BUSINESS INTELLIGENCE 2.0: THE ROLE OF WEB 2.0 APPLICATIONS IN LEVERAGING BUSINESS INTELLIGENCE

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ABSTRACT:
Business Intelligence (BI) is an emerging key enabler for increasing organizational performance and adding value. Business intelligence is currently becoming a top-priority for many organizations as part of their strategic initiatives. This platform of technologies, applications, and processes used for gathering, storing, accessing, and analyzing data is shifting into a more interactive platform referred to as Business Intelligence (BI) 2.0. Web 2.0 applications such as social networking sites are leveraging the traditional business intelligence into a more pro-active, event-driven, real-time service. No doubt the evolution of the Web and it user-generated content has opened up a new generation of business intelligence along with its emerging technologies that will cause a responsive shift amongst organizations and the way of making decisions. This paper outlines the Web 2.0 tools and introduces a new perspective in business intelligence reflecting future innovations in data analysis, integration, and decision making. Despite the progress witnessed in the business intelligence platforms, there are still many opportunities for further academic research that would enhance organizations performance and competitive intelligence.

INTRODUCTION:
The easy access to information provided by the Internet has intensified the competitive environment. Today we live in what has become known as the information age, where information has taken on more value more than any other time in history. People are more informed, more connected that ever before. The Internet is changing the organization, as walls are torn down between organizations and their customer, suppliers, partners. So as organizations are time shifting and pace shifting, and aiming to achieve forward and background integration so will the level of Business Intelligence (BI) and the level of organizational performance. The BI isn't a black box anymore, but it is a system that is growing and expanding. The Internet and Web 2.0 applications helped transform the traditional structure of social exchange; it provided a free and open environment for ideas exchange. This powerful tool is leveraging the traditional business intelligence into a new generation of more advanced tools called Business Intelligence 2.0.

The Web has evolved from static pages, to dynamic online collaboration, and the role of online social networking sites have developed and noticeably affected the level of business intelligence as they have become the primary source of information for any organization. The certain features associated with such communities such as crowd sourcing (i.e. Wikis), blogs, discussion groups, forums, pro-active alerts and notifications, mashups and portal integration, mobile access, rich interfaces and other technological services combined with the Web revolution such as open source BI, advanced analytical tools, and enterprise integration have provided event-driven, real-time and instant access to information

This paper is structured as follows; the first section introduces the background of business intelligence as a term, explaining the meaning of it, the benefits provided by such a tool, and its importance to organizations in decision making. Authors then move on to defining Web 2.0 applications introduced by the Internet and its revolution, focusing on the social networking sites and their role in collecting, storing, processing and disseminating information. The third section links these applications to traditional business intelligence and shows how these sites provide a strong tool for leveraging organizational traditional business intelligence into more pro-active services. Information analysis tools for extracting information and achieving business intelligence are further explained. The authors in the final section of this paper then discuss and summarize this topic of interest reflecting the main conclusions of the new generation of business intelligence and its effect in leveraging organizational level of intelligence and value of decision making.

BACKGROUND ON BUSINESS INTELLIGENCE (BI)
Business Intelligence (BI) is a general term which includes architecture, tools, databases, and applications to provide better decision making (Turban et al, 2007). The term BI appeared in 1989, trying to change the typical perspective that decisions should be based on facts, and not personal opinions (Tapscott, 2008). BI has been characterised not only as a profit generation tool but more like a survival versus bankruptcy in organisations today (Moss and Atre, 2003). BI can be exploited by companies to better understand the information capabilities available to them, the technological advances in their domain, current and future market trends as well as the regulatory framework where they operate (Negash, 2004).

