

Business Intelligence: Overview and Case Reports

Professional MBA Program
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Paul Hippenmeyer
Rick Morgan
Dave Ouellette

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Executive Summary

Business Intelligence (BI) is a vital subject that covers a vast area of interest for today's businessman. BI consists of both internal and external categories that deal with the ability of a company to determine what its competitors are doing as well as understanding what forces may be at work against them. Finally, how does your business incorporate the data that it collects into useful information yielding a competitive advantage? The field of BI is frequently murky and can easily cross the confused boundaries of business ethics as well as federal law. Using current academic literature, case studies and an interview with a BI provider, we have outlined the key aspects of BI that your business needs to understand in today's competitive environment.

What we term "Internal" Business Intelligence covers the ability of a company to keep information from its competitors so that they may not gain a competitive advantage from their espionage activities. Theft can take the form of **Industrial Espionage (IE)**, as defined by the Economic Espionage Act of 1996 (EEA), where trade secrets are stolen by a foreign governments or agents against domestic businesses. The U.S. government has stated that five countries are particularly involved in IE, these being France, China, Taiwan, Japan and Israel.

Business Espionage, on the other hand, is defined by the Central Intelligence Agency (CIA) as involving the theft of trade secrets by competitors, either foreign or domestic. This may include cases where former workers for a company take the protected trade secrets with them when they take on a new and competitive job elsewhere and use them against a previous employer.

The protection of Trade Secrets has been codified by the U.S. federal government since the EEA of 1996 where companies are provide limited legal protection assuming:

- The company identifies its trade secrets.
- Takes reasonable measures to protect these secrets.
- Educates its employees on their responsibilities to protect trade secrets
- Establishes, and enforces, in-house policies to protect its trade secrets.

"External" Business Intelligence involves your company's attempts to gain information about a competitor to gain an advantage. Based again on a CIA definition, this is called **Corporate Espionage (CE)**. Although the term may not seem legal, there are many perfectly ethical methods to conduct CE.

Trade publications, trade shows, conferences and the internet are all widely accepted legal methods of conducting CE. On the other hand there are plenty of cases where ethical lines were crossed and, in some cases, where the federal government has become involved.

The full weight of governmental involvement may include sanctions, fines and penalties as the Department of Justice sees fit. In extreme cases it could lead to the loss of billions of dollars of money as well as an incalculable loss of prestige or respect through exposure in the media.

Perhaps BI's greatest weakness is that its Return on Investment (ROI) is frequently hard to quantify. Very few companies are able to say exactly how much value BI brings yet the potential losses arising from the inability to keep trade secrets can carry a devastating impact. On the flip side, making the most of your collected information, if handled properly, can affect the bottom line.

Information technology has contributed greatly to the acquisition, processing and melding of internal and external data. What was once a cottage industry is growing rapidly and promises sophisticated solutions that your company can use to make best use of the vast amount of data that your business acquires. The software business alone is approximately \$2 billion dollars per year. Leaders in the field include Hyperion, Cognos, the SAS Institute and Business Objects.

Best Practices for BI include employee education as to both ethical and unethical methods used by competitors and foreign entities to mine data. Organizations that deal with governmental secrets hold another level of responsibility to keep these areas secure from outward attack.

Externally companies should aggressively seek competitive information that is available in the public domain and maintain high ethical standards to help ensure that they stay out of trouble with the law. Last of all, technology should be used as an enabler not as an end-all. In establishing BI initiatives, start small, align with a measurable business outcome, enable change management and let an experienced provider help with the extraction, transformation and loading of data into appropriate data warehouses.

As stated before, BI is a vast subject that covers a lot of areas. Many parts of BI are confusing and companies can find themselves in legally and ethically gray areas very easily. These areas need to be understood through aggressive internal and external Business Intelligence programs in order to succeed.

Introduction

What is Business Intelligence (BI)? This is the main question that comes to mind when discussing this complex subject. According to Hannula et al, it is the *Systematic* business information *acquisition* and *analysis*. In addition, it is also called Competitive Intelligence, Corporate Intelligence, Market Intelligence, Market Research, Data Warehousing, and Knowledge Management. As you can tell it is a very broad subject with many definitions.

