of specific terms that are relevant and vital to understanding the details involved in strategic and tactical BI/BA implementations. Most importantly, this study defines business analytics (BA) as a component of the larger environment of business intelligence (BI), as suggested by Greengard (2010).

Absorptive Capacity – "the ability to gather, absorb, and strategically leverage new external information" (Elbashir, Collier, & Sutton, 2011, p.1).

Business Analytics (BA) – A component of business intelligence. "BA taps into statistical and quantitative data for explanatory and predictive modeling. For example, BA can predict which customers are likely to close accounts" (Greengard, 2010, p. 20).

Business Intelligence (BI) - "Business intelligence refers to the use of technology to collect and effectively use information to improve business effectiveness" (Nadeem & Jaffri, 2004, p. 1).

Business intelligence system – "[software] systems [that] provide business analytics and corporate performance management reporting capabilities" (Elbashir, Collier, & Sutton, 2011, p.2).

Data Mining – "the process of extraction and quantitative analysis of data from…data structures in order to build predictive models" (Gessner & Scott, 2009, p. 1-2).

Data Warehouse – "a database used for reporting. The data is offloaded from the operational systems for reporting" (Data warehouse, n.d., para. 1).

Decision support systems (DSS) –information systems expressly designed to support decision making that focuses on data-driven decision making (Information system, 2011, para. 1-2).

Enterprise performance management (EPM) – also known as Business Performance Management. A set of management and analytic processes that enable the management of an

organization's performance to achieve one or more pre-selected, strategic goals (Business performance management, n.d.).

Enterprise resource planning (ERP) – an integrated software application that "integrates internal and external management information across an entire organization…to facilitate the flow of information between all business functions inside the boundaries of the organization" (Enterprise resource planning, n.d.)

Governance – The standardization of use, access, and quality of data. (Shankar & Menon, 2010).

Insight - New information giving actionable ideas to drive business in a stated desired direction and providing competitive advantage (Cooper, 2006).

New information – "new finding" (Cooper, 2006, p. 262).

Actionable - information that drives a business (Cooper, 2006, p. 262).

Stated desired direction - a finding that contributes to an organization's goals, which typically include competitive advantage (Cooper, 2006, p. 262).

Knowledge Management (KM) – "a systematic process for acquiring, organizing, sustaining, applying, sharing, and renewing both tacit and explicit knowledge to enhance the organizational performance" (Gerami, 2010, p.2).

Management Control System (MCS) – "formal, information-based routines and procedures that provide managers with measures, performance indicators, and procedures to maintain or alter patterns in the organizational activities to ensure that they are consistent with organizational objectives and strategies" (Elbashir, Collier, & Sutton, 2011, p.156)

Master Data Management (MDM) – The process of acquiring, managing, and sharing trusted master data, across and for all business areas of a company (Shankar & Menon, 2010).

Online Analytical Processing (OLAP) – "In computing, online analytical processing…is an approach to swiftly answer multi-dimensional analytical queries…allowing for complex analytical and ad-hoc queries with a rapid execution time" (Online analytical processing, n.d., para 1).

Predictive Analytics – "equations and mathematical models used to forecast or 'predict' prospect and customer future behaviors such as the purchase of a product or service" (Gessner & Scott, 2004, p. 199).

Project Sponsor – a company executive that oversees the project and ensures that the strategic business needs are met by the project (Armstrong et al., 2010).

Real-time Business Intelligence – also known as "right time" BI. "'real-time' [data] only needs to be as fresh as the business requirements [and] in most cases, the value of data decreases rapidly as it ages" (Watson et al., 2006, p. 8).

Strategic Alignment – the correspondence between business processes and the system(s) that support them (Elhari & Bounabat, 2011, p. 1).

Strategic Business Intelligence – "long-term strategic planning" use of BI (Whitacre et al., 2009, p.1).

Tactical Business Intelligence- "[BI] that provide[s] solutions that the organization can implement in the short run to meet challenges imposed by the tactical scenarios" (Whitacre et al., 2009, p.1).

Research Parameters

This section of the study provides information about the methods used to design the overall study. The references included in this study are collected based on a specific process, according to key words and phrases that are identified through a preliminary review of the topic. Each reference is screened and evaluated to ensure that it meets the requirements for this study. The search strategy, key words, evaluation criteria, as well as a documented reading and organization plan are described.

Search Strategy

The selection of references to support this annotated bibliography focuses on literature that describes selected types of business intelligence software and the potential effects of their usage on company efficiency. The goal is to collect and organize literature that addresses the potential efficiency gains of business intelligence software implemented with a strategic emphasis and potential efficiency gains of any tactically implemented BI software.

The types of literature sources searched include reports of research performed by educational institutions and technical research groups, peer review journals (e.g. Harvard Business Review) and professional business publications, including case studies that report the impact on efficiency results of successful BI implementations.

Key words. Journal database searches are executed via the UO Libraries website portal and via the Google Scholar search engine using the following list of phrases. These phrases are derived iteratively after analyzing the broader topic of business intelligence and the articles that (1) categorized the scope of influence into (a) the broader, more holistic and; (b) the narrower,

more tactical views of business process data and (2) categorized the terms into either (a) more historically focused or (b) more future looking.

- business intelligence +
    - analytics
    - balanced scorecard
    - company culture
    - increase efficiency
    - strategic tactical
- business analytics +
    - strategic tactical
    - intelligence
    - strategic intelligence
    - skills
- business intelligence process integration
- analytics decision making

Subtopic Search Terms

Tactical implementations of business intelligence.

- Silo business intelligence
- Departmental business intelligence
- Front-line business intelligence
- End user analytics

Strategic implementation of business intelligence.

- Consolidated data warehouse

- Decision support systems
- Enterprise business intelligence
- Enterprise performance management
- Knowledge management
- Master data management
- Strategic alignment
- Strategic planning business intelligence

Specific search terms are derived from iterative exploratory searches into the topics of business intelligence and business analysis, particularly as they relate to strategic and tactical design and implementation.

All of the references are retrieved from the University of Oregon (UO) library databases, via their online website. The UO library's Computer Source, JSTOR, ArXiv.org and Factiva databases appear to have the most relevant results for these search phrases. Only articles published since the dot-com bubble burst in 2000 are included, in order to avoid the "'growth over profits' mentality" that many companies exhibited (Dot-com bubble, n.d., para. 12) and to focus on the ongoing developments of business intelligence.

Evaluation Criteria

The articles and other references cited in this study are evaluated according to the University of Oregon Library's criteria outlined in its Critical Evaluation of Information Sources (n.d.). The key areas described include, authority, objectivity, quality, coverage and currency.

Authority. The author of each article must have some background related to the topic points cited in this study, preferably repeated exposure over a long period of time.

Objectivity. The author(s) must present information as facts and provide examples of the information provided. Marketing and advertising their own company's products eliminate an articles' objectivity.

Quality. For an article to be of sufficient quality to be included in this study, the author(s) must have some direct relationship with business intelligence and the specific topic of the article for which it is cited.

Coverage. Each article is reviewed to confirm that its content is both relevant and in accordance with related findings of companion article citations.

Currency. The search parameters of this study purposefully exclude articles published previous to the year 2000, so only current trends and more recent findings are included in this study. Older articles that give context to the evolution business intelligence are excluded from this study.

Reading and Organizing Plan

The reading plan describes an approach for reviewing the literature that passes the requirements identified in the Evaluation Criteria section and structures the presentation of the material that supports the main topic question and related sub-questions. The reading plan outlines the process for capturing key quotes, topics and relevant links to the main topic. The organization plan describes the structure and flow of the Annotated Bibliography section of this study.

A review of the literature that meets the evaluation criteria and addresses the research questions includes the identification of relevant citations for the main study and information relevant for inclusion in the summary of each article in the Annotated Bibliography. Specifically,

the examination of the content of each article includes the steps described in the Reading Plan Preview.

Throughout the reading process, article content is analyzed to identify how the article fits within the scope and focus of the research questions of this study and may dictate the need for additional research, or additional key words, search parameters or evaluation criteria. This is particularly important since business intelligence, as defined in this study, includes both the technical, back-end architecture and the user-friendly, front-end user interaction interface. Finding a clear description of the various elements of business intelligence and the distinction between the strategic and tactical goals guiding the designs and implementations is vital to presenting the audience with the answers to the key research questions and also with the supporting background documentation for the information presented in the articles.

After completing the reading process, relevant information is consolidated and presented thematically in the Annotated Bibliography section of the paper. Themes are related to the research questions, and are used as major headings and relevant references are included under each heading. The themes included are those deemed most suitable for providing the audience with the information they need to ensure that the design and implementation of a business intelligence system is optimally accomplished, in order to yield the best efficiency improvement. References supporting a specific theme are listed together as a way to identify patterns and links across and between research questions of this study.

The primary topic of emphasis of why a company should adopt a strategic approach to business intelligence (BI), in addition to specific tactical approaches for potential increased efficiency gains is examined in references to historical precedents, experienced business

professionals and survey results from past implementations of BI. The supporting content identified through the sub-questions provides additional detail. More specifically, focus on the sub-questions of this study is designed to better direct the audience's attention; each of the sub-questions is examined in relation to areas as described below.

Sub-question one: How does a strategic design and implementation of a business intelligence system differ from a tactical implementation? This question addresses the differences between strategic and tactical design and implementation of a business intelligence system. Focus is on the steps involved with each type of BI and both the prerequisite hardware and software needs and the possible user-interface differences. This question also focuses on the needs that are immediately addressed by each of the two types of BI implementations. The references in the Annotated Bibliography are grouped under the theme title of "Differences between strategic and tactical design and implementation".

Sub-question two: How can company efficiency be increased through employee training in the usage of business intelligence systems? Examination of how company efficiency can be increased through employee training in the usage of business intelligence systems includes how to integrate BI into existing business processes, and how BI influences existing business processes and performance. The theme is titled "Potential for increased efficiency through training and usage of BI".

Sub-question three: What key factors, including requirements, scope and coverage, are required to support successful comprehensive (strategic) implementation of a BI software solution within an organization? This question examines the key factors that are required to support successful strategic implementation of a BI software solution within an organization. Focus is on the need for executive buy-in and involvement, project sponsors, training employees, and using sufficient and appropriate hardware and software. These many factors are addressed in references listed under the theme "Key factors for strategic implementation success."

