e-SI whitepaper

# Business Intelligence

by Dick Chase

## Introduction

Business Intelligence (BI) is a confusing buzzword. But, like all popular buzzwords, it is instantly meaningful for most people. The problem is, the meaning can differ, sometimes dramatically, from person to person.

Here we provide a practical, yet comprehensive definition of BI. We also go over the two major approaches to BI: Decision Support (DSS) and Knowledge Management (KM), along with some of the tools used in these disciplines.

Finally we place all this within the context of business and technology today, and point to where we believe Business Intelligence is moving in the future.

# Executive Summary

Business Intelligence is the acquisition, and utilization of fact based knowledge to improve a business's strategic and tactical advantage in the marketplace. *e-SI*™ utilizes the natural interconnected nature of the Internet and World Wide Web to enable business intelligence through the integrated delivery of accepted and tested decision support technologies and the facilitation of conversations through communication technologies. *e-SI*™ recognizes that Business Intelligence is not a technology but a process. As such the process can be aided by technology, but it cannot be replaced by technology. *e-SI*™'s holistic approach to Business Intelligence offers the best products for the right tasks with an integrated delivery that optimizes business intelligence.

From the start of the Industrial Revolution through the 20th century, the story of business success was the story of managing transactions with technology. Factories produced materials faster and more efficiently, assembly lines improved the process even more, and computing technology has allowed us to capture everything we do. Today, any computer can talk to any other computer through wires and TCP/IP to provide human-viewable information, via HTTP and browser technology. At the same time, in the background, software applications can trade information with one another using formatted XML tags to identify what different data elements mean. With such plumbing in place, the only boundaries between humans lay in cultural norms based on historical technical boundaries.

In the 21st century rapid incremental advancement in computing technology is driving a revolutionary change in the way we do business. The revolutionary aspect comes not as much from *how we do things* – using technology to perform critical tasks faster and more reliably – but in *what things we do* – using technology to drive business strategy.

In short, technology has changed the nature of business itself. The story of business success has become the story of managing intelligence.

# What is Business Intelligence

Most of the published literature covering the topic of business intelligence begins with the premise that the reader already understands what BI is. Those writings that do offer a definition, generally provide a narrow one that encompasses only the tool or technology being discussed. While the latter is certainly helpful for placing the ideas presented within a specific context, it makes comparisons difficult especially if the context itself is never clearly defined.

## Beyond the Buzzword

Business Intelligence is the acquisition, and utilization of fact-based knowledge to improve a business's strategic and tactical advantage in the marketplace.

We'll start with a look at the dictionary[1] definitions for both "Business" and "Intelligence":

**busi•ness** —*n.*

1. an occupation, profession, or trade: *His business is poultry farming.*
2. the purchase and sale of goods in an attempt to make a profit.
3. a person, partnership, or corporation engaged in commerce, manufacturing, or a service; profit-seeking enterprise or concern.
4. volume of trade; patronage: *Most of the store's business comes from local families.*
5. a building or site where commercial work is carried on, as a factory, store, or office; place of work: *His business is on the corner of Broadway and Elm Street.*
6. that with which a person is principally and seriously concerned: *Words are a writer's business.*
7. something with which a person is rightfully concerned: *What they are doing is none of my business.*
8. affair; project: *We were exasperated by the whole business.*
9. an assignment or task; chore: *It's your business to wash the dishes now.*

The meanings of *business* are straightforward and generate little, if any, confusion. It is the subject, for which *intelligence* is a modifier. Within the commonly used context of business intelligence, the third meaning above is universally accepted as the primary definition. Some may wish to broaden the definition to include non-monetary considerations (the Red Cross is not "profit-seeking"). In describing business intelligence extending the meaning in this way is fine, as such broadening has negligible affect on the positions presented in this paper, or any other discourse on business intelligence. In fact, for the purposes of this discussion, we use "business" in its broadest sense; as an organized group for which intelligence is important to the collective and individual success of the group.