BI has been around for a long time. As illustrated in the class presentation, BI is nothing more than the gathering of information to give your business an advantage over your competitors, whether it concerns rugs and carpets or the building of combat aircraft.

The purpose of this paper is to explore every facet of Business Intelligence, including internal and external BI and the tangible/intangible aspects leading to a competitive advantage. Internal BI refers to the protection and utilization of internal data and external BI refers to the gathering of data and information about the competition.



Figure 1. Business Intelligence Model.

Internal Business Intelligence and Espionage

To paraphrase an interpretation of Sun Tzu's "The Art of War"; it will not do for a corporation to act without knowing the competition's strategy, and to know the competition's strategy is impossible without espionage. Sun Tzu created his strategy and philosophy over 2000 years ago and the Japanese still apply it today for business and politics. It is very important to understand the classifications of espionage and how a business can protect its physical and intellectual assets from competitors.

According to CIA there are three types of Espionage when dealing with trade secrets, businesses intelligence and competitive advantage:

- **Industrial Espionage** – Foreign government vs. Domestic Business.
- **Business Espionage** – Foreign or Domestic Business vs. Domestic Business.
- **Corporate Espionage** – Legal and ethical intelligence gathering by Domestic Businesses, for a competitive advantage.

The FBI, on the other hand defines the theft of trade secrets using the definitions in the Economic Espionage Act of 1996 - **Economic Espionage** includes both:

- **Industrial Espionage:**
 - Section 1831 - the theft of trade secrets by a *foreign instrumentality*
 - any agency, bureau, ministry, component, institution, association, or any legal, commercial, or business organization, corporation, firm, or entity that is substantially owned, controlled, sponsored, commanded, managed, or dominated by a foreign government;
 - and/or a *foreign agent*
 - any officer, employee, proxy, servant, delegate, or representative of a foreign government.
- **Business Espionage:**
 - Section 1832 – the theft of domestic trade secrets by a foreign or domestic business.

In addition, according to the Economic Espionage Act of 1996 the term *trade secret* means all forms and types of financial business, scientific, technical, economic, or engineering information, including patterns, plans, compilations, program devices, formulas, designs, prototypes, methods, techniques, processes, procedures, programs, or codes, whether tangible or intangible, and whether or how stored, compiled, or memorialized physically, electronically, graphically, photographically, or in writing *if*

- the owner thereof has taken reasonable measures to keep such information secret; and

- the information derives independent economic value, actual or potential, from not being generally known to and not being readily ascertainable through proper means by, the public.