BI can be used to identify customer's preferences by following their shopping pattern which could be traced either on line or through loyalty cards. In the past, companies studied customers' needs and made a product that fit the need of the "average customer". Today, companies have the ability to respond to individual customers' need. By means of data mining, companies can use their collection of

data in diverse ways, such as decide which customers should receive a particular offer, deepen customer loyalty and avoid serious customer mistakes by offering the right service to the right customer. According to Tapscott (2008) BI addresses some important questions for a decision maker, such as: "Who are our most disloyal customers", but also: "Do we care if we lose them?".
Apart from the customers preferences BI has the capacity to offer vast amounts of data related to both their customers and their products to the company. For example Lam & Tan (2001) and Turban et al (2007) believe Amazon.com is attractive neither due to the good deals nor the selection of music but because of its personal attention to users. This way companies can meet, and even predict, the customer's needs (Kotler, 2003). According to Li (2005), the primary aim of BI is to render data into high quality actionable information. Companies are able to utilize information will better understand customer needs. Online retailers can use data mining techniques to identify consumer purchase patterns, understand preferences create profiles (Lam & Tan, 2001) and predict unexpected purchases (Ryals & Knox, 2001). According to Davenport & Harris (2005), automated decision making is coming of age after problems and slow evolvement. Automated decision making may lead to reduced staff, but also dependence on employees with high expertise, who still need to make sense of the data available and take the actual decisions.
There are many BI applications areas, and some of the most common are data warehouse reporting, sales and marketing analysis, and planning and forecasting (Thompson, 2004). Thompson reports that BI can provide:

- Faster and more accurate reporting (81%)
- Improved decision making (78%)
- Improved customer service (56%)
- Increased income (49%)

BI can play a crucial role in almost every function in an organization, such as Customer Relationship Management (CRM) including segmentation and campaign effectiveness analysis, alternative Sales Channels such as the Internet, enterprise management as well as human resources and finance. Accordingly Gang, et al. (2008) believe that BI has an important role to play within the retail industry; one of the main reason being that other technologies such as Point of Sale (POS) as well as CRM depend of effective BI practices to work well.
Nevertheless, a survey in 2007 revealed that 64% of the managers did not feel they had access to the right data in order to identify and meet their customers' needs. Additionally, there are cases of companies that although they have access to relevant data they might use political, cultural, and professional reasons for not taking full advantage in using customer data (Howson, 2008). Overby et al (2006) give the rare example of Apple when successfully both using customer data and responding accordingly with their products such as iTunes application and I-phone/I-pad devices. Having access to vast amount of data is not uncommon for organizations, nevertheless although many businesses have invested heavily in collecting their data, fewer manage to analyze and redeploy them effectively (Tapscott, 2008). Davenport et al (2001) argue that companies have access to a lot of data, but lack processes that would help them to benefit from it. The main issue for these companies is to convert the huge amount of data available into business value. Despite having the technological tools, the companies fail to turn data into knowledge and results.
In the next section we examine the use of Web 2.0 applications as a way to collect data from a vast amount of information given by people participating in on line communities.

WEB 2.0 APPLICATIONS: SOCIAL NETWORKING SITES (SNSs)

Web 2.0 refers to the second generation of web development and web design that facilitates information sharing, interoperability, user-centered design and collaboration on the World Wide Web (Alexander, 2006). The advent of Web 2.0 led to the development and evolution of Web-based communities, hosted services, and Web applications. Examples include social-networking sites, video-sharing sites, wikis, blogs, mashups and folksonomies. The term Web 2.0 is commonly associated with Web applications that facilitate interactive information sharing, interoperability, user-centered design, and collaboration on the World Wide Web. A Web 2.0 site gives its users the free choice to interact or collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where users are limited to the passive viewing of content that was created for them (O" Reilly, 2005).
The advent of the third generation Internet-based broadband and other Web-based technologies has transformed the human fabric and nature of social interacting. The wide spread of digital communities and the move to their mass adoption is traced back to the increasing number of Internet users connected all around the globe. In a report by the ComScore (Schonfeld, 2009) indicates that the estimate number

of Internet users for the year 2008 counted nearly a growing 1.5 billion web surfers worldwide, with 283 million all over Europe, and 36.7 million only within the United Kingdom. The popularity of virtual spaces has grown tremendously over the past few years, and people became more motivated to express themselves, communicate, and maintain relationships digitally using a whole range of media and applications. Facebook, MySpace, LinkedIn, and other social networking sites are expected to grow to 1 billion participants by 2012 (Alexa, 2009).