**in•tel•li•gence** —*n.*

1. capacity for learning, reasoning, understanding, and similar forms of mental activity; aptitude in grasping truths, relationships, facts, meanings, etc.
2. manifestation of a high mental capacity: He writes with intelligence and wit.
3. the faculty of understanding.
4. knowledge of an event, circumstance, etc., received or imparted; news; information.
5. the gathering or distribution of information, esp. secret information.

Intelligence generates diverse responses. Within contemporary literature it is used to mean "things" as in definitions 1 and 4, "properties" as in definitions 2 and 3, and "activities" as in definition 5. This multiplicity of meaning allows the word to be accurately used within a variety of unrelated contexts: Search engines provide intelligence (definition 5), databases provide intelligence (definition 4), e-mail provides intelligence. Indeed it is this very confusion that has promoted "Business Intelligence" popularity. Any vendor can lay claim to promoting business intelligence with utmost sincerity. Two products apposite in function and form, can both honestly say that they are business intelligence tools. The danger comes when arguments are made about a business intelligence tool, or that product A's claim to be a business intelligence tool is false. What all do, and what intelligence is, is manage the flow between data and knowledge.

At e-SI we prefer to take an holistic approach to business intelligence. There is no one technology or tool that does, or even attempts to do everything (though vendor marketing

[1] Dictionary entries from The Infoplease Dictionary. © 1999 The Family Education Network. http://www.infoplease.com/ipd/A0515599.html (October 25, 1999).

statements may conflict with this). Technologies and tools are only of use if they contribute to intelligence. As such, intelligence is inclusive rather than exclusive in terms of technology.

e-SI defines Intelligence as: The acquisition, management and utilization of knowledge. Not a mention of technology anywhere.

## Facts vs. Knowledge

What is knowledge? Defining knowledge has long been the province of philosophy. As such, it is constructive to borrow from philosophy to build a definition within the context of business and the use of technology to help us manage knowledge. The branch of philosophy known as empiricist epistemology identifies a distinction between knowledge by acquaintance and knowledge by description. Knowledge by acquaintance is knowledge developed from direct contact with facts. Knowledge by description, on the other hand, is knowledge for which we have no direct experience. This differs in a significant way from a-priori knowledge in that the knowledge does not just exist, but can be traced back to experience.

In the context of business, consider a transaction with a customer. A customer calls us and tells us that they did not receive the merchandise they ordered from us and adds that they are very angry with us. From this experience we "know" that a customer did not receive some merchandise and that one of our customers is angry. This knowledge adds to our business's intelligence if we are able to act upon it (we can apologize, and find out if we did ship the product, and if so, where it went. We can also begin to infer (though not prove) that customers who do not receive ordered merchandise would be angry with us).

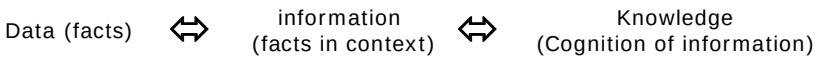
So how does a business capture and disseminate the knowledge obtained from such a transaction? Of course, it is impossible for one person to be involved with every customer contact. We can look through a database of orders, shipments and complaints. We can know that 10% of our customers did not receive ordered merchandise. We can know that they are all angry. We can act upon this knowledge (implement steps to make sure that customers receive the merchandise they order, or at minimum prompt notification of delays with reasons for the delay.

But is experience itself - these facts sitting in databases - knowledge?

There is a fundamental difference between facts or data and knowledge or understanding. Facts are the most granular elements making up intelligence. Without facts, we have no knowledge. In between knowledge and facts is information. Information is facts in context. Understanding facts in context is knowledge. Just as protons and electrons are not atoms and atoms are not molecules, facts are not information and information is not knowledge.

The challenge comes from creating knowledge out of facts, and from creating facts out of knowledge by description. Machines, by their binary nature, handle facts exceptionally well. They do not handle knowledge at all.

If this is the flow:




Then we look for technology that manages data in ways that make the process of organizing the data into information (data in context), and rendering data from information (data extracted from context) better. We also look for technology that enables us to navigate information.