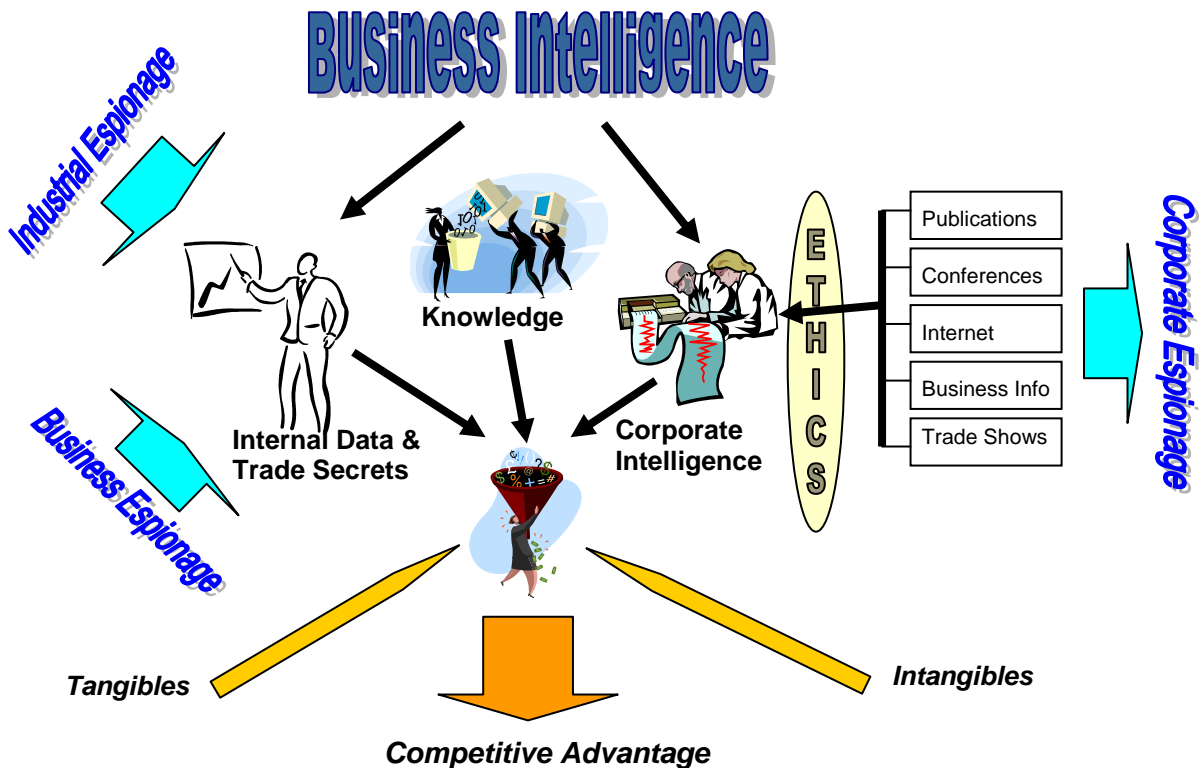


Figure 2. Sources of Business Intelligence.

Industrial Espionage

As stated in the definition, Industrial Espionage is the theft of trade secrets by a foreign instrumentality and/or a foreign agent. The main countries that are actively engaged in Industrial Espionage are:

- France
- China
- Taiwan
- Japan
- Israel

An example of Industrial Espionage was the French Government, in conjunction with Air France, planting electronic listening devices in the seats in first class. The purpose of these devices was to monitor conversation between first class customers discussing business topics. It is unknown as to the amount of information that was lost during these flights. Based on an ASIS survey of Fortune 1,000 companies 20% of all

trade secret thefts are conducted by foreign governments, or agents working for these entities and foreign and domestic competitors.

Business Espionage

Besides foreign governments, foreign and domestic companies are responsible for the theft of trade secrets from domestic companies. Some of the case studies that are examples of this type of espionage include:

- Retired Kodak employees forming a consulting business passing along Kodak internal information.
- Taiwanese Business receiving insider information on creation of labels from an employee of Avery Dennison.
- A Lockheed Martin employee hired by Boeing bringing along trade secrets.

Protection of these trade secrets should be the most important aspect of domestic business operation. However, because ours is an open culture environment most businesses tend to pass around the trade secrets internally which helps to create new ones. The question arises that if 20% of all trade secret thefts are conducted by foreign governments or businesses, which makes up the remaining 80%. The same study shows that 30% are employees (e.g., Avery Dennison), 28% are former employees (e.g., Kodak and Lockheed Martin/Boeing), and the remaining 22% are vendors, contract employees, OEM employees, and consultants. These people are outsiders that have insider's access and privileges. It is easy to see that the majority of the trade secret thefts come from inside the business. Steven Fink, in his book *Sticky Fingers* (2002), dedicates an entire chapter on the protection of these trade secrets. I will paraphrase some of the more important concepts.

With the advent of the Economic Espionage Act (EEA) of 1996 the onus was placed on companies to protect their trade secrets. The first steps a company should take to protect trade secrets should be:

- Identify the trade secrets
- Take reasonable measures to protect those trade secrets
- Educate employees about how to protect trade secrets
- Establish policies to make sure the businesses are not stealing trade secrets from other companies.

Once the trade secrets have been identified, protected compliance programs need to be set up to discourage theft in general. All these procedures are required for the companies to be protected by the EEA. Trade secrets have a life of their own. Depending on the industry and the volatility of competitive advantage a trade secret may only be useful for a few months or many years.