Since its introduction, the Internet has enabled entirely new forms of social interaction, and activities, thanks to its basic features such as the widespread usability and access. Web 2.0 applications such as Social Networking Sites (SNSs) such as Facebook, Twitter and MySpace have created new ways to socialize and interact. Users of these sites are able to add a wide variety of information to pages, pursue common interests, and to connect with others. It is also possible to find existing acquaintances, to allow communication among existing groups of people. Sites like LinkedIn foster commercial and business connections. YouTube and Flickr specialize in users' videos and photographs, and a lot more examples to mention. Within 15 years the Web has grown from a group work tool into a global information space with more than a billion users. Currently, the Web is both returning to its roots as a read/write tool and also entering a new, more social and participatory phase. These trends have led to a feeling that the Web is entering a second phase -a new improved- Web version 2.0 (Cormode and Krishnamurthy, 2008).

Indeed, the rapid growth of network access, and convergence of a cheaper, faster, and flexible medium of computer mediated networking opened opportunities for creating, sharing and exchanging all kinds of information. It increased the velocity of transactions and fostered interactional density. The proliferation of low cost access anytime and from anywhere enticed organizations to become active in managing their information analytical tools online, to help achieve better level of business intelligence.

	Site	Users/million	Source
1.	Facebook	over 500	www.facebook.com/press/info.php?statistics
2.	My space	over 15	www.readwriteweb.com/.../myspace_mail_now_has_over_15_million_users.php
3.	Twitter	over 190	techcrunch.com/2010/06/08/twitter-190-million-users/
4.	LinkedIn	over 60	techcrunch.com/2010/.../linkedin-now-60-million-strong/
5.	Flickr	over 40	www.numberof.net/number-of-flickr-users/

Table 1: Examples of Web 2.0 SNSs and users subscribed worldwide.

Regardless of the absence of a generally accepted definition for Social Networking Sites (SNSs), everyone nowadays seems to have a noticeable idea of the hallmarks and the main objects forming them. However, Lee et al., (2003) defined Web 2.0 communities as “the cyberspace supported by computer-based information technology, centered upon communication and interaction of participants to generate member-driven contents of different types of informational value”. But the question remains, how can such online communities leverage organizational business intelligence?

BI 2.0: THE ROLE OF SOCIAL NETWORKING SITES IN LEVERAGING BI

The initiation of digital networks has not been for the sake of its own; each with the intention of gaining the adoption of friendship and dating hunters (i.e. MySpace, Facebook), educational and learning seekers (i.e. Yamaha, Pearson), and emotional and health support desirers (i.e. Bebo be well, iVillage). Most sites support people to connect based on shared interests, political views, or activities. Some sites cater to diverse audiences, while others attract people based on common language or shared racial, sexual, religious, or nationality-based identities. Sites also vary in the extent to which they incorporate new information and communication tools, such as mobile connectivity, blogging, and photo/video-sharing.

On a general level, Web 2.0 communities can be categorized according to Peck et al., (2007) into five main classes:

- Person-Oriented Communities: This type of communities represents the sort of communities where the person and social interactions are in focus. Examples on that are Bebo, MySpace, and Facebook.
- Professional Communities: Professional communities focus on business networking and Communities of Practice (CoP). Examples are LinkedIn and itLinkz.
- Media-Oriented Communities: Communities that focus on the creation, distribution and consumption of user-generated multi-media content, such as videos, music, and photos. Examples are YouTube and Flickr.
- Virtual World Communities: Communities have changed from using simple text-based environments to integrating more multimedia tools and applications to enhance user-generated content. These 3-D

virtual communities are created and owned by its own members and users. A typical example on that is Second Life.

 Mobile Communities: Communities that allow easy access, and make it possible to have direct and indirect contact with the community and make any updates on the move, such as Twitter and Facebook.

Web 2.0 communities cannot survive without lasting user involvement and participation in terms of generating user content and social interacting (Soroka and Rafaeli, 2006). Indeed, Web 2.0 communities to be successful and live up to their higher expectations need a critical mass of active users to be reached and maintained to pitch in the goods from data to information to knowledge. For the past couple of years, millions of people have turned daily to Web 2.0 communities to conduct diverse information-seeking and communication activities. A great number of users, however, are passive information consumers (Fichter 2005; Totty 2007). They read world news, review weather forecasts, and look for medical information. Over time, many would assume an additional role and become information providers contributing content on a wide range of topics in blogs and wikis (Baller and Green 2005; Goodnoe 2006).