Sub-question four: How can the technical difficulties related to gathering and incorporating existing database information, corporate process knowledge, and numerous office documents be overcome in order to gain additional efficiency from a business intelligence system? The technical difficulties related to gathering and incorporating various types of existing documents, data and knowledge need to be overcome in order to gain additional efficiency from a business intelligence system. This question focuses on the retrieval of the many types of information into a centralized location, following industry-standard practices for managing the master data. In addition, facts regarding how the information should be consolidated, cleaned, stored and retrieved are identified. References are organized under the theme "Leveraging the value of information, no matter how it is stored."

Annotated Bibliography

Four content categories serve as a way to organize 32 references selected for presentation in the Annotated Bibliography. Each reference is categorized into one of these categories, based on a primary area of emphasis. These four themes (described below) are used to instruct the audience on best practices and documented ways of addressing known issues with the design and implementation of business intelligence in organizations of all sizes.

Annotations consist of three elements: (a) an excerpt from the published abstract; (b) a summary of relevant ideas; and (c) an assessment of the credibility of the reference. The summaries include paraphrases or quotes from the articles and represent the ideas of each author, as selected and presented by this researcher.

Differences between strategic and tactical BI design and implementation. The difference between a strategically focused and tactically focused design and implementation addresses the concern of possible limited immediate gains for only a single department as opposed to long-lasting gains across the entire organization. These gains can be analyzed using numerous statistical measurements, but also include a value calculation as simple as a Return on Investment (ROI).

Potential for increased efficiency through training and usage of BI. The change in behavior and company efficiency through the use of business intelligence documents many of the diverse ways that business intelligence can help organizations, from running more smoothly and wasting less time, to enabling employees to make front-line, customer-influencing decisions.

Key factors for strategic BI implementation success. The key factors for a successful design and implementation of strategically focused business intelligence include these larger categories: (a) the various pieces of business intelligence, (b) the hardware and software

architecture, and (c) human-centric aspects that need to be proactively included to gain the largest on-going efficiency improvements and competitive advantage.

Leveraging the value of information, no matter how it is stored. The fourth theme presents the audience with a vision of an integrated, single source of related information, even though the information may be stored in multiple formats, including databases, emails, images, pdf files, and even audio files. Business intelligence systems that are comprehensive in content, is obviously less restrictive, but also more beneficial to users, since that information can enable them to be more efficient in their job duties.

Differences Between Strategic and Tactical Design and Implementation

Afolabi, B., & Goria, S. (2006). Corporate information systems architecture for business intelligence solutions. *Business Intelligence Systems Conference*, MIPRO 2006, *V,* 269-274. Retrieved on May 9, 2011 from http://hal.inria.fr/inria-00083012/fr/.

Abstract. This article considers the two basic levels of decision-making in organizations: strategic and tactical. A model illustrates the minimal business intelligence objective of providing the right information to the right person at the right time as a variable. The article includes numerous substantiating and contextual references that lend credence to the proposed model.

Summary. The stated objective of a business intelligence system is one that supplies the right information to the right person(s) at the right time. The article provides descriptions for the "right information" for the "right person(s)" at the "right time" for both strategic and tactical functions and decision-making. The right strategic information provides information needed for decision making at the organizational level. The right tactical information helps individuals confronted with medium and short-term problems. The right strategic person is the one who makes strategic decisions within an organization or the person who directly influences those decision makers. The right tactical person includes heads of departments, project group leads or the only person to occupy a critical function of the organization. The right strategic time is the timeframe wherein the moment of deducing environmental changes and alerting the organization to the change is relevant to the future orientation of the organization. The right tactical time is the time in which the right person can consume and take action on the information, but most especially, the time in which the person hopes to be informed. The importance of timely

information delivery is described, including the allowable latency for information remaining "right" for use.

Credibility. This article is published in a conference proceedings. Both authors work at the *Lorraine Research Laboratory* of Computer Science and its Applications, one of the 21 research laboratories of The Institut National Polytechnique de Lorraine (INPL). Goria is an associate professor with a list of peer-reviewed publications. Afolabi is one of his graduate students.

Cooper, T. (2006). Enhancing insight discovery by balancing the focus of analytics between strategic and tactical levels. *Journal of Database Marketing & Customer Strategy Management*, *13*(4), 261-270. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=buh&AN=22633169&site=ehost-live&scope=site

Abstract. An insight at a strategic level can change an industry, but insights at a tactical level are more typical and incremental advantages over competitors are the norm. Since the only real source of competitive advantage is learning faster than competitors, deciding where to focus is crucial.

Summary. Information is sometimes hidden from senior managers due to structural or communications issues that prevent information flow. The value of that information, once received, is how that information yields insights – from front-line tactics to company-wide strategy. Cooper proposes that gaining and acting on insights is vital to stay ahead of competitors. These insights must meet three specific criteria: (a) they must be a new finding, (b) they must be actionable, and (c) they must contribute to the organization's goals. The importance of balancing appropriately between tactical and strategic levels is demonstrated. Two key themes for insight generation include data source integration and constant open dialogue between analysts and senior management. In addition, a tactical focus tends to generate islands of potentially deep knowledge that are never linked to strategic insights. Tactical analysis is all that is possible without clear company direction. Upper management involvement and support is required for both tactical and strategic insight generation. This balanced focus on strategic and tactical levels of insight can lead to increased growth in the value derived from analysis.

Credibility. The article is published by an experienced professional with analysis experience from more than a half a dozen industries, including Novo Nordisk, Avis, and Vodafone. The author holds a master's degree in data analysis. The article is published in a peer-reviewed journal.

Nadeem, M., & Jaffri, S. (2004). Application of business intelligence in banks (Pakistan). arXiv:cs/0406004v1 [cs.DB]. Retrieved on April 7 from http://arxiv.org/ftp/cs/papers/0406/0406004.pdf

Abstract. Competitive factors such as globalization, deregulation, mergers and acquisitions, competition from non-financial institutions, and technological innovation, have forced large financial companies to re-think their business. BI is now in reach of smaller and medium sized companies due to price and availability.

Summary. An ideal BI system gives an organization's employees, partners, and suppliers easy access to the information they need to effectively do their jobs, and the ability to analyze and easily share this information with others. The key to an information marketplace is an active information repository for internal and external access that contains or points to a various types of information. Information workers need to be able to drill down, drill up, slice and dice business information to quickly identify relevant facts, preferably using self-service tools. BI systems can be deployed strategically, for a holistic view of the company or tactically for a specific department's areas of pain. However, many business intelligence tools are difficult and time-consuming to use, even for power users. Determining if specific BI software is a good fit for a company should include an analysis of ROI. The ROI analysis of BI includes how efficiently it operates, how well the infrastructure is supported and how well BI produces business insight from raw operational data. Integrating data, using business variables that are true across the whole enterprise and setting up the BI system to trigger alerts to business decision-makers all enable action toward resolving problems and generating insights.

Credibility. This thesis is written by a Master's of Computer Science graduate student and co-authored by the MSCS / MCS Coordinator of Shaheed Zulifqar Ali Bhutto Institute of

Science and Technology. The article is published in ArXiv, an archive for electronic preprints of scientific papers. It is referenced by two articles published in peer-reviewed journals, though it has not been published in a peer-reviewed journal to date.

Shankar, R. (2009). Critical technologies for compliance and risk management. *Business Intelligence Journal*, *14*(2), 44-52. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=41522175&site=ehost-live&scope=site

Abstract. The article focuses on the master data management platforms, and their use in ensuring regulatory compliance and lowering operational risks of organizations during economic slowdown. The need for strong data governance and technological skills for successful compliance initiatives is described including compliance requirements of various industries including retail and pharmaceutical.

Summary. This article provides an overview of the benefits of master data management (MDM), especially as it can help ensure "that critical enterprise data is validated as correct, consistent, and complete when it is circulated for consumption by internal and external business processes, applications or users" (p. 44). The steps of establishing strong MDM governance and enabling MDM governance with MDM technology are described for best practices and ensure that "key components are built into your master data management solution" (p. 47). Ten critical requirements for MDM include (1) establishing an MDM platform that can handle multiple data types, (2) support for the compliance-related data governance policies and processes at the enterprise level, (3) incorporation into existing workflow tools, (4) handling of complex modeling and relationships, (5) support for service-oriented architecture (SOA) services to protect higher-level compliance from changes made to the underlying MDM system, (6) ability to clean data inside of the MDM platform, (7) options to allow and enable both deterministic and probabilistic matching, (8) creation of a golden master records with optimal field-level information that is stored centrally, (9) storage of history of all changes and lineage of how

duplicates are merged, for audit trails; and (10) support for both analytical and operational usage via a business intelligence tool. The benefits and key questions regarding MDM to show regulatory compliance for many industries are reviewed, from medical to retail to financial to pharmaceutical.

Credibility. The article is written by the senior director of Product Marketing with a company that focuses on master data management, Siperian, Inc. This article is published in a technical journal, commonly used by BI professionals. There is no product-specific emphasis that might otherwise prejudice the article.

Volonino, L., Gessner, G., & Kermis, G. (2004). Holistic compliance with Sarbanes-Oxley. *Communications of AIS*, *2004*(14), 219-233. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=cph&AN=16743174&site=ehost-live&scope=site

Abstract. The theory underlying US securities laws is that investors are helpless without reliable information. The Sarbanes-Oxley Act requires C-level executives to confirm their confidence in the information their company generates by signing off on the figures personally.

Summary. Holistic compliance is an enterprise-wide and long-term approach that views the Sarbanes-Oxley Act of 2002 as an opportunity to improve internal controls with public reporting. Holistic compliance to the regulations in the law means that silo compliance to a specific area of the business is no longer sufficient and "tends to be riskier and less effective given ongoing regulatory mandates" (p. 222). Corporate executives are required to attest not only to their company's financial statements, but also on the control processes surrounding the collection of the data behind a company's financial statements – down to the transaction level. Section 409 of the law additionally requires real time disclosure of financial and operating events. This massive, zero-tolerance legislation has created challenges that rival those of any IT implementation. Information quality improvements require research into process simplification and standardization, data simplification and standardization and technology standardization and integration. Consolidated reporting and overall data governance of enterprise-wide data supports the needs of those executives that must comply with this legislation. Business intelligence and knowledge management are key to holistic compliance and should be used to improve overall efficiency for organizations and help improve their competitive position and support management as they actively evaluate information systems and audit processes.

Credibility. The article is published in a peer-reviewed journal, by a professor and two associate professors from Canisius College in Buffalo, New York, covering the topic from the perspective of information systems, marketing and accounting, respectively.

Potential for Increased Efficiency through Training and Usage of BI

Afolabi, B., & Thiery, O. (2005). Business intelligence systems and user's parameters: An application to a documents' database. *Dans Modelling Others for Observation A workshop of IJCAI 2005*. Retrieved on May 9, 2011 from http://arxiv.org/abs/cs/0509088v1.