In Fink's book there is a comprehensive list of what constitutes trade secrets covering technical, production and process, vendor/supplier, quality control, sales and

marketing, internal financial and internal administrative information. Once the list has been compiled and the trade secrets have been classified, the risk of loss should be assessed. Based on this risk assessment the level of protection is identified. In addition, a list of who has access to the trade secrets should be compiled. The level of risk for each trade secret on your list is identified based on the following six criteria:

1. The extent to which the information is commonly known outside of the company.
2. The extent to which the information is commonly known inside the company.
3. The value of the information itself, both to the company and to the company's competitors.
4. The measures taken by the company to protect the trade secret.
5. The company's time, effort, and expenditure of resources to create the trade secret in the first place and
6. The ease or difficulty others would have in uncovering the trade secret, acquiring it, or developing it in a parallel process.

Once the level of risk is identified the value of the trade secret should be identified. There are three basic and accepted ways to place a value on trade secrets: the market approach (comparable value to something in the market place), the cost approach (cost of replacement) and the income approach (anticipated revenues and future economic benefits).

The security of the trade secrets takes many forms. The purpose of the security is to reduce the risk of theft. The following list is some suggestion as to level and purpose of the security.

- Education of employees in all aspects of trade secrets
 - What they are
 - Periodic reminders
 - Importance of
 - Proper handling
 - Criminal penalties
- Marking of confidential and proprietary information
- Confidentiality agreements signed by all employees and third parties.
- Non-compete agreements
- Nondisclosure agreements
- Oversight policies and procedures
- Testimony review
- Controls
- Background checks
- ID badges

Even with all these checks and balances no trade secret is entirely safe. In the Avery Dennison case study, even though the company did all that they could to protect

the trade secrets; an employee stole information over an eight year period and passed it to a competitor in Taiwan. The trade secrets, consisting of millions in dollars of R&D, were stolen over the eight year period of thefts. Since the employee only received \$160,000 for all the secrets stolen, money did not seem to be the motivator for this theft. A strong defense seems to be the best security for trade secrets.

External Business Intelligence

External BI is the legal and ethical collection of data and information. A company, to maintain or gain a competitive advantage, must collect this external information and data. Based on the CIA definition this is called Corporate Espionage (CE).

Businesses have a variety of ways to gather intelligence from their competitors with the great majority of these methods being both potentially valuable and legitimate (legal).

Corporate Espionage

While at first blush CE may give the appearance of something unethical, in reality there are a number of ways for companies to carry out CE that are well within the established bounds of proprietary. Many of these are actually simple methods that may prove very lucrative when properly utilized. CE is generally conducted by the employee. These are employees who gather the competitor's information as part of their normal employment process. This information can be collected in the following ways:

- Publications
- Conferences
- Internet
- Business Information
- Trade Shows

Publications

Practically every business has some sort of trade publication or periodical that can prove a wealth of information on what a competitor is doing. Information can frequently be found in editorials, articles and even advertisements. Examples of business journals are numerous. In the aviation industry they include such industry standards as "Aviation Week & Space Technology" a 50+ year old weekly that has been also known for years as "Aviation Leak" due to its staff's ability to find and publish otherwise sensitive information in a public forum. During the 1970s it was reputed that fifty copies were delivered to the Soviet airline terminal in New York City on the night of issue and that they were translated enroute to Moscow. That's the kind of impact this magazine has in the industry.

“Av Week” frequently gives first notice of new cutting-edge aviation technology or of mergers and other business news in the field of flight. It remains a critical reference for anyone involved in both military and commercial aviation, whether involved in operations or manufacturing.

Within the specialized military field of Electronic Warfare (EW) the magazine “Journal of Electronic Defense” is another highly thought of reference. “JED” is produced for AOC, an EW professional organization that originally was named the Association of Old Crows, the crow being a long standing symbol of those in the field.

Once again, JED allows companies to show off what they want others to see as most articles are written by organizations with a specific public release goal in mind. Articles of this nature prove that one needs to know the source of the article and take claims and comments with the proverbial “grain of salt” before drawing conclusions.

Conferences and Trade Shows

Conferences provide a superb opportunity to see what a competitor is officially advertising as well as to gain intelligence in a less-than-formal atmosphere. Many professional trade organizations organize annual meetings where companies are encouraged to set up booths to show their peers and fellow companies what they have to offer.

