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# Business Intelligence 2.0: Are we there yet?

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## Abstract

Business intelligence (BI) has been with us for years now, and, we would argue, not much has changed. Advances in the consumer communications and the entertainment world have dwarfed commercial software applications. Consumers have unprecedented access to information and tools with which to consume information. Social media, mobile access, augmented reality and 3D views of pictures and video have blurred the lines between our private and work personas and have fundamentally changed the way the consumer utilizes information. Conversely, BI has seemed to lack in any real innovation.

In this paper, we will outline what the next chapter of innovation should contain for business intelligence, analytics and data integration. Some hints of these features exist today, while others have lagged behind as the industry has endured a number of mergers and acquisitions. The vendors that have survived the economic and industry turmoil can now turn from treading water to making waves.

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## Introduction

Since the early 1990's, the Internet has shaped our world. Access to information via email, YouTube, Twitter and Facebook keep us entertained and informed. A fundamental shift has occurred in our ability to research, compare, buy and interact with each other and with information, resulting in the elevated expectations of the consumer.

As the web evolved from static pages, to dynamic/ database driven content to online collaboration and web properties as destinations, we have seen the Business Intelligence (BI) vendor community slowly evolve their products to take advantage of this changing landscape. At first, HTML and PDF were utilized as output destinations, and then came portals and alternative devices such as WAP on mobile phones. Unfortunately, the contributions from the software community have simply evolved the way that we use the same information, but have not revolutionized the decision-making paradigm. While many vendors were engaged in survival and/or integrating the latest acquisition, true innovation in business intelligence was kept at bay.

The silver lining appears to be just on the horizon. New products are beginning to emerge and R&D organizations are beginning to be infused with money and excitement. This paper presents our vision of an idealized BI. This is less about what interface engines and portal integrations vendors offer and more about how our expectations are influenced by lessons from the web and rich media. Just as *Star Trek* gave us a vision for transportation, communication and cultural diversity, the world of BI is shaped by the web, social media and entertainment television. Let's see what we can imagine!

### *Traditional BI*

While this is not a primer on business intelligence, it might be helpful to talk about what we mean by BI. Business intelligence is a management strategy used to create a more structured and effective approach to decision making. The cornerstone of this "fact-based" decisioning framework is technology that allows us to access, analyze and present information. BI includes those common elements of reporting, querying, OLAP, dashboards, scorecards and even analytics. The umbrella term "BI" also can refer to the processes of acquiring, cleansing, integrating and storing data. Terms such as master data management (MDM), data quality, data enrichment and, the ever present, data warehouse, data mart and operational data store all fit somewhat neatly into this package we call BI.

There are several types of BI that include strategic, tactical and operational BI that can be differentiated based on the currency and scope of data under scrutiny. Technologies range from relational, star-schemas, in-memory models and MOLAP, ROLAP and Hybrid OLAP.

This focus on technology is part of the problem. Take look at most BI vendor web sites: they describe their technology as the differentiator. The secret sauce that makes them yummier than others is their ability to integrate with other technologies, the way they compress data, and the speed with which their hash algorithms slice through data or their new rich graphics and keeping up with Tufte and Few's mandates for information visualization (Few, 2006). Contrast that with social networking: Nielson Online, which monitors the top social networking sites, reported an 82% growth – Worldwide – in social networking use (<http://money.cnn.com/news/newsfeeds/articles/marketwire/0589146.htm>) and reported the year before that Twitter had grown by 2500%!

Twitter is certainly not alone. Properties like Bebo, Ning, LinkedIn and Facebook dominate the Internet as the “the next wave”. Few users know or care about the web servers they use or the database that captures information. End user adoption did not require a work-breakdown-structure describing the software installation, verification, testing or training plan. Users liked it because it served a purpose, was easy to use and required no formal training. Gartner cites the lack of adoption as one of the most common and visible signs of failure in delivering tangible results for BI initiatives (Gartner Research Note: [http://www.gartner.com/it/content/660400/660408/key\\_issues\\_bi\\_research.pdf](http://www.gartner.com/it/content/660400/660408/key_issues_bi_research.pdf)).

### BI 2.0

While there are precious few references that paint a vision for the future of business intelligence, there have been some authors that describe BI 2.0 using the following terms:

- Proactive alerts and notifications
- Event driven/ real time/ instant access to information
- Advanced analytics
- Enterprise Integration
- Mashups and portal integration
- Mobile/ Ubiquitous access
- Improved visualization, Rich Interfaces (RIA)
- BI as a service (SOA and SaaS)
- In-memory analytics
- and even Open Source BI

Instead of characterizing features that evolve current state, let us take a lesson from *Star Trek* and create the future of BI in our imaginations. We’ll do that by exploring what we can learn from the web, social media and entertainment.