Business Intelligence is used to understand the capabilities available in the firm; the state of the art, trends, and future directions in the markets, the technologies, and the regulatory environment in which the firm competes; and the actions of competitors and the implications of these actions. BI is a term that replaced decision support, executive information systems, and management information systems (Thomsen, 2003). However, the key to achieve the ideal business intelligence is the actionable information delivered at the right time, at the right location, and in the right form to assist decision makers. The objective is to improve the timeliness and quality of inputs to the decision process, hence facilitating managerial work. Sometimes business intelligence refers to on-line decision making, that is, instant response.

Most of the time, it refers to shrinking the time frame so that the intelligence is still useful to the decision maker when the decision time comes. In all cases, use of business intelligence is viewed as being proactive (Nelson, 2012). Therefore, the essential dimensions (see figure 1) of a pro-active BI 2.0 are: the traditional BI (i.e. existing information and data warehouses), the Internet, and Web 2.0 applications (i.e. Web 2.0 communities).

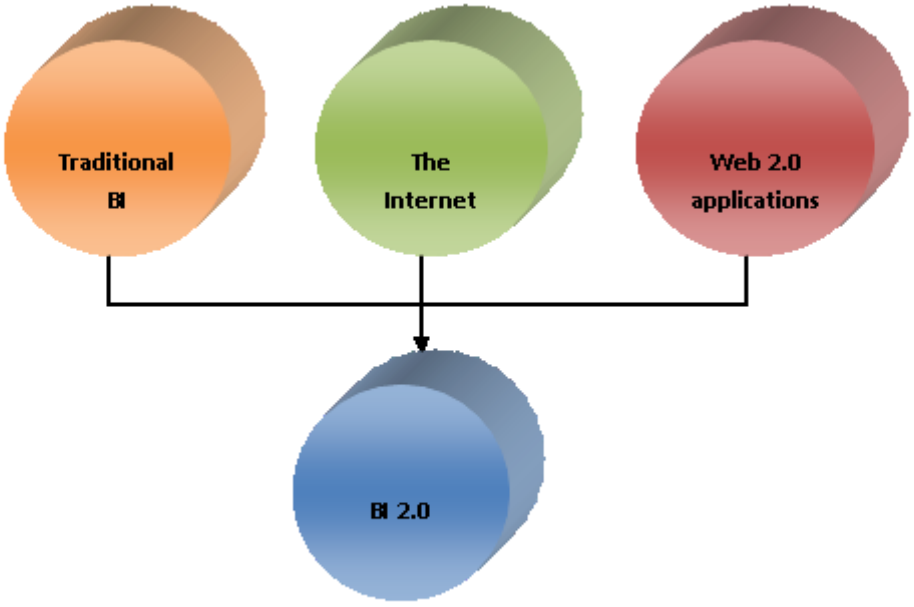

Figure 1: Dimensions of Business Intelligence 2.0

Business practitioners have developed automated tools to support better understanding and processing of information in communities such as social networking sites. In recent years, business intelligence tools have become important for analysis of information on the Web (Lee, 2007). Researchers have also developed advanced analysis and visualization techniques to summarize and present vast amount of information for business purposes. Business intelligence tools enable organizations to understand their internal and external environments through the systematic acquisition, collation, analysis, interpretation, and exploitation of information online.

Business intelligence tools have become more open to the Web (Mendoza, 2012), through which businesses nowadays share information and perform transactions. However, automated search capability in many tools can lead to information overload. Despite recent improvements in analysis capability (Lee et al., 2007), there is still a long way to go to assist qualitative analysis effectively. Most tools that claim to do analysis simply provide different views of collection of information. Due to limited analysis capability, these tools are weak at visually summarizing a large number of documents collected from the Web.