These events are usually scheduled in exotic locations, such as Miami or Las Vegas (not many seem to end up in say, Bismarck, North Dakota) that will hopefully bring in crowds of people who also see the event as a way to get out of the office for three or so days. Business conferences also allow opportunities to meet others in the same field and network, that urbane social skill from which a savvy intelligence gatherer can potentially garner a bounty of information.

Again drawing upon the relatively closed business of electronic warfare, the AOC holds one major convention a year, almost always near a major military facility. For instance the 2003 event was at Dayton, Ohio to celebrate the bi-centennial of the Wright Brothers’ first flight. 2004’s was in San Diego, a city known for its large Navy influence.

This year’s AOC Convention featured displays by over 100 companies that deal with the EW field and ran the gamut from industry giants Lockheed-Martin, Northrop-Grumman and Boeing all the way to the other end of the spectrum with small suppliers and niche players. The three-day even also featured professional speakers and plenty of opportunities to talk to competitors in a predominantly casual environment.

Use of the Internet for gathering Business Information

The rise of the Internet and the associated Wide World Web (WWW) has opened vast new possibilities as well as areas of concern, in the area of business intelligence. The Internet provides a vast and typically unmoderated avenue of gaining information on

a company's competitors. "Data Mining", as it now generally called, can provide more information in a short period of time than was even remotely possible even twenty years ago. Like any other business tool, however, it needs to be used properly to be of any real use.

There are several good reasons to use the Internet for data mining.

1. It is probably the SAFEST method of gaining data on a competitor. Assuming your searching is carried out on public web sites a company can gather reams of material perfectly legally from what is regarded as public domain.
2. Most internet mining is CHEAP in that it does not take a vast amount of capital to conduct such work, even if you outsource the information gathering to a second party.
3. Such work can also be an ANONOMOUS method of looking at your competitor, assuming you've taken the proper steps to hide your tracks through the use of non-traceable search methods.
4. Above all, use of the Internet is EFFICIENT, or at least it appears to be. The fact you can gather a large amount of data quickly would seem to be a tremendously efficient method of information gathering, yet perhaps the real question should be "IS IT?"

Internet Data Mining

Like any other method of gathering intelligence the Internet has its own faults and caution areas. One of the biggest things to consider is that your competitor will only place what he wants you to know on his web site. Say you are trying to determine what the capability of another company's new product is and how it would compare to what you are developing. The prudent intelligence gatherer will quickly realize that he is seeing only the good points of the other program and none of the 'warts' or problem areas. While what is provided is probably of some value, it needs to be taken with the proverbial grain of salt and not totally at face value, since some of the material provided may, in fact, be a conscious attempt to plant misinformation.

Another problem area arises in that the use of the Internet is so easy and seemingly efficient that it can encourage a "path of least resistance" mentality where your intelligence gathering efforts may be unwisely spent in this area. In a similar vein the vast amounts of information gathered may well develop into a sorting and storing dilemma- as said by Myburgh (2004), "Too often, too much time is spent on collection or research, leaving inadequate time for analysis"

At the risk of using a military intelligence analogy once too often, using the Internet for BI while ignoring or downplaying harder, less easily defined methods of data gathering is similar to the government (and military) relying on technical intelligence,

such as satellites and wiretaps over Human Intelligence, or HUMINT. While the technical side is absolutely invaluable for information the human side is an absolute requirement to provide proper context and analysis to the material provided by scientific means.

Case Studies: BI and Ethics

So far we have dealt with Business Intelligence with an assumption that the company will be carrying out BI from both ethical and legal standpoints. Needless to say, that's not always the case and it is not always apparent where the ethically gray area starts and the illegal takes over.

Fleischer et al. (2003) states that there are five areas where BI can fall, at least in terms of how an organization conducts BI on a personal level. These areas can help address what exactly is legal and what is not.

1. The first of these is LEGITIMATE means. They can include applying for formal talks or a visit where the 'target' company is made fully aware of who you are and what you seek. Needless to say you may not even get a foot in the door- but no one will ever argue with the legitimacy of this method.