Abstract. The article shows the necessity of including certain user parameters in Information Systems that are used in Business Intelligence systems in order to integrate a better response from such systems. A user model that is based on a cognitive user evolution and a good definition of the information needs of the user will accelerate the decision making process.

Summary. The goal of a business intelligence system (BIS) or an economic intelligence (EI) system is to help decision makers and other users in their individual decision-making process. A strategic information system (SIS) contains and provides strategic information, useful for decisional processes of an organization. Information systems (IS) driven decision making is based on information found in the IS and also on the user's objective. Architecting a BIS can be broken into the four stages of (1) selecting the right data from filtered heterogeneous system source data, (2) mapping the data for each users' allowed access, (3) analyzing what information is needed by what user and training employees to recognize information relevant to their needs and (4) interpreting the data to enable users to make the right decisions. There are three main types of users of a BIS: (a) decision maker, (b) information watcher/analyzer, and (c) the end user who interacts with the BIS. Understanding the BIS is key for efficient usage and users must grow their knowledge through the cognitive phases of observation, elementary abstraction, reasoning and symbolism and creativity. Informational need is tied to the information users' need for each of their particular decisional problems. As part of the each user's growth, the user must

match their expectations relevant to their field of knowledge and expertise with the BIS, to help align the IS with strategic processes.

Credibility. Both authors work at the *Lorraine Research Laboratory* of Computer Science and its Applications, one of the 21 research laboratories of The Institut National Polytechnique de Lorraine (INPL). Thiery is professor of Computer Science and Afolabi is one of her graduate students. The article is published in Dans Modelling: A Workshop of IJCAI 2005, which appears to be similar to a conference proceeding.

Afolabi, B., & Thiery, O. (2006). Using users' expectations to adapt business intelligence systems. *Advances in Knowledge Organization, 10*, 247-254. Retrieved on May 9, 2011 from http://arxiv.org/abs/cs/0608043v1.

Abstract. The article proposes a user model / formula that allows the information architecture to help the user explore the contents of the information base, formulate ad-hoc requests, add notes and tie data requests to business process objectives. It examines the general characteristics of business or economic intelligence system and proposes two models that are important in adapting these systems to the user. The first model is based on the definition of a decisional problem and the second on the four cognitive phases of human learning.

Summary. This article contains some of the same background information as Afolabi, & Thiery (2005), but focuses in more detail on adapting the business intelligence system (BIS) based on the user's expectations. A user's ability to use a BIS is "directly proportional to [their] knowledge of the system" (p. 3). First, the user's knowledge of the system is evaluated to establish the importance of the user's role, their work habits and their most frequently used data. Next, with that information a personalized structure can be generated to improve their use of the system, in order to improve their usage of the BIS. Classifying different types of users by their roles and how they request information and the types of decisions they make based on that information is key to defining user domains. Economic intelligence systems (EIS) then combine strategic information systems with user modeling domains, to consolidate and formalize business processes and related training programs. The informational need of a user is the informational representation of their decisional problem. A decision problem can be formally evaluated as a function of the user model, the user's specific environment and the user's decision-based objective.

Credibility. Both authors work at the *Lorraine Research Laboratory* of Computer Science and its Applications, one of the 21 research laboratories of The Institut National Polytechnique de Lorraine (INPL). Thiery is professor of Computer Science and Afolabi is one of her graduate students.

Briggs, L. (2010). BI case study: Balanced scorecard system keeps university health system in the pink. *Business Intelligence Journal*, *15*(4), 28-30. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=56102207&site=ehost-live&scope=site

Abstract. This case study reports on the balanced scorecard system at Duke University Health System in North Carolina. The successful system integrates performance reports and balanced scorecards. It has a huge effect at the Health System in decision-making.

Summary. The success in operations and performance management, "including its ability to maintain a solid operating margin in a challenging business" is attributed to a combination of effective leadership, innovative use of a BI tool called a balanced scorecard and processes that enable a consistent review of performance (p. 28). The evolution of the organization's intranet site into a sophisticated, heavily relied-upon balanced scorecard and performance reporting solution is vital to the success of the system. The balanced scorecard is used by both front-line managers and executive leadership and is constantly updated as market and business user needs require. Initial issues include high administrative overhead, system limitations and complex user interface screens, particularly with a commercial scorecard solution. With their custom-built balanced scorecard, their small staff generates big returns by spending most of their time training and teaching leadership usage. The scorecard is generated monthly, integrating reports and scorecards in a consistent view that helps to address issues and provide accountability and data for performance reviews. Most of the labor for the system is required annually, when loading target thresholds for all 5,200 measures, set according to organizational, strategic priorities. Monthly reviews of the scorecards occur for all departments and include reviews by the president's office with specific action items and follow-up. This

consistency helps to zero in on the correct issues to address and provides an accountability model.

Credibility. This case study is written by a technology journalist, but most of the key points included in the article are direct quotes or paraphrased points from Jeff Harger, the head of performance management at Duke University Health System. The article is published in a technical trade journal that is not peer-reviewed.

Fitzgerald, M. (2006). The profit pipeline. *CIO Insight*, (64), 51-57. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=19920228&site=ehost-live&scope=site

Abstract. The article focuses on the efforts of Mike Green, chief information officer of United Pipe and Supply Co., to implement business intelligence software to better analyze the performance of the company. After solving some problems, the company experienced an increase in profits before taxes.

Summary. The owner of United Pipe and Supply Co., Dave Ramsey wanted to know about the efficiency of the cost management of the company. With the installation of business intelligence software, the CIO and other executives determined their shortcomings and the problems concerning their customers. Their biggest and most prized customer was the least profitable, costing the company $50,000 annually. With the insights identified by their business intelligence (BI) software, salespeople can intelligently let a potential customer go to a competitor when it makes more business sense to do so. The initial implementation of BI includes the consolidation of data and reorganizing the data in order to facilitate the type of reporting that executives and managers need to see, but are unable to see in their transactional system. When inefficiencies and unprofitable processes and transactions are identified, retraining or proactive discussions with big customers helps ensure that both the organization and its best customers collaborate to find better solutions that decrease expenses. This step is especially helpful in reducing expenses due to customers travelling multiple times a day for inventory rather than stocking some inventory at their site. The BI system allows the organization to help

customers “streamline operations in ways that save [the customer] money [and] has helped turn a number of unprofitable customers into profitable ones” (p. 55).

Credibility. The case study is published by a freelance business journalist in a technical industry publication. Due to the collaborative nature of this article with representatives of the company whose experience is published, the information is considered relevant since the facts and processes likely come from the source – employees at United Pipe and Supply Co.

Gessner, G., & Scott, R. A. (2009). Using business intelligence tools to help manage costs and effectiveness of business-to-business inside sales programs. *Information Systems Management*, *26*(2), 199-208. doi:10.1080/10580530902797623. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=37604200&site=ehost-live&scope=site

Abstract. Predictive analytics, data mining, and other business intelligence tools may help inside sales teams to effectively manage their costs and generate sales.

Summary. Record-high transportation costs and unprecedented travel difficulties are driving up expenses and uncertainties associated with use of an outside sales team. As a result, sales managers operating in today's high-cost and high-risk environment need to invest in sophisticated data analytics to support inside sales teams that do not travel. Successful inside sales operations use the three technology solutions of analytics, knowledge management and e-learning in a unified communications architecture. These three related elements of business intelligence are used to reduce the costs of finding sales opportunities and to find sales opportunities that are more likely to close than by chance alone. This paper presents empirical evidence showing an increase in outbound telemarketing sales revenue due to greater customer rapport with the inside sales team. By far, the most dramatic impact BI can have in inside-sales is in the reduction of costs. The sales people spend much less of their time building relationships with potential customers that likely won't generate any sale. Order-pattern analysis, grouping customers by their buying history, and event-triggering for self-service customers are all methods used to decrease customer attrition.

Credibility. This article is published in a peer-reviewed journal by an associate professor of management and marketing from Canisius College, in Buffalo, New York (Gessner) and the current general manager – formerly CIO and COO - of healthcare at Modern Marketing Concepts, Inc. (Scott).

Heinrichs, J., & Lim, J. (2005). Model for organizational knowledge creation and strategic use of information. *Journal of the American Society for Information Science & Technology*, *56*(6), 620-629. doi:10.1002/asi.20152. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=16679886&site=ehost-live&scope=site

Abstract. The article focuses on a model for organizational knowledge creation and strategic use of information. The model supports investment in technological solutions to improve the organization's efficiency and their knowledge workers' effectiveness.

Summary. Knowledge is a source of competitive advantage and access to the right information and understanding the underlying processes of an organization is the lifeblood for the organization. “Organization knowledge management and effective strategic use of information requires a new paradigm and a strategy that utilizes competitive intelligence tools while incorporating the knowledge workers’ mental decision models and environmental response patterns in decision making” (p. 621). Knowledge workers must pay increased attention to the changing market, the competitive environment and the desired strategic outcome for the organization. Strategic information utilization requires the “capability to discover the various patterns in the data, appraise the success of the chosen strategy, develop insights based upon the discovered patterns, and then formulate responses to the generated insights” (p. 623). The integration of information visualizations and guided analyses facilitates the utilization of additional knowledge, allowing the organization to “thrive at higher levels of turbulence” (p. 623). Competitive advantage can be won or lost by marginal differences in the speed, accuracy and the comprehensiveness of information delivered to knowledge workers. Knowledge workers need to proficiently use competitive intelligence tools to synthesize and apply the analytical

assessment models used by the organization. By so doing, knowledge workers can gain additional insights and arguably produce greater competitive advantage for the organization when they use leading-edge competitive intelligence tools coupled with an analytic decision models application.

Credibility. The article is published in a peer-reviewed journal by an associate professor in library and information science at Wayne State University (Heinrichs) and a marketing professor at the University of Toledo with research areas including data mining and business intelligence (Lim).

Rogge, E. (2005). Move in sync. *Intelligent Enterprise*, *8*(4), 22-27. Retrieved on April 16, 2011 from http://www.informationweek.com/news/software/bi/60404502#.

Abstract. This study focuses on the adoption of business intelligence (BI) at Telus Corp, in Canada to align business data with day-to-day operations for better performance and performance management in general.