The process cannot be automated with technology, but it can be facilitated. Systems store facts and present information based on these facts. Systems, especially networked systems, are invaluable to humans in managing information. But managing information is not the same as managing knowledge. It's up to us through understanding and through analysis, to create knowledge.

### On Sharing Knowledge

"Knowledge is only a resource with respect to the human resource, not with respect to computer storage and retrieval"

-Michael H. Brackett, "Business Intelligence Value Chain", DM Review March, 1999

For millennia, humans have stored knowledge in the form of stories and shared knowledge through the vehicle of conversation. The only thing that has changed has been the medium through which stories are transmitted and in which conversations take place. Knowledge began being shared through person-to-person or group conversations through spoken language. With the advent of writing, humans could carry on conversations through books. This eliminated the constraints of time and place upon conversation. Remember back in college when the professor asked "and what was Russell's response to Hegel?" Hegel died 40 years before Bertrand Russell was born. But they did have a conversation, and it was carried out in the writings of both philosophers.

OK, so what we're talking about is using technology to store and manipulate data that supports knowledge and facilitating our people's ability to think and converse as much as possible. We are not talking about using technology to manage or manipulate knowledge itself.

## Approaches to Business Intelligence

There are two basic approaches to business intelligence in terms of technology: Decision Support and Knowledge Management. They overlap quite a bit, but are opposites in their approach. Decision Support tries to help people get at, share and understand data. Knowledge Management tries to help people make data out of what they understand so that knowledge may be captured, and to share and propagate that captured knowledge.

In general, DSS is tightly related to specific technologies: data warehousing, OLAP, and Data mining. Knowledge Management is tied more to business practices and process, with technology playing a supporting role in terms of facilitating those processes. Tools and technologies commonly associated with knowledge management include collaborative technologies such as messaging and document management. Both the DSS and KM approaches often make heavy use of the tools "owned" by the other. Knowledge management proponents often claim that decision support is a subset of their province, while DSS proponents often claim the reverse. Recognizing these disciplines as approaches, we at e-SI believe that both are actually sub-sets of the broad topic of business intelligence.

## DSS: Transforming Data into Knowledge

DSS technology serves to turn data into information that people can turn into knowledge into intelligence.

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| Data Warehousing | Dimensional modeling of data with relational technology. Instead of organizing data into tables of columns and rows that relate to other tables through columns, data warehousing organizes data into a single table according to it's dimensionality. Relational technology excels at holding and organizing tremendous amounts of data. |
| OLAP | Specialized structures to enable real-time "speed of thought" interactive analyses. It takes the dimensionally organized data from data warehousing and stores it in its own data structures. The benefit in terms of technology is that OLAP structures are optimized for this type of data organization in ways that are simply not possible with relational technology. The distinctions between data warehousing and OLAP as technologies are slowly disappearing as database management systems become true, well, database management systems, incorporating both relational and multidimensional technology. Arguments between proponents of OLAP and data warehousing are as vacuous as those between DSS and KM. |
| Data Mining | Automating the process of sifting through electronic data to discover non-trivial, non-obvious facts. Face it, when looking through millions or billions of bytes of data, even with the slicing and dicing features of multidimensional databases, you'll never catch all the connections, especially the ones you're not expecting. Computers, however, are excellent at parsing data. Data Mining is probably one of the more accurate and productive terms to come out of information technology. With Data Mining you really are digging through mountains of data to find nuggets of gold. |

## KM: Facilitating Knowledge Sharing

Knowledge Management focuses on sharing knowledge within and without an organization. This includes capturing knowledge, storing it, and propagating it. The common definition of knowledge management within the systems community is "combining business processes with technology to create a collective corporate memory."[2]

This is a restrictive and, in our opinion, dangerous definition. As we stated earlier, technology can be a tremendous aid to Knowledge Management, but combining business process with technology is only part of the story. While DSS originated with technology (the process of letting humans make productive use of data embedded in systems), KM originates from humans, and as such, technology can only play a supportive (though highly valuable) role.