The following four areas are clearly considered to be unethical and, in some cases, illegal:

2. The second area is MISREPRESENTATION, which is where you do not tell the other company who you are and/or actively try to deceive them as to your true intentions. This may also include using a "Trojan Horse" scam where you enter with a company by legitimate means and then use this opening to obtain information that you are not allowed to have.
3. IMPROPER INFLUENCE can include threats of a financial nature as well as almost any other type of collusion. Blackmail of personnel or even improper use of "insider" information to gain a competitive advantage may also fall under this category.
4. The use of IMPROPER MEANS may include outright theft or the illegal purchase of material that you would otherwise be unable to obtain. This can range from a classic "black bag job" breaking and entering theft to computer hacking. It is all considered illegal.
5. UNSOLICITED material can provide a company with a serious dilemma in that they may be offered insider information that they would not have otherwise tried to obtain. Even if it's "offered on a silver platter" this is still considered unethical, as the following case study will illustrate.

Boeing and Lockheed: Beware of Gifts

On 25 June 2003 the U.S. Department of Justice (DOJ) issued a press release stating that two former Boeing managers were being charged with federal felony counts for their involvement in a plot to steal corporate secrets from the Lockheed-Martin Company.

About a year earlier, two Boeing officials had hired an individual for the company's space systems division. This individual had formally worked for Lockheed-Martin, which is Boeing's primary competitor for governmental space program contracts.

The new hire had been privy to a number of Lockheed's proprietary secrets and had brought along documentation on these programs to his new company. As explained in the federal case, these Lockheed papers met all of the requirements of trade secrets and were therefore illegally obtained by Boeing, even though they were unsolicited by the company.

Boeing was charged under the Uniform Trade Secrets Act of 1985 (UTSA) as well as the EEA of 1996. As reported in the 25 July 2003 edition of the *Washington Post*, the DOJ determined that Lockheed's trade secrets had been illegally obtained and, with the agreement of the Department of Defense (DOD), had been used to unethically impact competitive bidding process for specific space programs within the DOD.

The net result was that the DOD stripped Boeing of seven missile launches in favor of Lockheed-Martin with monetary losses of approximately \$1B in immediate contracts. Boeing was also suspended from bidding on any new contracts until allowed by the DOD. This suspension lasted until mid-2004, which made this penalty a very severe one for Boeing indeed.

Air France Knows more than you Think

There's often a fine line drawn between business intelligence and governmental espionage. One of the more illuminating cases in the recent past involved the accusations made against the leading French airline Air France. In the 1990s it was leaked to the press that the carrier had microphones installed in some, if not all, of their First Class and Business section seats on trans-Atlantic flights.

The implication, of course, was that the airline was probably recording the conversations of selected "high-interest" passengers on their flights. What the *airline* would want with the discussions of some of their customers was never really clear although there were immediate questions asked about possible complicity by the French Government itself.

Perhaps not surprisingly, no admission of guilt, or apology, ever came from the airline or French Government. What is learned from this case is the apparent lengths some countries, or companies, will go in the name of business intelligence.¹

The Sidewinder Missile Reverse Engineered

The area of military sales can easily cross the vast gray area of intelligence to espionage. One such case involves the *Sidewinder* air-to-air guided missile.

The *Sidewinder*, which carries the U.S. military designation AIM-9, was developed by the U.S. Navy after World War II as a weapon for the new generation of jet aircraft. The missile utilized a simple guidance principle where it would home in on the heat generated by an opposing aircraft's engine before exploding. The missile's early version saw first combat in 1958 and it has since been used world wide, becoming the most successful air-to-air guided missile in aviation history with literally hundreds of aircraft shot down.

Through the years the Sidewinder has been sequentially improved in capability by Ford-Philco and later Raytheon and has been widely exported to U.S. allies through a variety of governmentally sanctioned programs. One of these countries was Israel, who received its first *Sidewinders* during the late 1970s.

Although the Israelis had developed their own heat-seeking missile, they realized that the American *Sidewinder* was a vastly superior weapon. As later reported in the open press by "Aviation Week & Space Technology", the Israelis apparently used the U.S. weapons to improve their own missiles, which were introduced as the *Python III* during the late 1980s. What makes this story even more curious is that in 2001, when a Chinese F-8 "Finback" fighter aircraft collided with a U.S. Navy EP-3E reconnaissance aircraft the photos of the Chinese aircraft showed that they were carrying the Israeli *Python III* missile- something that the Israeli government officially denied it had ever exported. The lesson here is that in spite of attempts by companies, and even governments, to limit technology export they never really know where their best work will end up.