## Outside Looking In

### *The Web*

There is little doubt that the web has evolved. It is not only a marketplace for buyers and sellers, entertainers and voyeurs, educators and students; it is a palette for our creativity and serves as a destination for our lives, our relationships and our minds.

In the true spirit of the Web, let’s take a look at some of its most popular features and see what lessons we can apply to BI. Whether we use Twitter, Facebook or texting (SMS), at the end of the day, this is how many people make decisions. Whether you are searching for nearby restaurants or trying to track down your cousin Sally – there is an app for that! The table below outlines some of the most popular features gather from the Inter-webs and our take on what lessons we can borrow for our vision of BI 2.0.

Web 2.0/ Social Networking Feature	Key Concepts	Lesson for BI
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Web 2.0/ Social Networking Feature	Key Concepts	Lesson for BI
Facebook	Destination web property that allows people to stay connected. What am I doing now? Allows for participation in a continuum of passivity.	Destination naturally forces people to login and participate. Continuous flow of information. Provides environment for developers to create their own applications. Post things of interest (reports, graphics, interpretations) to my personal page (things I have discovered.)
Twitter	Short, concise updates. Information flows continuously and people can pay attention and re-tweet and encode as needed. Twitter users have evolved the platform to make it more usable (e.g., hash tags). Informality leads to quick dissemination.	Real-time, continuous flow of decisions, status about the business, complex event processing. Platform evolves through unplanned usage/ organic evolution of capabilities. Succinct explanation of the state of the business. Search commentary; generate word clouds that provide a visualization of the "vibe" or sentiment of the business. Tags and users comments.  Submit note-worthy information (anything on the web you think is newsworthy) – associate it with data or objects.
Wikis, Google Earth, GeoCommons	Community developed content (Crowd sourcing). Allows for user contributions to create, evolve and innovate.	Collective knowledge is greater than creator. Allow contributors to enrich information. Comment on a concept contained within the context of the application, page, widget or data element – or sentiment that is derived from the content.
YouTube/ Flickr	User contributed media. Does one thing well. New outlet for media; removed barriers to entry for videographers; users determine rankings.	Interesting relationships, patterns, findings published. Ratings of findings help generate a "vibe" or sentiment within an organization.
LinkedIn	Connecting people through linkages. People are just links/ nodes away from each other. Creating professional networks.	"Mechanical Turk" – how to find people or data/ systems that can provide the answer to something in your organization.
Digg, Delicious, Share-this, Add-this	Create links to content of interest. Tell other people what is interesting	Facts can be quickly disseminated throughout an organization. Content

Web 2.0/ Social Networking Feature	Key Concepts	Lesson for BI
	through voting or sharing.	<p>can be rated on quality or utility.</p> <p>Tagging a data element to enrich its content. Digg style adder to digg a graph/ data representation, report, page (number of hits/ views on an object; number of diggs (interest versus activity) (digg, bury, who dugg this, share, bookmark).</p> <p>Bookmark (to my bookmarks, my home page, my department, my metrics).</p> <p>Allow for metrics to be tagged or "watched" so they can see how things change over time</p>
Blogs	Users create content and attract followers. Can be a one-way conversation. Allows for conversation via comments.	Information can be interpreted and informally published to a group of interested parties.
Email/ Xobni	Formal or informal communication. Implicit decision-making cycle or information distribution. Creates linkages between people and their communication with you and others.	Natural way of getting and imparting information. Decisions become searchable. Information can be retrieved quickly. A record is created.
Forums, Discussion Groups, eRooms	Creates a topic/ project based environment for capturing information and decisions. Ability to create synergies across a diverse group of people (geographic, organizational, etc.)	Environment for creating and archiving knowledge. Discuss the meaning of a metric/ problem.
Semantic Web, Search, Word Clouds, Wordles	<p>The meaning (semantics) of information and services on the web can be defined as it is contributed, making it possible for the web to "understand" and satisfy the requests of people and machines to use the web content.</p> <p>Search becomes more usable.</p> <p>Associations between words/ concepts are linked visually.</p>	<p>Allow people to modify the semantic layer over the data, and try to encourage the use of existing semantic terms to avoid fragmentation. Create an intersection of the organizational layer with the semantic – maybe create some word cloud visualizations that show *who* is interested in what terms (re: data) over time. Our internal auto-generated semantic terms should be included, based on structured data elements.</p> <p>The semantic layer is more than just</p>