Summary. Telus Corp., one of the largest telecommunications company in Canada, has developed a BI system that through user-friendly interfaces communicates vital information and strategic performance metrics to the far reaches of the company's enterprises. The author discusses three phases of performance management (PM): (a) the *understand phase* that looks at historical data to establish a perspective, (b) the *optimization phase* that includes planning and forecasting, and (c) the *align phase* where agendas and actions are brought in sync with strategy through the definition of objectives and targets; and how vendors are addressing PM. The integration of data from multiple, distributed sources into the BI platform is the biggest problem during the *understand phase*; the other two phases are less understood, which is why a strategic rather than tactical perspective is needed. Along with performance gauges, these BI tools supply collaboration features that can relate discussion, action and logging with metrics. The key is to deliver an integrated view of information, especially essential data that exists outside the tactical boundaries of the employee, manager or business function. In the final *align phase* of PM "organizations improve the communication of strategic direction, track execution against planned objectives and uncover opportunities to automate processes. To communicate strategic direction, you must articulate the plan to all stakeholders" (p. 3). Implementing scorecards of

metrics that are tied to benchmarks and levels of success plays an important role in PM because they drive changes in behavior.

Credibility. This article is published in a technology journal by the vice president and research director of business intelligence and data integration at Ventana Research, in San Ramon, CA.

Key Factors for Strategic Implementation Success

Armstrong, R., Gallo, J., Geiger, J. G., Johnson, P., & McKnight, W. (2010). BI experts' perspective: Executive sponsorship. *Business Intelligence Journal*, *15*(4), 38-44. Retrieved from EBSCO*host.* http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=56102209&site=ehost-live&scope=site

Abstract. A successful executive sponsor should be placed high in the organization, should be well respected by the peers, should have a track record of completing projects, and should be a strong communicator.

Summary. One of the initial requirements of implementing business intelligence is developing the infrastructure, which has a significant cost and slowly appearing results. This article presents a scenario in which an existing sponsor who has historically provided cover with the other senior executives decides to leave the company, during this initial infrastructure development phase of the BI project. The multiple contributors to this article outline what they would recommend to the project manager for next steps. Armstrong recommends getting a recommendation for a replacement sponsor from the out-going project sponsor, along with the names of the biggest supporters of the BI project. Armstrong also recommends documenting and communicating current success stories backed by real dollar values to executives and presenting a schedule of future short-, mid- and longer-term application deliverables. Gallo recommends immediately marketing the success of the project to date, both in reducing costs as well as increasing revenue. After the marketing is underway, Gallo recommends getting to know managements' goals and objectives to create business cases for future applications with

monetary dollars attached, before communicating with executives to get another sponsor for the projects outlined. Geiger suggests reviewing the current environment and progress towards strategic goals, consulting with the outgoing sponsor for lessons learned and recommendations for the future, enlisting a new sponsor that has a passion for BI and delivering and publishing results. Johnson's advice is to get the entire executive management group involved, trained and engaged with the project and then work with the user base, to get them using the system as efficiently as possible.

Credibility. This article is published in a technical industry journal by the director of data warehousing at Teradata Corporation (Armstrong), a senior data warehouse architect from Information Control Corporation (Gallo), an executive vice president with Intelligence Solutions, Inc. (Geiger), a senior manager of specialized services with Hitachi Consulting (Johnson) and an information management consultant (McKnight). All of the authors are professionals with experience implementing data warehouses and other information technology products.

Davenport, T. H. (2006). Competing on analytics. *Harvard Business Review*, *84*(1), 98-107. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=19117901&site=ehost-live&scope=site

Abstract. A new breed of organization has upped the stakes in generating the biggest competitive advantage; Amazon, Harrah's, Capital One, and the Boston Red Sox have all dominated their fields by deploying industrial-strength analytics across a wide variety of activities.

Summary. Organizations are competing on analytics not just because they can, but because they should. Business processes are among the last remaining points of differentiation and analytics competitors wring every last drop of value from those processes. Analytics competitors analyze business processes in a coordinated way as part of a strategic process championed by top leadership and pushed down to decision makers at every level. To compete on analytics, senior executives must make it clear through their involvement and vocal commitment that analytics is central to enterprise (not departmental) strategy, and they must be willing to change the way employees think, work and are treated. Employees should be hired for their expertise with numbers or trained to recognize their importance in order to make the best decisions. This article lays out the characteristics and practices for statistical analytic employees, including the requirement to base decisions on hard facts. Organizations also need to look externally, since the most proficient analytics practitioners help customers and vendors. The transformation of an organization requires a significant investment in technology, the accumulation of massive stores of data, and the formulation of company-wide strategies for managing and integrating the data into existing business processes.

Credibility. The article is published in a peer-reviewed journal, by Professor Thomas Davenport, who currently holds the President's Chair in Information Technology Management at Babson College.

Elbashir, M., Collier, P., & Sutton, S. (2011). The role of organizational absorptive capacity in strategic use of business intelligence to support integrated management control systems. *Accounting Review*, *86*(1), 155-184. doi:10.2308/accr.00000010. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=57337355&site=ehost-live&scope=site

Abstract. This study examines the influence of organizational controls related to knowledge management and resource development on assimilation (i.e., strategic integration and use) of business intelligence (BI) systems.

Summary. BI systems use analytics and performance management concepts to leverage enterprise system databases and provide core management control system (MCS) capability. This study provides empirical evidence of the benefit of integrated, enterprise-wide business databases for effective MCS. The results of this study indicate that organizational absorptive capacity (i.e., the ability to gather, absorb, and strategically leverage new external information) is critical to establishing appropriate technology infrastructure and to assimilating BI systems for organizational benefit.

Simply deploying enterprise systems is insufficient to achieve significant benefits to MCS', especially if they are not used to the best strategic effect, relative to the development of relevant knowledge and skills. Organizations with an existing sophisticated IT infrastructure will be better able to assimilate BI systems, particularly across marketing and sales, customer relations and business operations, in proportion to (a) the time since adoption of BI, (b) the size of the organization, and (c) the size of the company in revenue earnings. Further, findings show that while top management plays a significant role in effective deployment of BI systems, their impact is indirect and is relevant as function of operational managers' absorptive capacity. In

particular, this indirect effect suggests that leveraging BI systems is driven from the bottom up as opposed to the top down. This differentiates BI from other isolated strategic MCS innovations that have traditionally been viewed as top-management driven.

Credibility. This article is published in a peer-reviewed journal by a senior lecturer at The Australian National University (Elbashir), an associate professor of accounting and business information systems at The University of Melbourne (Collier), and a professor of accounting at the University of Central Florida (Sutton).

Hopkins, M. (2010). The new role of it. *Computerworld*, *44*(23), ecial-ecia4. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=voh&AN=58106777&site=ehost-live&scope=site

Abstract. An interview with Beth Holmes, information technology (IT) analytics lead of Monsanto Co., describes the value of analytics and skilled employees focused on providing data analysis at Monsanto.

Summary. Holms says that business analytics have changed over time as part of the evolution of applying analytics to business processes, where the simplest solution is often the smartest. Usage of analytical methods is increased in every level of the organization and helps to bridge silos between groups and teams. It is vitally important that the best information possible for different decisions-making processes is available from the range from strategic planning to daily operations. Understanding the possibilities of things that may happen, as identified by statistical analytics, are critical for operational profitably. In addition, detecting the change in the relationships between the variables of statistical models and incorporating those changes back into the models provides companies with a competitive edge. “As higher quality information becomes available faster, we need to be poised to make decisions faster and take action as well” (p. 4). The best leaders are inquisitive and sagely use employees with the right talent to use the data for decisive actions, based on that data. This requires, too, a deep and intimate collaboration between the business units and the analytics group, to create a model for which the business unit takes ownership.

Credibility. This article is written by the editor-in-chief of the MIT Sloan Management Review, a website and magazine that brings ideas from the world of thinkers (scholars, researchers, and management thought leaders) to the executives and managers who use those ideas to build businesses. This Review is peer reviewed.

Kellet, A. (2006). The isolated, tactical use of business intelligence tools is outdated, inefficient and needs rapid closure; Future value of business intelligence to organizations will come from the extended use of enterprise intelligence services. *M2PressWIRE*, Retrieved from EBSCO*host.* http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=nfh&AN=16PU2718832926&site=ehost-live&scope=site

Abstract. Europe's leading IT research and advisory organization, Butler Group, is calling for the business community to bring the era of tactical use of multiple Business Intelligence (BI) tools to a rapid close.

Summary. This article states that most current BI deployments are implemented to deal with departmental data control and management issues. As a result, the technology's ability to support the organization and its strategic business intelligence requirements is being severely constrained. The era of using multiple BI tools in isolated deployments to support enterprise decision making is outdated, inefficient and must come to a close. Instead, organizations should make better, extended, use of business intelligence in ways that incorporate the information delivered into existing business processes. Enterprise organizations are often incredibly good at capturing data, however there are consistent issues with data quality and data usage, as well as departmentally-focused business intelligence. The author believes that integrating, standardizing and consolidating the management of BI yields key cost savings benefits. The use of Web technology to implement and deliver BI helps increase information availability and simultaneously reduce the IT support load by encouraging self-service, which has a dramatic impact on the efficiency with which information is used within the organization.

Credibility. The article was written by Andrew Kellet who is an editor of M2PressWire and a Senior Research Analyst with the Butler Group. The Butler Group is an IT Research and Advisory organization in Europe that informs clients on current, emerging and future technology and its impact on business.

Kromer, M., & Yu, D. (2008). Adopting BI in an organization using proof-of-concept techniques. *Business Intelligence Journal*, *13*(2), 7-12. Retrieved from EBSCO*host*.

http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=35748473&site=ehost-live&scope=site

Abstract. Without executive sponsorship, there is always an uphill internal battle that can force cost overruns and deployment delays, and possibly doom BI projects completely. This article provides a proof-of-concept technique that can help win the attention and adoption of a BI project from executives and management.

Summary. Data warehouse groups have historically used many methods to collect data from numerous, disparate data sources, clean the data and provide a single source for customer records. Each step requires tremendous effort and a variety of technical skill. Before engaging with this time-intensive process, the authors share how they model the effort of data gathering, data modeling and producing the results in an Excel spreadsheet. First, they conduct business-productivity studies and use the results of those studies (initially stored in an unstructured data warehouse) to model a star schema data mart to organize and structure the data. Next, they develop an OLAP cube on that data mart to provide summaries, aggregations, hierarchies and drill-down capabilities, so that users do not need to directly access either the original source system or the data warehouse. Lastly, they present the information to the users in "spreadsheets in a formal, executive-summary-style presentation" (p. 8). Executives and other upper management personnel are often amazed at these results, since most business intelligence software and technology has yet to be adopted at the enterprise level, so the benefits have not yet

been seen. Involving upper management in the larger, more pervasive BI deployment strategy, is required to ensure overall success at the company-wide scope of the BI software adoption.