AFMSS: Lesson Learned

Having been bitten by reverse engineering of its missile, the US refused when Israel wanted to purchase a *single* Air Force Mission Support System (AFMSS) in conjunction with their F15I aircraft acquisition. The US Government stated that Israel could purchase 20 systems or none at all. Israel wanted to reverse engineer the AFMSS system and the US was not going to allow this to happen again.

¹ It would certainly be naïve to assume that Air France was alone in conducting business intelligence in flight. During the 1940s and 1950s Juan Trippe's globe girdling Pan American airlines was accused of the same kind of behavior, the assumption being made by many that it was the full knowledge of the US government.

What to do with it all? Knowledge and Data Management

Besides your own trade secrets and intellectual property, think about all the data and information your company possesses regarding your customers, your suppliers, your manufacturing processes, your distribution channels, your advertising and marketing channels. Moreover, think about all the knowledge you employees carry around with them; their contacts, clients and networks. All this gathered data and knowledge is not useful until it is manipulated to produce information. Knowledge is the aggregate of data that the employees have gained over their lifetimes. The common term for the capturing and archiving of employee knowledge and experience is Knowledge Management. Knowledge Management could be the subject for another paper; however, it is also used in conjunction with BI to generate the information necessary to create the competitive advantage. Combining all the data that is gained through Corporate Espionage, archiving of employee knowledge, internal data and trade secrets and turning it into useful information is the IT intensive aspect of BI. Sophisticated BI applications have been developed to allow you company to exploit this information to your best advantage.

The rest of the paper will examine the tangibles and intangibles of return on investment and cost savings. The financial return of Business Intelligence, like many other esoteric business functions, is hard to assign a real dollar value. Is productivity better? How much have we gained on the competition? Is our market share improving? These are just some of the questions that need to be answered.

The Evolution of Business Intelligence

BI has been practiced in one manifestation or another for many years as companies try to keep tabs on their competition, enter new markets, merge with or acquire new companies, develop new products, acquire new customers, etc. In the 1990s, information technologies (IT) evolved to enable resource wide applications such as **Customer Relationship Management (CRM)**, **Enterprise Resource Programs (ERP)** and **Supply Chain Management (SCM)** that help streamline many large and medium sized businesses to make them competitive. In addition, in the late 1990s, IT enabled the process of data warehousing, especially for transaction-intensive industries such as financial, retail and telecommunications (Williams and Williams, 2003). As a result, there are vast amounts of information stored in company computers about all aspects of the business.

Externally, the Internet has made available a huge amount of secondary information as well as rapid acquisition of company-specific information such as 10K filings residing government web sites. With some of the resource-wide applications becoming more common place, and not yielding further competitive advantage, companies are looking to BI applications and practices to tap the huge amount of internal and external information available, basically combining various enterprise wide

applications... In fact, one could argue that the enterprise-wide applications are becoming “non-core” and that BI applications are becoming a strategic asset.

BI-related software and applications have been called **Decision Support Systems (DSS)** or **Executive Information Systems (EIS)** over the years (Philipson, 2003). The vendors in the market tended to be niche players. More recently, there has been consolidation in the field such that larger BI vendors are starting to dominate. These include Cognos, SAS Institute, Business Objects and Hyperion. In addition, large established software/application companies such as Microsoft, SAP and Oracle may be developing more of a presence in the field (Philipson, *ibid*). BI software currently accounts for revenues of about \$2 billion a year and is predicted to grow at 8.5 % over the next three years (Forrester Research as quoted in *The Economist*, 2004). On the technical side, the applications are advancing in three areas (“A Golden Vein” *The Economist*, June 2004):

- The first is “real time” data mining which might enable re-pricing of items “on the fly”.
- The second is the ability to perform “predictive analytics” which is using historical data to predict future trends.
- Lastly, there are applications to analyze unstructured data such as information on the Web.