Web 2.0/ Social Networking Feature	Key Concepts	Lesson for BI
		<p>commentary – it also should support adding context by linking measures and visualizations together – associating them in a 'you may also be interested in' way.</p> <p>Word lookup – define a word, measure, metric, lineage, dataset or concept. Hover over a word and popup menu allows for additional information.</p>
Reddit/ erqqvg	<p><a href="http://erqqvg.com/">http://erqqvg.com/</a> or <a href="http://erqqvg.com/popreddits/">http://erqqvg.com/popreddits/</a></p> <p>Nice visualization of how Reddit's stories change over time, with "yellow-fade" indications when new comments and votes and registered.</p>	Rate the quality of a data element or interpretation (e.g., see what is rising to the top throughout the organization.
Slideshare/ DocsTOC	Upload, link and share your content either publicly or privately.	Slide and documenting sharing with user contributed content (upload supporting docs, reference from web addressable content) –See also YouTube above.
Glue (FireFox Plugin)	Tell me what the crowd thinks. The firefox plugin connects you with friends around things you visit. Show your friends who looked at the same things and tells you what they thought.	What data/ reports/ information people are looking at or interested in. Quickly spreads information throughout the organization. See related metrics/ data displays related events. Show word cloud of comments, tags, diggs by all, by departments and users.
Slashdot	Content web site where content is moved up or down in the web site based on the points scored (visits, ratings). Users are given a number of points of influence to play with and you can moderate things up and down.	Detection of new issues/ themes for decision making.
RSS	Provides for a dynamic feed for content used to publish frequently updated works—such as blog entries, news headlines, audio, and video—in a standardized format.	Commentary should be available as an RSS feed. Reports or data updates could be delivered via RSS feed.

Web 2.0/ Social Networking Feature	Key Concepts	Lesson for BI
DataVerse/ ManyEyes/ Swivel	User contributed data, data visualizations and analysis.  thedata.org; swivel.com; manyeyes.alphaworks.ibm.com	Crowd-source analysis - add supporting materials, point to new dataset or derived works, create a custom graphic/ data representation and add a link to a page or object.

There is little doubt that the web will continue to evolve – even faster than companies will respond to this evolution with products, services and even models for monetizing the advances. The opportunity for those of us that live and work “BI” will continue to grow, as will the opportunities for vendors to take these lessons and apply them judiciously to their product portfolios.

### *Media and Entertainment*

Television and movie directors have long since evaporated disbelief in what is likely with flying cars, “trans-morph-portion”, and three-course meals in a pill. And while they continue to tease our imaginations, Apple has long since transformed the possible into the now. They have shaped the way that we want to engage with computers for over two decades (even before we knew that we wanted to!) As an “i-everything” fan, I’ve enjoyed watching them lead the way in how we interact with devices and information. With “places” and “faces” delivered with every Mac, we’ve seen facial recognition and geo-tagging become real with devices that sell for less than \$500.

Not that Apple is the only innovator in technology, but they seem to do a really good job making it usable. There exist a range of vendors that have nourished our love of mobility, visualization, touch and interaction. With 3D television and touch/ gesture devices on the shelves today, we will no doubt have more lessons in store for us as we think about the art of the possibility with data, visualization, analysis and communication of results.

If we were to make our predictions about the future based on watching *CSI*, *NCIS* and *24*, then we’ll have clarity of purpose and laser sharp background for our every business decision. Here is what we could expect if Cameron, Spielberg and Crichton designed our next generation of BI:

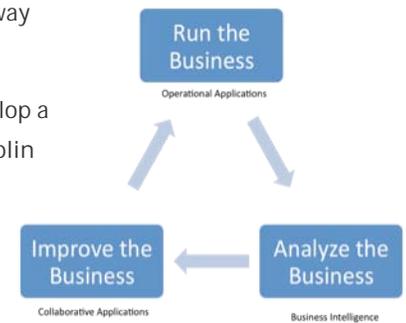
- Data will come at us in every form imaginable. Video, text, email, conversations, photos will dominant our databases in the future. Systems that force us to structure information in rows and columns will be outdated.
- We should be able to integrate data whether or not we have keys or indexes or even if the data exists in a database. There will be no one “enterprise data warehouse” where everything is dumped. Time and information flow too quickly for a refresh.
- Patterns will be plucked quickly from limited data. Images (moving or otherwise) but will accessed, sharpened and shaped from any device in any location.
- Data will come equipped with context and everything (including us) will be geo-tagged.
- Predictive analytics will allow us to arrest people before they commit the crime.
- We will spend more time visualizing and interacting with data, than collecting and beating data into submission.