Credibility. This article is published in a technical journal by two experienced product managers from Microsoft, both of whom focus on business intelligence solutions. The significant contextual background information is vendor-agnostic and the authors are clear that their case study uses specific, Microsoft products.

Shankar, R. (2008). Master data management strategies to start small and grow big. *Business Intelligence Journal*, *13*(3), 37-47. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=35748489&site=ehost-live&scope=site

Abstract. Examination of two master data management (MDM) approaches, a technology-focused strategy and a business-focused strategy, show how each starts with small, initial projects and expands to push MDM to solve additional business problems.

Summary. As master data management (MDM) receives more the attention within mainstream industries, enterprises are looking for successful MDM deployment strategies. The *technology-focused strategy* for MDM deployment advocates starting small with technology and then growing the MDM solution to include more and more entities, including additional architectural styles, and integrating the solution with the operational system. The technology-focused strategy requires initial successes; otherwise it will hamper the enterprise-wide deployment. However, starting with an MDM strategy that focuses on only vendors or customers or inventory or products will not effectively improve the overall systemic supply chain and will limit the usefulness for the MDM solution for supply chain performance management. Narrow deployments limit the potential business value, slow the speed of growth and usage of MDM and can actually impede the resolution of difficult business problems. The *business-focused strategy* tends to be more successful, since it looks at the business problems that need to be addressed, how business operations will use it and the business requirements for master data governance and control. The business-focused deployment strategy requires a multi-entity deployment and provides a complete solution “using only the required master data, implemented with the correct

solution architecture, deployed for the correct business use, and with the correct data governance structure" (p. 41).

Credibility. This article is published in a technical journal by the director of product marketing at a master data management platform provider, Siperian, Inc and the article shows no bias toward any vendor-specific product.

Trkman, P., McCormack, K., de Oliveira, M. P. V., Ladeira, M. B. (2010). The impact of business analytics on supply chain performance, *Decision Support Systems*, *49*(3), 318-327, ISSN 0167-9236, doi:10.1016/j.dss.2010.03.007. Retrieved on April, 16, 2011 from http://www.profitpt.com/pdf/Business-analytics-supply-chain-performance.pdf.

Abstract. This technical paper investigates the relationship between analytical capabilities in the plan, source, make and deliver area of the supply chain and its performance using information system support and business process orientation as moderators. The findings suggest the existence of a statistically significant relationship between analytical capabilities and performance.

Summary. This article models a sample of 310 companies from different industries from the USA, Europe, Canada, Brazil and China as part of a study to identify the strength of the relationship between the use and integration of analytical business intelligence and organizational performance. Business analytic (BA) tools are used in combination to gain information, analyze that information and predict outcomes of problem solutions in any of the four areas of plan, source, make and deliver for supply chain management (SCM). The use of BA minimizes operating costs and helps to accurately forecast market trends; as usage increases, the quality of information can lead to “enhanced competitive advantage”, “improved performance” and “higher profit margins” (p. 319). Companies that are more process-oriented may be in a better position to utilize BA to improve performance, but in order to thoroughly implement BA, companies need to undergo business process changes, apply change management practices and focus on changing downstream decision making and business processes. However, the moderating effect of information systems (IS) support is considerably stronger than the effect

of business process orientation, since the system architecture needs to enable and allow event-driven, fast and well-informed decisions. The results provide a better understanding of the areas where the impact of business analytics may be the strongest.

Credibility. This article is published in a peer-reviewed journal by an assistant lecturer for Information Management as part of the Economics faculty at the University of Ljubljana in Slovenia (Trkman), a principal business process and supply change management consultant with DRK Research (McCormack), a graduate student from the Federal University of Minas Gerais, Brazil (de Oliveira), and the graduate student's professor of Economic Science at the Federal University of Minas Gerais, Brazil (Ladeira).

Watson, H. (2011). Business analytics insight: Hype or here to stay? *Business Intelligence Journal, 16*(1), 4-8. Retrieved from EBSCOhost. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=59623524&site=ehost-live&scope=site

Abstract. The article discusses the author's insight on business analytics, the history of the term *analytics,* and thoughts about it. This article recaps much of the 2010 Deloitte Analytics Symposium.

Summary. The article describes the use of analytics in analyzing data with statistical and mathematical techniques as part of a decision support system (DSS) and shares 10 important and interesting insights about business analytics (BA). (1) Analytics has existed in some form since the late 1960s, from when it was included in the descriptions of a decision support system, a data warehouse, business intelligence, or OLAP application. (2) Analytics has many definitions, based on where they are used, who performs them, the skills required and the technologies involved. (3) Analytics are becoming a requirement for organizations to compete and support new business strategies, to understand customer wants and needs and cater to them. (4) BA are overhyped but their overall success depends on how well companies make the required organizational and technical changes to generate the promised business value. (5) The vast amount of data contains a wealth of potentially useful information but there are tremendous challenges for capturing, sorting and analyzing the volumes of data. (6) BI platforms are changing and growing with the experience and market needs, sometimes integrating BA into the transaction system and other times using new hardware appliances to support them. (7) Analytics can be used in nearly every area of a business, including in the oft-forgotten HR department. (8) Analytics require a diverse set of skills and organizations must develop internal, analytics-

oriented training programs to grow the necessary skills. (9) There is a shortage of people with analytical skills and/or business training and experience necessary effective BA usage. (10) Advanced analytics found in software-based analytical, predictive models are the best option, since the tools allow the user to select the best model for the target population of data to be analyzed.

Credibility. The article is published in a technical journal by a professor of the Management of Information Systems and a Chair of Business Administration at the University of Georgia.

Watson, H., Wixom, B., Hoffer, J., Anderson-Lehman, R., & Reynolds, A. (2006). Real-time business intelligence: Best practices at continental airlines. *Information Systems Management*, *23*(1), 7-18. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=mth&AN=19141701&site=ehost-live&scope=site

Abstract. Continental Airlines is a leader in real-time business intelligence, and much can be learned from how they have implemented it. To support the current and future needs for real-time data, Continental's data warehouse group develop a warehouse architecture that can grow and scale and implement significant hardware to support the loading of the warehouse and managing the real-time delivery of information to users.

Summary. Data management for decision support has moved through three generations, with the latest being real-time data warehousing. This latest generation is significant because of its potential for affecting tactical decision making and business processes. To be successful with real-time BI, organizations must overcome both organizational challenges and technical challenges. The most important challenge with real-time BI is the *right-time* to deliver the data and the allowable amount of latency between the creation of the data (or the recognition of a specific event) and the time that the right people are notified and educated, so that they can take action on that real-time BI information. A key to success for the organization is to recognize that latency needs will change, so all data loads and is distributed via a queuing mechanism, which is entirely automated. This architecture is flexible and enables the data warehouse team to focus on generating new value through "applications that can leverage real-time BI by impacting business processes to create value to an organization", rather than spending time monitoring the processes (p. 18).

Credibility. This article is published in a peer-reviewed journal by a professor of the Management of Information Systems and a Chair of Business Administration at the University of Georgia (Watson), an associate professor of commerce at the University of Virginia (Wixom), a professor of Data Management, MIS, Operations Management, and Decision Sciences at the University of Dayton (Hoffer), the Vice President and Chief Information Officer at Continental Airlines (Anderson-Lehman) and the data warehouse technical director at Continental Airlines (Reynolds).

Whitacre, J., Abbass, H., Sarker, R., Bender, A., & Baker, S. (2009). Strategic positioning in tactical scenario planning. *Genetic And Evolutionary Computation Conference 2008*, 1081-1088. Retrieved on May 7, 2011 from http://arxiv.org/abs/0907.0340v1

Abstract. Planning problems demand solutions that can satisfy a number of competing objectives on multiple scales related to robustness, adaptability, risk, etc. Planning problems are of vital interest in many human endeavors and computational scenario-based planning may be a good method to use for this problem domain. The article discusses results that highlight the fact that scenario-based planning is naturally framed within a multi-objective setting. However, the conflicting objectives occur on different system levels rather than within a single system alone.

Summary. Capability planning problems are found in many important areas, including defense and security. Planning provides a unique context for optimization that has not been explored in great detail and involves a number of interesting challenges which are distinct from traditional optimization research. Using scenarios as part of the planning process, both for long-term as well as short-term plans, is a useful optimization technique.

This paper introduces computational scenario-based planning problems and proposes ways to accommodate strategic positioning within the tactical planning domain. Long-term planning cannot work in isolation of tactical planning, nor vice versa. “Tactical decisions need to take into account strategic positioning so that short term decisions meet immediate threats while being in themselves steps towards meeting long-term threats” (p. 1). One of the main challenges with this combined strategic-tactical planning is translating the strategic vision statement into a concrete set of quantifiable targets with unambiguous performance metrics. Looking toward the future, predictive techniques utilizing large sets of historical data can be effective, depending on the statistical model implemented. In recent years, there has been notable progress using

computational models for complex environments, so a hybrid approach of human-based and computational-based techniques are the most successful.

Credibility. The article is published in the 2008 proceedings of the Genetic And Evolutionary Computation Conference and accessed via arXiv, an archive for electronic preprints of scientific papers, by a research associate (Whitacre) a professor (Abbass) and an associate professor (Sarker) with the School of Information Technology at the University of New South Wales Australian Defense Force Academy (ADFA), as well as two professors at Defence, Science and Technology Organisation in Australia (Bender & Baker).

Wixom, B., Watson, H., Reynolds, A., & Hoffer, J. (2008). Continental airlines continues to soar with business intelligence. *Information Systems Management*, *25*(2), 102-112. doi:10.1080/10580530801941496. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=mth&AN=31560813&site=ehost-live&scope=site

Abstract. This case study of Continental Airlines follows up with the study done on real-time business intelligence two years previously and describes how business intelligence at Continental has evolved over time. It identifies Continental's challenges with its mature data warehouse and provides suggestions for how companies can work to overcome these kinds of obstacles.