Although search engines may help, their linear list display of numerous results may lead to information overload (Srivastava et al., 2000). Tracking the response pattern on a topic in a newsgroup could be a valuable source of assessing emerging opinions, ideas and views on topical subject matters. Electronic mailing lists are also organized by topics. Usually, each Internet user who subscribes to a list receives every message which is sent to the list by various subscribers.

To give few examples, the continuous flow of information on Facebook provides environment for developers to create their own applications. Real-time decisions and event-processing, relationships and patterns on sites such as Twitter, YouTube, and FlickR help generate a vibe or a sentiment within an organization. LinkedIn can help also in providing answers to certain questions or problems in an organization.

INFORMATION ANALYSIS TOOLS FOR SOCIAL NETWORKING SITES

WEB MINING

Web 2.0 and Web applications continue to grow at an amazing rate as information gateways and as mediums for conducting business. Web mining is the extraction of useful implicit knowledge and information from Web 2.0 applications (Abraham, 2003; Chakrabarti, 2003). Based on several research studies Web mining can be classified into three domains: content, structure and usage mining (Cooley, 2000; Chung et al., 2005).Web servers record data about user interactions whenever requests for resources are received. Analyzing the Web access logs can help understand the user behavior and the web structure (Abraham, 2003). From the business and applications point of view, knowledge obtained from the Web usage patterns could be directly applied to efficiently manage activities related to e-business, e-services, e-education and so on (Kitsuregawa et al., 2002). Accurate Web usage information could help to attract new customers, retain current customers, improve cross marketing/sales, effectiveness of promotional campaigns, tracking leaving customers and find the most effective logical structure for their Web space (Klosala and Blockeel, 2000). User profiles could be built by combining users' navigation paths with other data features (Pazzani and Billsus 1997), such as page viewing time, hyperlink structure, and page content.

Whenever a visitor access the server it leaves the IP, authenticated user ID, time/date, request mode, status, bytes, agent and so on. The available data fields are specified by the HTTP protocol. There are several commercial software tools that could provide Web usage statistics. These statistics could be useful for Web administrators to get a sense of the actual load on the server. For small web servers, the usage statistics provided by conventional Web site trackers may be adequate to analyze the usage pattern and trends. However as the size and complexity of the data increases, the statistics provided by existing Web log file analysis tools may prove inadequate and more intelligent mining techniques will be necessary.

Much work has been performed on extracting various patterns of information from Web logs (Cheung et al., 1997) and the application of the discovered knowledge range from improving the design and structure of a Web site to enabling business organizations to function more efficiently. On popular social networking sites such as Facebook, and MySpace, users are given the impression that they are in control of their own data, but this is not always the case. Facebook provides users with an option of deactivating an account. However, it is not possible to completely erase all personal information from the site (Aspan 2008). While users have privacy settings in which they can specify who may access their personal details, there were instance where this was not the case. For example, it was reported that more than half a million images were leaked from MySpace without any consent from the users. In addition, MySpace still draws concerns about child stalking.

Current information technology tools enable organizations to capture and access large amounts of information in structured and semi-structured data and knowledge bases, causing there to be more information available than humans can process (Chen et al., 1998; Aggarwal et al., 1999). The identification of Web communities is important in the business intelligence analysis process (Pawar and Sharda, 1997). However, the huge size of the Web 2.0 applications has made this a difficult task. It is simply impossible for a person to manually browse the entire Web to identify the Web communities of a firm and the information such communities might contain. Search engines have been helping tools in searching information on the Internet. However, oftentimes a significant portion of the Web pages

returned by search engines are irrelevant or outdated and analysts still have to spend a long time to manually browse the content of each Web page, acquire the overall concept of the set of the search results, and summarize the information. Facing numerous "most relevant" Web pages, the process of identification of Web communities certainly become a time-consuming and mentally exhausting task to complete.