- Touch screens will be replaced by touch-less gestures, gyroscopes, eyesight and augmented reality! (for example, <http://crackberry.com/and-you-thought-touchscreens-were-cool-enter-touchless>)

## Summary

So what does this mean for us in the world of business intelligence? My belief is that there will be a slow, but responsive shift among people in organizations (and the vendors that support them) to fundamentally change the way that we make decisions – or more accurately, the way that we use computers and software and data to make decisions. **Closed Loop Decision Workflow**

In 2009, Colin White developed a white paper for organizations that wanted to develop a comprehensive, enterprise strategy for business intelligence. (White, 2009) Here, Colin described a model for decision-making he referred to as “closed-loop decision workflow.” Key to that model of decision making are those applications that support the collaborations between individuals to improve the business. This model illustrates the importance of tacit methods of decision making that often involve those methods that exist outside of the formal BI frameworks. This is key to understanding how decisions are made and where collaborative technologies found in social networking sites and business intelligence can fit together.



Source: Colin White 2009 - An Enterprise Framework for Business Intelligence

The state of the art in business intelligence is evolving. In-memory analytics, rich interfaces, visualizations and emerging technologies around the storage and access of information are challenging the status quo. If we were to craft the future of business intelligence, here are a few things that we would want to include in our episode of BI 2.0.

1. Decisions, facts and context will be developed through “crowdsourcing.” No longer will reports (or how data is structured) be left up to the designer, the environment will evolve as users make the data and derived insights work better through contributions of many.
2. Similarly, data and reports will incorporate narrative context information supplied by users. For example, data points and graphs annotated with descriptive insight directly along side the results. This concept of collaborative business intelligence is essential to using BI as a competitive/ strategic tool.
3. Data will have a more direct linkage with action. When you see something wrong, the data will tell you where it is going wrong and why. Exceptions, alerts and notifications will be based on dynamic business rules that learn about your business and what you are interested in.
4. People will be able to directly act on information. Interactions with operational systems, requests for information, comments, “start a discussion”, provide supporting information, “become a follower” of the metric, and “rate or report a problem” will reside alongside the data.
5. Business decisions shall be monitored so that interventions and our hypotheses about business tactics will be tagged in the context of the data that measures its effect. Our ability to test a hypothesis will be integrated into our decision support systems. Say, for example, we see something in the data; we explore it; we understand its root cause; and design an intervention to deal with it. We will be able to tag interventions or events that have happened and have that appear in the context of the reporting of the data so that over time our collective knowledge about the world will be captured along side the data and artifacts.

6. Visualizing data and complex relationships will be easier and more intuitive models of info-graphics will become mainstream. Tools will have the ability to create graphic representations of the data based on what it “sees” and displays the best visual display given what it has. Furthermore, the tools will learn what visualizations work best for you and your environment.
7. The ability to detect complex patterns in data through automated analytic routines or intelligent helper models will be built into analytic applications.
8. Finding information will be easier and search results will provide context so that we know when we have the right results. Users will have the ability to tag specific data elements at various levels (page, widget, some aspect of the data presentation – row, column, cell, line, point) or an abstract interpretation of the results. Anyone looking at the same data will see that context when viewed.
9. Linkages with unstructured contents such as documents, discussions and commentary as well as a knowledge base of previously answered requests will be key to ensuring collective knowledge and collaboration.
10. Technical, process and business event monitoring will allow streamlined operational processes (Business Process Engineering, Business Activity Monitoring, Business Rules Engineering) and learning models will be applied to organizational flow of data.

Our vision is that collaboration should be more than just displaying a chart and a wiki in the same screen – commentary should be tied to relevant dimensions of the information being displayed. Textual insights should go well beyond “word clouds” that shows associations between content.

The BI community has the ability to learn from and harness the incredible expansion of technology in social, media, and the entertainment industry and find ways to integrate those possibilities into our decision-making paradigm. The first step is to imagine something different.

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## Biography:

Greg Nelson, President and CEO

Greg is a certified practitioner with over two decades of broad Business Intelligence and Analytics experience. This has been gained across several life sciences and global healthcare organizations as well as government and academic settings. He has extensive software development life cycle experience and knowledge of clinical informatics and regulatory requirements and has been responsible for the delivery of numerous projects in clinical and business environments. Greg’s passion begins and ends with helping

organizations create *thinking data*® – data which is more predictive, more accessible, more useable and more coherent.

Mr. Nelson holds a B.A. in Psychology and PhD level work in Social Psychology and Quantitative Methods and certifications in project management, six sigma, balanced scorecard and healthcare IT.

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