Summary. As the business intelligence industry matures, it is increasingly important to investigate and understand the nature of mature data warehouses. Although data warehouse (DW) research is prevalent, existing research primarily addresses new implementations and initial challenges and not mature or maturing implementations. Data warehousing is a journey, rather than a destination and managers need to understand how to evolve data warehouse initiatives to meet the changing and growing needs of the business over time. A mature DW is one that is a part of the institutional fabric and integral to the functioning of the organization; it is part of the culture of the company. One of the key reasons behind the DW's success is the philosophy to grant users access to all data, unless there iss a reason not to do so, which implicitly allowed users to become data warehouse analysts, rather than "simply consumers of prewritten reports" (p. 104). The DW team remains small, focusing its efforts jointly with liaisons with each functional area and its priorities are evaluated by an advisory body made up of former steering committee members. The challenges of (a) staffing with people with database

marketing skills, (b) scalability and performance issues, (c) business continuity and disaster recovery management, (d) the growing volume of data that is “hard to digest”, (e) real-time data freshness, and (f) rapid service delivery of high-quality applications are all key issues that need to be continually managed. There is a chance of making the right moves now to avoid future missteps.

Credibility. This article is published in a peer-reviewed journal by an associate professor of commerce at the University of Virginia (Wixom), a professor of the Management of Information Systems and a Chair of Business Administration at the University of Georgia (Watson), the data warehouse technical director at Continental Airlines (Reynolds), and a professor of Data Management, MIS, Operations Management, and Decision Sciences at the University of Dayton (Hoffer).

Leveraging the Value of Information, No Matter How It Is Stored

Berler, A., Pavlopoulos, S., & Koutsouris, D. (2005). Using key performance indicators as knowledge-management tools at a regional health-care authority level. *IEEE Transactions on Information Technology in Biomedicine*, *9*(2), 184-192. http://moodle.ncku.edu.tw/file.php/39790/paper/Using_Key_Performance_Indicators_as_Knowledge-Management_Tools_at_a_Regional_Health-Care_Authority_Level_.pdf

Abstract. This paper proposes a patient-centered information model that drives information flow at all levels of the day-to-day process of delivering effective and managed care, toward information assessment and knowledge discovery.

Summary. The advantages of the introduction of information and communication technologies in the complex health-care sector are already well-known and well-stated in the past. The medical community has embraced most of the technological discoveries allowing the improvement in patient care, but they have not embraced the technology as it improves health-care informatics. Taking the above issue of concern, this work proposes an information model for knowledge management (KM) based upon the use of key performance indicators (KPIs) in health-care systems. Based upon the use of the balanced scorecard (BSC) framework (Kaplan/Norton) and quality assurance techniques in health care (Donabedian). In order to persuade health-care decision-makers to assess the added value of KM tools, those should be used to propose new performance measurement and performance management techniques at all levels of a health-care system. The proposed KPIs form a complete set of metrics that enable the performance management of a regional health-care system. In addition, the performance framework is technically applied by the use of state-of-the-art KM tools such as data warehouses and business intelligence information systems.

Credibility. This peer-reviewed article is written by a project manager of a large health-care informatics project with Information Society SA (Berler), a research associate professor at the Institute of Communication and Computer Systems at the National Technical University of Athens (NTUA), Greece (Pavlopoulos) and a professor and head of the Biomedical Engineering Laboratory at NTUA (Koutsouris).

Elhari, K., & Bounabat, B. (2011). Platform for assessing strategic alignment using enterprise architecture: Application to e-government process assessment. *IJCSI International Journal of Computer Science Issues, 8*(1). Retrieved on May 9, 2011 from http://arxiv.org/abs/1104.1132v1.

Abstract. This paper presents a platform/model for modeling enterprise architecture and for assessing strategic alignment based on internal enterprise architecture metrics. This assessment can be used in auditing information systems. The platform is applied to assess an e-government process.

Summary. This article provides a detailed description of a robust technical model that can be followed to validate that an information system is properly aligned with company strategy. The model is called Strategic Alignment (SA). This alignment and consistency check of strategic enterprise metrics validates existing information systems. The recommended enterprise architecture that is currently recognized as allowing for the best SA includes a business layer, application layer, information layer and technology layer. The business layer represents the business processes of the organization and includes the activities for each business process and the criticality of each process. The application layer represents the systems that automate the processes or activities and the functionalities in the system that are needed to complete the process. The information layer includes the various sources of data and their descriptive attributes, including if they are secure, confidential and/or redundant. Finally, the technology layer describes the hardware and software infrastructure. The explicit identification and linking of the critical components of an enterprise's processes is vital for the Strategic Assessment to identify superfluous, irrelevant and misaligned – or not – corporate assets or processes. The

article uses the 2004 Census of Population and Housing data from Morocco to complete this SA assessment with an E-Government organization. The completed SA identifies all of the interrelated processes, activities, applications, functionality, data sources, information entities, operating systems and technology, since each of these affect an organization's performance to goals.

Credibility. The article is written by a Professor of Computer Sciences (Bounabat) and a PhD candidate (Elhari) at the National High School for Computer Science and Systems Analysis (ENSIAS) in Morocco. The article is solely published in ArXiv, an archive for electronic preprints of scientific papers.

Ferguson, M. (2006). Let the data flow. *Intelligent Enterprise*, *9*(3), 20-25. Retrieved on May 6, 2011 from http://www.informationweek.com/news/software/bi/179101909.

Abstract. The article discusses the simplification of information integration processes for strategic business applications and intelligence systems.

Summary. The more complex an organization's business relationships and activity, the more corporate leaders demand IT to simplify. The potential benefits for this demand include reductions in cost, increased agility in the marketplace and better separation of processes from application silos and overall improvements in business performance. Business users demand common interfaces, common business processes and common application functionality, tools and services. Metadata provides a common source of definitions and context about the data, or data that describes the information demanded by users. This metadata is leveraged by most business intelligence software and utilized as part of the needed business integration efforts to build a common framework with the data merged from the multiple information silos; silos are the bane of most organizations. The three main approaches in data integration include (a) data consolidation using extract, transform and load (ETL) tools; (b) federated querying and real time data integration using primarily ETL tools, and (c) synchronization of multiple, heterogeneous data copies with message-oriented middleware. An integral part of master data management is operational data, whether from unstructured documents, web content, e-mail and other content, including multimedia. One main goal is to reduce the number of copies of operational data while providing holistic views of customers, products, assets and other data, and also reducing the efforts required for maintaining consistency across systems.

Credibility. This article is published in a technology journal by the managing director of Intelligent Business Strategies, focusing on enterprise BI and business integration. The lack of vendor-specific product recommendations helps to qualify the credibility of the article.

Gerami, M. (2010). Knowledge management. *International Journal of Computer Science and Information Security, 7*(2), 234-238. http://arxiv.org/abs/1003.1807v1

Abstract. The need for knowledge management and its related processes, as well as a tacit and explicit knowledge and understanding of organizational culture, is a key issue for successful implementations of knowledge management.

Summary. Knowledge management is the process of making relevant information available quickly and easily for people to use productively with some type of action response. Knowledge is found in people, processes and information, where information includes images and all forms of multi-media. According to Buckman Laboratories' Koskiniemi, "Successful knowledge sharing is 90 percent cultural, 5 percent tools and 5 percent magic. All the technology and tools in the world won't make you a knowledge-based organization if you do not establish a culture that believes in sharing" (p. 3). Only people can capture and store the knowledge gained from information. "Management sends signals about what is important through its recruiting priorities, promotions and possibly more than anything, through its own behavior. These deeply embedded cultural assumptions are significant" (p. 3). Knowledge sharing must be fostered and seen as a priority and its management must be holistically coordinated. A climate of employees voluntarily sharing information, creativity and expertise needs to be created, which generates new knowledge that needs to be managed. Managers may need to look beyond traditional tools to find ways of building trust and developing fair business information flow processes. Incentivizing the flow of information, rather than letting the information be hoarded is recommended to facilitate the flow of information.

Credibility. This article is published in a peer-reviewed journal by a professor on the faculty of Applied Science of Post and Communications, organized under the Ministry of

Information and Communication Technology, a government-sponsored entity of higher education in Tehran, Iran.

Grabova, O., Darmont, J., Chauchat, J., & Zolotaryova, I. (2011). Business intelligence for small and middle-sized enterprises. *SIGMOD Record 39*, 39-50. Retrieved on May 9, 2011 from http://arxiv.org/abs/1102.0115v1.

Abstract. BI becomes an essential part of any enterprise, even small enterprises, due to the increasing volume of data that is indispensable for decision making. Data warehouses are the core of decision support systems, which are currently used by all kind of enterprises in the entire world. This paper discusses the existing approaches and tools working in main memory databases and/or with web interfaces, relevant for small and middle-sized enterprises in decision making. The authors propose a specific in-memory database, using open source products and ETC processes, in addition to storing business data close to its users to mitigate security issues when using BI provided via the cloud.

Summary. Although many studies have been conducted on the need of decision support systems (DSSs) for small businesses, most of them adopt existing solutions and approaches, which are appropriate for large-scaled enterprises, but are inadequate for small and middle-sized enterprises. Small enterprises require cheap, lightweight architectures and tools (hardware and software) providing online data analysis. In order to ensure these features, this article reviews web-based business intelligence approaches since they are simple for end-users to utilize. Web technology allows multiple information formats to be shared with end users, such as (a) structured database data, (b) semi-structured data, such as templated spreadsheet files, and (c) unstructured data, such as multimedia and chunks of text. However, this also creates the need for managing these heterogeneous data sources. For real-time analysis, the traditional OLAP architecture is cumbersome and storage-costly; therefore, the authors review in-memory

processing and Internet-based cloud computing services, both open source and for-pay BI products.

Credibility. This article is written by a principal researcher (Chauchat) and two doctoral students (Grabova & Darmont) from the University of Lyon (ERIC Lyon2) in France. Grabova also works at the Kharkiv National University of Economics in the Ukraine, where Zolotaryova is the head of the IT Department.

Mouncy, P., Tzokas, N., Hart, S., & Roslender, R. (2002). Core strategic asset or just a tactical tool: How UK companies view the value of their customer databases. *Interactive Marketing*, *4*(1), pp. 41-58. Retrieved on June 6, 2011 from http://www.theidm.com/resources/journal/papers/core-strategic-asset-or-just-a-tactical-tool-how-uk-companies-view-the-value-of-their-customer-databases-peter-mouncey-nikolaos-tzokas-susan-hart-and-robin-roslender-interactive-marketing-vol-4-no-1/

Abstract. This paper describes a research project commissioned by the Institute of Direct Marketing and undertaken by the University of Strathclyde School of Marketing that investigates the value that organizations place on their customer databases. While research clearly identifies the importance of the customer database as a revenue generator, the results of this project also demonstrate that in many organizations the full potential is not being realized, particularly in developing and supporting corporate strategy.