WEB BROWSING AND SEARCH ENGINES

The simplest Internet-based analysis tool may be just a Web browser like the Internet Explorer. Using a manual browsing method, an analyst only needs to enter a firm's competitor's URL in the browser and then manually browse the information for further analysis. This manual browsing method is common to analysts. It is simple as many people are experienced in Internet surfing nowadays. Manual browsing also ensures the quality of the information collected and alleviates the problem of garbage in, garbage out, thus improving the quality of knowledge discovered (Srivastava et al., 2000). However, the process of manual browsing is very time-consuming and mentally exhausting as well. Data collection is the most time-consuming task in typical analysis projects, accounting for more than 30% of the total time spent (Prescott and Smith 1991). It is not practical for analysts to go through the Web sites of all stakeholders of a company in detail.

Many different search engines are available on the Internet. Each has its own characteristics and employs its preferred algorithm in indexing, ranking and visualizing Web documents. For example, Google (www.google.com) and AltaVista (www.altavista.com) allow users to submit queries and present the Web pages in a ranked order, while Yahoo! (www.yahoo.com) groups Web sites into categories, creating a hierarchical directory.

A Web search engine usually consists of the four main components: spiders, indexer, retrieval and ranking, and user interface (Paliouras, 2000; Chau et al., 2001; Abraham, 2003). Spiders are responsible for collecting documents from the Web using different graph search algorithms (Chau et al., 2001). The indexer creates indexes for Web pages and stores the indices into database. The retrieval and ranking module is used for retrieving search results from the database and ranking the search results. The user interface allows users to query the search engine and customize their searches (Chen et al., 1998).

These search engines do not keep their own indexes. When a search request is received, a meta-search engine connects to multiple popular search engines and integrates the results returned by these search engines (Paliouras et al., 2000).

TEXT MINING:

Text mining, also known as text data mining (Han and Kamber, 2001; Abraham, 2003) or knowledge discovery from textual databases (Feldman and Dagan 1995), refers generally to the process of extracting interesting and non-trivial patterns or knowledge from unstructured text documents (Chakrabarti, 2003; Chen and Chau, 2004). Text mining is as well an extension of data mining or knowledge discovery from structured databases (Cooley, 2000). Text mining is a fascinating multidisciplinary field, including the knowledge from information retrieval, textual information analysis, information extraction, and information clustering. Text mining tools help analysts better understand the retrieved Web document set from the Internet, identify interesting Web documents more effectively, and gain a quick overview of the Web documents' contents. This saves the manual browsing time of reading the entire set of Web pages. Analysts only have to examine the categories which are of the firm's own interest.

As information on the Internet is mainly in the form of text, e.g. HTML hypertext documents or PDF documents, text mining and textual information analysis become popular in the literature of Internet-based analysis tools. Textual information analysis is mainly based on natural language processing and has to index the source Web documents for analysis. After the documents are indexed, further analysis like document classification and clustering can be applied. Document classification is one form of data analysis that can be used to categorize the documents into a predetermined set of document classes or concepts. Clustering is the process of grouping the data into classes or clusters so that objects within a cluster have high similarity in comparison to one another (Feldman, R., and Sanger, J. (2007), but are very dissimilar to objects in other clusters. In text mining, the classes or clusters would have category labels defined based on the keywords or phrases that appear in the Web documents collected. The facts that document clustering generates the categories automatically based on the documents make the category labels of clustering more specific, descriptive, and meaningful with respect to the cluster contents.

SUMMARY:
The state of the art of business intelligence is evolving on a rapid pace. The second generation of web development and web design facilitates information sharing, interoperability, user-centered design and collaboration on the World Wide Web. The advent of Web 2.0 led to the development and evolution of Web-based communities, hosted services, and Web applications such as social networking sites. Organizations are turning into making use of such communities in not only achieving business intelligence, but also leverage the level of information extraction and analysis to better decision making and enterprise intelligence. Although the level of competition online is massive, but the number of Web sites full of useful information is even more massive, therefore it is becoming easy for any analyst to browse, index, and mine data and information available online if equipped with the right pro-active analytical tools for such analysis. Web mining, text mining, Web browsers, and search engines are some of the most commonly used tools of Web information analysis mentioned in this paper. However, the advances in communications and technologies will grow rapidly and organizations should be able to grow on the same pace regarding their organizational thinking, their existing level of business intelligence, and the analytical tools they use to extract, and analyze Web information that will better serve them in coping with the next generation of business intelligence, the BI 2.0.

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