### Technology and KM

Some believe that it is a task of knowledge management to brake down knowledge into explicit facts that can be reliably reconstituted later on. This is because computers have proven incredibly powerful at storing and manipulating information if it has been carved up into small enough pieces. The temptation to use technology for this is very, very strong. It is also very, very wrong. "Unless you can scan a person's mind and store it directly into a database, you cannot put bits into a database and assume that somebody else can get back the experience of the first person."[3]

One primary way this has been attempted is through workflow automation. Automating pre-determined workflow makes a tremendous amount of sense on the assembly line where we wanted people to put the same part in the same bucket each and every time in the most efficient way possible. Automating a pre-configured workflow mechanism to manage organizational knowledge, no matter how well constructed by fabulously brilliant people, is completely wrong-headed and counter-productive. It is the very lack of predetermined structure that makes knowledge sharing constructive. If conversation is restricted to a predetermined pattern, no new stories will ever be created.

Technology can only aid, not automate the distillation of facts from knowledge. Humans are still best at turning facts into knowledge, and we've been doing it well throughout our history in the form of stories. In fact, there's little reason on a practical level to even attempt to replace the innate ability and skill of humans with technology. The most practical and productive application of technology is the automation of redundant tasks and capture, storage and organization of information, things that actually improve on the limitations of human skills.

Technology professionals have had such a difficult time over the years attempting to transform knowledge into data for storage because data is a very poor structure in which to

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[2] Bronwyn Fryer, "Should your company be doing knowledge management?", INC. Technology (Inc. Magazine) #3, 1999

[3] Yogesh Makhotra, Chairman of @Brint institute in Ft. Lauderdale, Fl. As quoted by Carol Hildebrand in "DoesKM=IT?", CIO Enterprise Magazine, September 15, 1999

store knowledge. Stories, on the other hand are an excellent form for storing knowledge for future use and transmission. If we already have and excellent storage form, why are we trying to create a new one?

***Manage as in guide, not manage as in control***

You can't fully manage knowledge with technology. This doesn't mean, however that humans can't use technology as a tool in the management of knowledge (humans actively do the managing, using technology as a tool). Technology can be used quite well to manage the facts from which knowledge can be, well, known, technology can be a significant enabler. It is important to always make the distinction that it is not knowledge itself that is being managed, lest people get the idea that the technology is in any way capable of "doing it for them".

It's dangerous to over-engineer KM by trying to manage it in the restrictive sense. New knowledge is created by putting together existing knowledge in new and unique ways. If we restrict what and how knowledge is shared and use, we restrict our ability to grow.

# Business Intelligence in the Connected Age

The Internet had fundamentally changed the way we view and use technology. HTTP means any machine can potentially access other machine inexpensively and reliable. XML means that any application can potentially meaningfully communicate with any other application. HTML means that any application can potentially communicate with any human being. We can now have conversations without worrying about the channel.

The all encompassing network has an obvious and growing impact on Knowledge Management, which we explore in greater detail in another white paper. For the balance of this discussion, we will focus on how the new network world affects the DSS side of business intelligence.

## Transforming DSS: Silos of Intelligence

A major topic of conversation over the past few years has been over data or application "Silos". As technology advanced a t a rapid clip, with an original focus on capturing and managing transactions, advancement in transactional technology far outpaced advancement in analytical technology. As a result, while the amount of data collected grew, the number of places and ways it was stored also grew. Analytic applications grew around specific pockets of data. These applications were essentially self-contained "Silos" of data. Important and valuable in and of themselves, but nearly impossible to look at as a whole, let alone manage in an efficient manner as the amount of data collected exploded.

It's not the distinction of data; it's the disconnectedness that's the problem. Integrating disparate data sources into a single unit has been a serious and, more often than not, futile task as data grows to almost unmanageable sizes and the sources themselves mutate in unexpected ways to reflect changing reality. At the same time, the whole is greater than the

sum of the parts. A bunch of Silos is not as good as an integrated system where you can get at what you need, when you need it, how you need it.