Summary. The shift in emphasis from selling products to focusing on the customer, in terms of where the enterprise derives its shareholder value should, in theory, lead to the customer database being viewed as a core corporate asset and vital to achieving strategic goals, but this is not the reality. Maximizing the value of the overall business in customer databases includes (a) customer needs and attitudes, (b) customer service information and complaint history within the databases, and then (c) ensuring that the information is widely available to all areas of the enterprise to help build marketing scripts, track sales and generate orders. Unfortunately, using the customer database to measure business performance and to build holistic strategies isn't currently done, since most customer databases have a much more focused, or tactical role. Organizations need to stress the importance of developing a culture where data quality is everyone's responsibility, in order to accurately support business strategy, training, and

performance measurements. To evaluate an organization's customer database, the costs of developing, operating and maintaining the database and the potential for value creation need to be calculated and measured using ROI, rate of return, and/or discounted cash flow.

Credibility. This article is written by the director of research at the Institute of Direct Marketing and a visiting fellow at Cranfield University (Mouncy), a professor of marketing and the director of research in the School of Management, University of East Anglia (Tzokas), the Vice Dean of research at the Strathclyde Business School in Glasgow, UK (Hart) and a doctoral research student focusing on strategic management accounting (Roslender). The article is published by the commissioner of the research, the Institute of Direct Marketing, on their own website.

Sarda, N. (2001). *Structuring business metadata in data warehouse systems for effective business support*. n.p. Retrieved on May 9, 2011 from http://arxiv.org/PS_cache/cs/pdf/0110/0110020v1.pdf.

Abstract. Decision support and business analysis requires extensive and in-depth understanding of business entities, tasks, rules and the environment. The purpose of business metadata is to provide this understanding. This article discusses some important limitations or inadequacies of business metadata proposals.

Summary. Large organizations utilize different types of data processing and information systems, ranging from the operational (OLTP) systems, data warehouse systems, to data mining and business intelligence applications. With these heterogeneous systems, it is important to create an integrated repository of what these systems contain and do in order to use them collectively and electively. The repository contains metadata of source systems, data warehouse, and the business metadata, a meaningful logical-level description of the data, as well as the purpose, relevance, potential use and past usage. Realizing the importance of metadata, many standardization efforts have been initiated to define metadata models. The authors describe the importance of providing an integrated and flexible inter-operability and navigation between metadata and data, and the important issue of systematically handling characteristics that change over time and evolution of the metadata itself. The business metadata should cover the categories of (a) job functions, (b) departmental or divisional organizations, (c) goal statements for each of these organizations, (d) business entities associated with processes – both internal and external, (e) processes decomposed to be associated with other metadata, (f) external events beyond the control of the organization, (g) measures and other quantitative parameters that measure the effects of business activities, (h) recorded evaluations of business measures against goals, (i)

business actions related to the evaluations, and (j) business concepts that are generalized classes of metadata that introduce business terminology. With this model implemented, it should be possible to navigate from data to the relevant, timely metadata to see metadata changes, record evaluations of business activities based on analysis of the data and also record proposed business actions – an integrated flow from data to metadata and back again.

Credibility. This article is written by a professor in the Computer Science and Engineering at the Indian Institute of Technology Bombay, in Mumbai, India. This paper is included in the proceedings of the Computer Research Repository (CoRR), for 2001 and is published in ArXiv, an archive for electronic preprints of scientific papers.

Shankar, R., & Menon, R. (2010). MDM maturity: pragmatism, business challenges, and the future of mdm. *Business Intelligence Journal*, *15*(3), 19-25. Retrieved from EBSCO*host*. http://search.ebscohost.com.libproxy.uoregon.edu/login.aspx?direct=true&db=bth&AN=55730951&site=ehost-live&scope=site

Abstract. Prevailing maturity models of master data management (MDM) are not always the best fit for organizations, since they do not have the same flexibility as some less mature MDM approaches, especially when the underlying business imperatives change or take on different priorities.

Summary. The major milestones of MDM maturity models include (a) data integration, (b) data quality, (c) master data governance, (d) propagation of master data, and (e) multi-domain enterprise data hub. However, some long-term users of MDM maturity models are scaling back to lower steps in the maturity curve, in order to change or take on different priorities. This trend in scaling back is typically tied to the lack of breadth in the reach of the MDM, but also justified by the driving force and ownership behind the implementation of MDM. In one company, as the organization understood the significant changes that would be required to implement MDM holistically and the associated cost in time, they instead chose an alternative, with a narrower but sophisticated approach. At another financial services company the challenges of merging multiple MDM processes, technology, governance models and business process integration was insurmountable via a master MDM strategy, so instead the organization opted for a search repository and a web-based data integration tool that provided a common view across all of the heterogeneous data sources. The faster time-to-value solution that is simpler and less mature is more successful, due to pressures with ROI and the "exponential complexity of expanding tightly controlled processes across subsidiaries" (p. 24). The authors, employees of a

company selling MDM products, encourage organizations make sure that the steps of data integration and data quality is sufficient to support future initiatives and then build out a governance framework that supports data from multiple domains.

Credibility. The article is written by a senior director of MDM product marketing at Informatica (Shankar) and a senior director of MDM and it identifies resolution solutions for Informatica (Menon). The article is published in a non-peer-reviewed technical business journal. The article is agnostic regarding specific technologies and instead focuses on master data management itself.

Conclusion

This annotated bibliography provides information that may help companies see greater potential to increase organizational wide efficiency by implementing a business intelligence solution that includes tactical views of company data that are directly tied to strategic objectives and data views, as compared to systems that rely solely on departmental, tactical views of the data (Alter, 2005; Davenport, 2006; McCafferty, 2010; Nadeem & Jaffri, 2004). This study proposes that the most valuable method of designing a business intelligence solution is to holistically identify and incorporate a company's strategic goals and long-term plans into the implementation throughout all relevant departments in a company (Kellet, 2006; Nadeem & Jaffri, 2004; Shankar, 2008; Whitacre et al., 2009). This implementation strategy provides action-oriented, tactical information to the end users, which fits with the strategic direction of the organization (Armstrong et al., 2010; Whitacre et al., 2009). Business intelligence solutions that are designed and implemented only for short term, tactical improvement within individual departments of the company cannot have the same impact on efficiency due to their narrow scope and lack of wide-spread usage (Mouncy et al., 2002; Nadeem & Jaffri, 2004; Sarda, 2001).

The main question addressed in this study is: Why should a company adopt a strategic approach to business intelligence (BI) and business analysis (BA) in addition to specific tactical approaches, in relation to potential efficiency gains? Conclusions are based on information presented in 32 selected references in the Annotated Bibliography section of this study and presented in relation to each sub-question addressed in the study. The key relevant points noted in the summaries of the references are presented below in relation to the sub-questions used to structure the Annotated Bibliography with the intent to provide information that substantiates specific reasons to design business intelligence systems strategically and implement the BI

tactically. The goal is to enable the audience to understand how to (a) gain the most efficiency in organizational processes, (b) control expenses during a business intelligence software implementation, and (c) leverage the BI system for future decision making.

How does a strategic design and implementation of a business intelligence system differ from a tactical implementation?

A strategic design and implementation process that plans for a business intelligence system from a holistic, enterprise-wide perspective varies greatly from a tactical process that focuses solely on the pain points for a single department of the organization. Both design and implementation strategies propose to deliver the *right information to the right person at the right time*, so that users can take action for decision-making (Afolabi & Goria, 2006). However, according to Nadeem and Jaffri (2004), the return on investment (ROI) analysis must consider *how well BI produces business insights across the whole enterprise*.

There are many procedural elements of a strategic process that aren't included in a tactical process, creating significance difference between the two design and implementation methods. A strategic process works to integrate data from multiple systems and creates a standard set of definitions and terms that are then used consistently across all levels of the BI system (Shankar, 2009; Ferguson, 2006). With this consolidated and integrated data, *data quality and cleanliness standards are established* and followed to ensure that the data can be properly interpreted, understood and aggregated to show trends across the organization and markets (Shankar, 2009). And when clean and high quality data is integrated from multiple systems, *data governance controls* should be established to maintain consistency and allow for audits of controls and information processes (Shankar, 2009). On the other hand, *a tactical focus tends to generate disconnected silos of information and knowledge* that cannot easily be passed on to

other areas of the organization; valuable data simply isn't accessible or available outside of the silo (Cooper, 2006).

From the process management perspective, a strategic design and implementation *includes both the support and direct involvement of upper-level management executives* (Cooper, 2006). These aspects are vital to ensure that the BI system is *fully aligned with corporate goals and current organizational strategy*, as well as ensure compliance to the Sarbanes-Oxley Act of 2002, by allowing corporate executives to ensure accurate data and processes related to financial statements, down to the transaction level (Volonino, Gessner, & Kermis, 2004). This involvement of upper-level management will also help to ensure that alerts are triggered to *inform business decision makers across the organization of enterprise-relevant events*, in order enable action responses (Nadeem & Jaffri, 2004).

How can company efficiency be increased through employee training in the usage of business intelligence systems?

Based on the studies included in this Annotated Bibliography, increased company efficiency can be achieved in multiple ways from usage and training with business intelligence systems. Primarily, users *of all types need to be trained to use the BI system*, including decision makers, information watchers and analyzers, and the end users, in order to learn how to interpret data that they query from the BI system, in their efforts to make the best decisions (Afolabi & Thiery, 2005; Afolabi & Thiery, 2006; Rogge, 2005). With this solid foundation of knowing what the system is showing them *and* how they can act on it, users of all levels can *make improved, informed decisions as they relate to their business task objectives* (Afolabi & Thiery, 2005; Rogge, 2005).

Trained users should be *better able to identify patterns and formulate responses* to the insights that they gain from the BI system (Fitzgerald, 2006; Heinrichs & Lim, 2005; Rogge, 2005). They should gain experience and proficiency with the guided visualizations of BI so they can more easily analyze data, which *allows the organization to more easily respond, adjust and adapt to market turbulence and organizational changes* (Heinrichs & Lim, 2005). Users need to continue to *expand their knowledge across the breadth of the BI system* to better leverage what already exists in the BI system and then ask for more (Afolabi & Thiery, 2005; Afolabi & Thiery, 2006; Heinrichs & Lim, 2005).

Organizations that have trained their employees how to efficiently use the enterprise business intelligence can *more readily identify customers that they need to work with* to retain or better collaborate with for increased revenue or decreased expenses, to streamline operations, and turn unprofitable customers into profitable ones (Fitzgerald, 2006; Gessner & Scott, 2009). This means that employees are able to *better use their time* by working with customers that are more likely to generate sales, rather than building relationships with customers that won't generate any sale (Gessner & Scott, 2009).