General data stores – all-encompassing self-contained warehouses or analytic applications – come with their own set of problems in addition to the difficulty of populating them with data. They simply don't work well for specific tasks. It has always (and will always) be the case that the best solutions for specific tasks come when you develop the solution independent of other related tasks. Try as we might, we will never find a single technology that will adequately address all of the issues.

Business Intelligence "Suites", for example, generally perform all things, mediocre. We see this in the new "portal" craze. Viador is a product that handles structured data very well. But it handles everything poorly. Similarly, Notes/Domino handles unstructured data very well, but handles "everything" poorly. Most specific applications handle specific tasks much better than applications designed to handle many tasks.

## Silos allow us to specialize

We do, however, have approaches and technology that do certain tasks of BI quite well. Ignoring for a moment the disconnected nature of silos, we see that silos are not a problem, but a benefit. Small specialized components work best. This has pretty much been the trend since Oog first used a rock to kill a mammoth (when Oog became the mammoth killing expert, leaving others the opportunity to become the mammoth cooking expert or mammoth eating expert).

The commoditization of applications also makes silos a good thing in terms of economic efficiency (I can make a better cheaper product if I can focus on what I do well). Just as specialization in manufacturing within the context of a managed factory fueled the industrial revolution, specialization in analysis within the context of a managed business intelligence framework fuels the information revolution.

Today it's common sense that in the manufacture of complex goods, individuals performing unique specialized tasks managed in an efficient manner (whether they are in the same location, or connected by efficient transportation channels) is much more productive that individuals performing all the tasks involved in the creation of the end product. The same is equally true in information technology.

The problem isn't one of data being organized in silos, but one of an inability to manage the silos.

So what if Silos can be connected?

### Internet allows for integration of silos

In the standards based world of the Internet, we have the opportunity for the first time to enable fast low cost communication of infinitely rich data. The widespread acceptance and use of three technology standards in particular allow for this:

- TCP/IP: Unlimited network – can get anything anywhere
- HTML: content rich documents of data structured so that people can talk to each other.
- XML: content rich documents of data structured so that applications can talk to each other and people can interact with the data. Allows for genuine practical integration in the classic sense: programs of different backgrounds to create a new whole.

The last item, XML, provides the final catalyst for a business intelligence revolution. While it is a technology standard developed by engineers, its power lay in its use by humans. "The chief skills for the use of XML will prove to be those of the business analyst, defining data and naming parts, rather than those of the programmer."[4] XML allows applications to share information based on business terms.

These technologies mean that Silos actually become a Good Thing. While in the mainframe and client/server worlds silos were definitely very bad things, the disdain for silos becomes moot in the context of the Internet. Instead of looking at directories of documents or databases of data as disparate random elements, they can realistically become parts of a greater whole while we still use the right tools for the right task. Instead of focusing on integration of back-end systems, we can focus on integration of delivery: that critical point in the business intelligence path where information gets transformed into knowledge.

Information can serve as topics of conversation that happen within an organization to be shared, combined, or separated as required by the people having the conversation. As silos, we can continue to focus on making applications the best they can be, in the proven manner that we know best. We can simultaneously be both the blind man, understanding a part of the elephant and the Prince – understanding the elephant as a whole. To misappropriate the words of John Donne: No application is an island unto itself.

At e-SI we are designing solutions using Java and XML in which all communication is performed with XML. As such, all information is available in documented form. The only step in enabling use is enabling access. Indeed using XML and Java, the systems are designed in such a way that modifications to the functionality of the system itself is possible by modifying the content of XML documents rather than programming code.

[4] Simon Phipps, Chief XML and Java Evangalist, "Meaning, not Markup", IBM, December 1999. http://www-4.ibm.com/software/developer/library/meaning.html

## Conclusion

Business intelligence is not about technology, but about people. The interconnectedness of the Internet and its related technologies offer people unprecedented opportunity to manage information in a way that maximizes intelligence for business. This is accomplished not by creating monolithic stores of data and calling it knowledge, but through a holistic approach of utilizing best products and best practices for information tasks, and giving people the power to make the connections they need to create knowledge.

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