What key factors, including requirements, scope and coverage, are required to support successful comprehensive (strategic) implementation of a BI software solution within an organization?

There are multiple key factors that impact the success of strategic implementation and usage of BI software within an organization, that pertain to requirements, scope and coverage (see *Table 1*). The first, according to Shankar (2008), is that the implementation process should be *transparent throughout the organization from the onset*, designed to deliver results rapidly in

specific areas that people can see, rather than working initially only on the design and other less visible behind-the-scenes work. Kellet (2006) states that business intelligence software needs to be *integrated into existing business processes and routine tasks*, so that the users have an ever-present exposure to information relevant to their decision-making. Armstrong et al. (2010), also states the need for both initial and *ongoing internal marketing* of the successes achieved with the business intelligence system, as the implementation progresses. This approach to implementation keeps users across the organization engaged in the process and informed of improvements and how they were achieved, rather than users only hearing promises but never seeing any results (Armstrong et al., 2010).

A BI software solution can require a *substantial hardware infrastructure* that often comes with significant cost and slowly appearing results (Armstrong et al., 2010). A major part of this hardware infrastructure is devoted to the integration of all enterprise-wide business databases for effective management control systems (Elbashir, Collier, & Sutton, 2011). Elbashir, Collier, and Sutton (2011) state that companies with an existing IT infrastructure will be better able to assimilate BI systems. Real-time delivery of information is becoming more important, where the latency and age of the information is low enough to act on the data. This requirement of real-time delivery requires specific infrastructure and proper design and customization to *ensure that the BI system can grow over time* (Watson et al., 2006; Wixom et al., 2008).

This infrastructure is particularly important due to the vast amount of data that might be "hard to digest" unless the BI system is designed to handle the volume adequately for users (Wixom et al., 2008). With this copious amount of data, *an analytics group* with specialized analytical skills needs to be grown within the organization, since there is a shortage of people with both the analytical skills and business training and expertise (Davenport, 2006; Hopkins,

2010; Watson, 2011; Wixom et al., 2008). There must also be *liaisons between the business intelligence group and users* of the BI system itself, to the extent that the data warehouse group is integrated into and within the organization's functional business areas (Hopkins, 2010; Wixom et al., 2008).

According to Kromer and Yu (2008), *completing business productivity studies* and *rolling out a small-scale business implementation* can help earn executive buy-in and then involve upper management in the larger strategic design and deployment. *Assigning a project sponsor* and *involving executive management* will help ensure management is both informed and involved, which reduces potential bottlenecks and implementation challenges, as users are asked to change their processes and their current way of doing things (Armstrong et al., 2010; Davenport, 2006). Armstrong et al (2010) states that the *integration of strategic goals directly within the BI application or project* is a requirement for a successful implementation. *Completing capability planning surveys and analyses* may also help ensure that the BI will satisfy a number of competing objectives on multiple scales related to robustness, adaptability and risk across the entire organization (Whitacre et al., 2009).

Wixom et al. (2008) describes that one of Continental Airlines' key reasons for success is their determined philosophy of *granting users access to all data* unless there is a reason not to do so. This philosophy needs to be established from the BI project inception. In addition, *measurement systems*, need to be established initially, such as balanced scorecards, which compare performance to metrics for both front-line managers and executive leadership, in order to reflect business performance both tactically and strategically (Briggs, 2010). Whitacre et al. (2009) also stresses the need to *translate strategic positions to short term decisions* and quantifiable targets, in addition to developing strategic planning models that incorporate a

combination of human-based and computational-based techniques since they are the most successful.

A company's culture and the organization's ability to gather, absorb and strategically leverage new information is also vital to a successful strategic BI system (Elbashir, Collier, & Sutton, 2011; Watson, 2011). Companies that are more process-oriented may be in a better position to utilize business analytics to improve performance, but all companies need to undergo *business process changes, apply change management practices* that focus on changing downstream decision-making and business processes (Trkman et al., 2010).

Table 1 summarizes the key factors across requirements, scope and coverage. Requirement factors identify elements and procedures described as being critical for a successful strategic implementation of business intelligence for an organization. Scope factors describe the breadth of exposure of the business intelligence across the organization and coverage factors explain the depth of the business intelligence implemented for a specific tactical department's or organizational unit's processes.

Table 1

Summary of key factors for strategic design and tactical implementation of business intelligence

Requirement Factors		
Factor	**Description**	**Reference(s)**
Transparent BI solution	Delivering results for specific tactical areas, done early and often	Shankar, 2008
Substantial hardware infrastructure required	Hardware infrastructure designed to integrate all enterprise-wide data for control purposes.	Armstrong et al., 2010
Ensure the BI system can evolve	A foundational infrastructure is needed that can support continued real-time delivery of data to end users	Watson et al., 2006; Wixom et al., 2008

Business productivity studies and small-scale implementations	Earn executive buy-in to better involve upper-management in the BI project	Kromer and Yu, 2008
Project sponsor and executive participation	Reduce potential bottlenecks and implementation challenges and help users change their existing processes	Armstrong et al., 2010; Davenport, 2006
Strategic goals	Integrate strategic-level foresight into the BI solution	Armstrong et al., 2010
Capability planning and analysis	Ensure all competing objectives are met, the system can scale for the future and can be adapted in the future	Whitacre et al., 2009
Measurement systems	To compare performance to metrics in order to reflect business performance both tactically and strategically	Briggs, 2010
Translate strategic positions into short term decisions	Develop planning models that use both computational and human techniques	Whitacre et al., 2009
Changes to processes and change management	Need to change downstream business processes and decision-making	Trkman et al., 2010
Coverage Factors		
Factor	**Description**	**Reference(s)**
Integrated BI	Business intelligence solutions are integrated into existing processes	Kellet, 2006
Open access to data	Philosophy to enable users to access all information relevant to their job duties, unless there is a reason not to	Wixom et al., 2008
Scope Factors		
Factor	**Description**	**Reference(s)**
Ongoing internal marketing	Maintaining an informed user base, since they are the customers and consumers of the BI solution	Armstrong et al., 2010

An analytics group	A group with the specialized analytical skills needed to leverage vast volumes of data; there is a shortage of people with both analytical and business skills	Davenport, 2006; Hopkins, 2010; Watson, 2011; Wixom et al., 2008
Liaisons between BI group and users	The data warehouse group needs to be integrated within the functional business areas of the organization	Hopkins, 2010; Wixom et al., 2008
Company culture	Company culture can enable absorption of new technology into the company	Elbashir, Collier, & Sutton, 2011; Watson, 2011

How can the technical difficulties related to gathering and incorporating existing database information, corporate process knowledge, and numerous office documents be overcome in order to gain additional efficiency from a business intelligence system?

Overcoming the technical issues related to an organization's multiple sources of information and leveraging that information across the organization requires planning and design, in addition to a significant amount of work (Elhari & Bounabat, 2011; Ferguson, 2006; Sharkar & Menon, 2010; Watson, 2011). Elhari and Bounabat (2010) suggest that an organization should complete a *strategic alignment (SA) evaluation and consistency check*, to explicitly identify and link critical components of the enterprise's processes and systems. Ferguson (2006) suggests *simplifying and establishing common processes across common tools, services and interfaces*. Documents, information and knowledge need to be centrally stored (Grabova et al., 2011). Once the state of the way things as they currently are is captured, improved upon, and simplified, then any additional business data that may not currently be captured needs to be stored and managed (Gerami, 2010). For example, employee knowledge needs to be captured, organized and organizationally managed through the use of *knowledge management systems and processes* (Heinrichs & Lim, 2005) and users need to be encouraged,

trained and incentivized to share their knowledge (Berler, Pavlopoulos, & Koutsouris, 2005; Gerami, 2010).

Once a clear and documented analysis of current systems and processes is documented, the next hurdle is to *integrate all of the systems and types of data*. Since heterogeneous systems do not natively communicate with each other and do not follow the same standards, existing silos of information need to be merged or somehow bridged (Mouncy et al., 2002; Sarda, 2001). Sarda (2001) states that the methods of searching and finding that information across data silos differ; there is no strategic business metadata to describe where each type of information can be found, nor is there a descriptive link between the data and the business process to which it relates. *Master Data Management (MDM)* is the current industry standard to merge this data and related definitions, and it provides a common search.

Implementing MDM includes (a) the integration of data from heterogeneous systems, data quality management (including the reduction or elimination of duplicates), (b) master data governance for standards of what the data means, and (c) propagation of that master data across the entire organization, where all information can be centrally accessed (Ferguson, 2006; Sharkar & Menon, 2010; Watson, 2011). Metadata discovery and management is designed and set up to occur across the entire extract, transform and load (ETL) process via business intelligence tools, querying interfaces, and master data management systems (Ferguson, 2006). MDM allows for key performance indicators (KPIs) to be established that show performance of users and processes across all business systems to enable performance management, using data warehouses and BI information systems (Berler, Pavlopoulos, & Koutsouris, 2005). MDM also facilitates more sophisticated analysis of database information, either in real-time, using traditional OLAP

tools, but also using in-memory processing and cloud computing services via the Internet (Grabova et al., 2011).

Table 2 summarizes the key technical issues identified in this Annotated Bibliography as they relate to strategic design and tactical implementation of business intelligence systems.

Table 2

Summary of technical issues related to the implementation of business intelligence

Overcoming Technical Issues		
Factor	**Description**	**Reference(s)**
Significant planning and design required	Need to overcome technical issues related to multiple sources of information and the need to merge and give access to that information, across the organization	Elhari & Bounabat, 2011; Ferguson, 2006; Sharkar & Menon, 2010; Watson, 2011
Strategic alignment (SA) evaluation	Identify and confirm relationships between data, processes and systems, across the enterprise	Elhari & Bounabat, 2011
Simplify processes	Simplify and establish common processes using common tools, services and interfaces	Ferguson, 2006
Knowledge management (KM) systems and processes	Capture and share employee knowledge. Incentivize employees to share their knowledge	Berler, Pavlopoulos, & Koutsouris, 2005; Gerami, 2010; Heinrichs & Lim, 2005
Utilize Master Data Management (MDM)	Integration of all types of systems and all types of data; bridging silos of information; common search methods and tools; business metadata describing each element of informational data; data governance; propagation of master data across the organization; ETL tools and processes; Enables establishment of KPIs and sophisticated analysis using both traditional and newer tools	Berler, Pavlopoulos, & Koutsouris, 2005; Ferguson, 2006; Grabova et al., 2011; Mouncy et al., 2002; Sarda, 2001; Sharkar & Menon, 2010; Watson, 2011

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