Advances on all these fronts are necessary to productively capture the correct information, process it in the context of a specific business objective and use it to a strategic advantage.

For the purposes of this report, we define BI as an umbrella term that encompasses the acquisition, processing and analysis of both internal and external data. As shown in Figure 1, when BI processes are externally focused, the term competitive intelligence is generally used. When BI processes are focused internally, they usually take the terms data mining, data warehousing or knowledge management. Ideally, a businesses BI focus should include both arms resulting in stronger analytics leading to a strategic advantage.

Is it Really Worth It? Measuring Financial Impact

Given the huge amount of data that is collected by companies and the information in the public domain, conventional wisdom suggests that the company that can extract, analyze and capitalize on the information will have a strategic advantage. As with any business initiative, management needs to know whether the cost of the effort was worth the benefit. That is, was there a tangible business advantage? Interestingly, the business community has had a difficult time determining the value of BI efforts. There are several reasons for this. The first is that, often, the executives initiate a BI effort without first calculating a projected return on investment (ROI). According to Eckerson (2003), in a 2001 The Data Warehousing Institute (TDWI) conference survey, “only 13% of all respondents had calculated the ROI of their BI projects, and only 37% were planning to

do so”. Why is this? When the 510 respondents who rated the value of BI projects as “high” or “very high” were asked what the benefits were, only two of the top 6 benefits were hard, tangible benefits (time savings, cost savings) compared to intangible benefits (single version of the “truth”, better strategy and plans, better tactics and decisions, and more efficient processes). The results of the survey are shown in Figure 3.

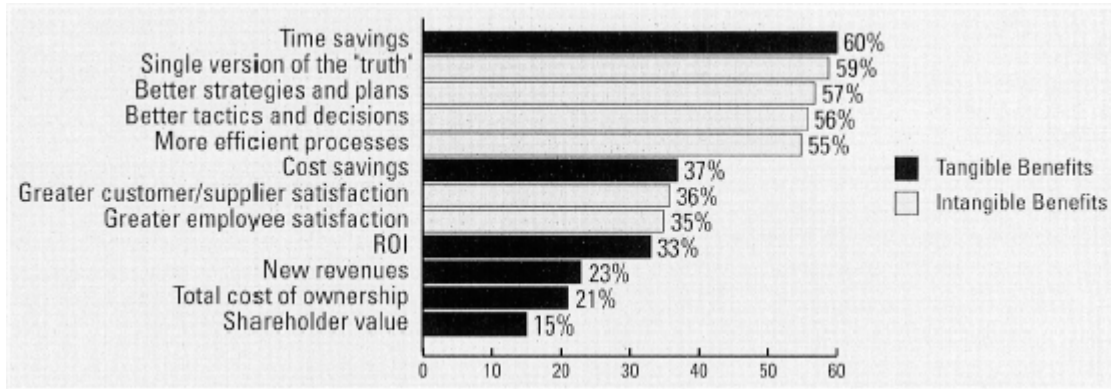


Figure 3. Benefits of Business Intelligence.

In another survey, the 50 top Finnish companies were polled regarding their BI practices. Here, the greatest benefits were; better quality of information, better observation of threats and opportunities, growth of the knowledge base, increased sharing of information and improved efficiency. In contrast to the previous study, cost savings and time savings were lowest on the list of benefits (Hannula et al., 2003). Therefore, it is not surprising that a ROI is difficult to determine when the perceived benefits are rather “soft”. Consistent with the above results, a Forrester research study found that “only 16 of 50 companies calculated an ROI before building a data warehouse” (referenced in Watson et al., 2004).

Williams and Williams (2003) stress the need for determining the ROI of BI projects. They argue that to get the most value out of a BI project, several “preconditions” must exist.

- First is the technical ability to carry out the project.
- Second is the ability to manage the project.
- Third, the BI project must be strategically aligned with the business.
- Fourth, BI does not exist in a vacuum. Therefore, certain idiosyncratic processes must be changed to accommodate the acquisition of the data to its fullest extent.
- Finally, there must be a change management process in place to make use of the information and to switch existing processes according to the results.

All of these steps require an investment of substantial time and money if BI is to capture the greatest value (Figure 4).

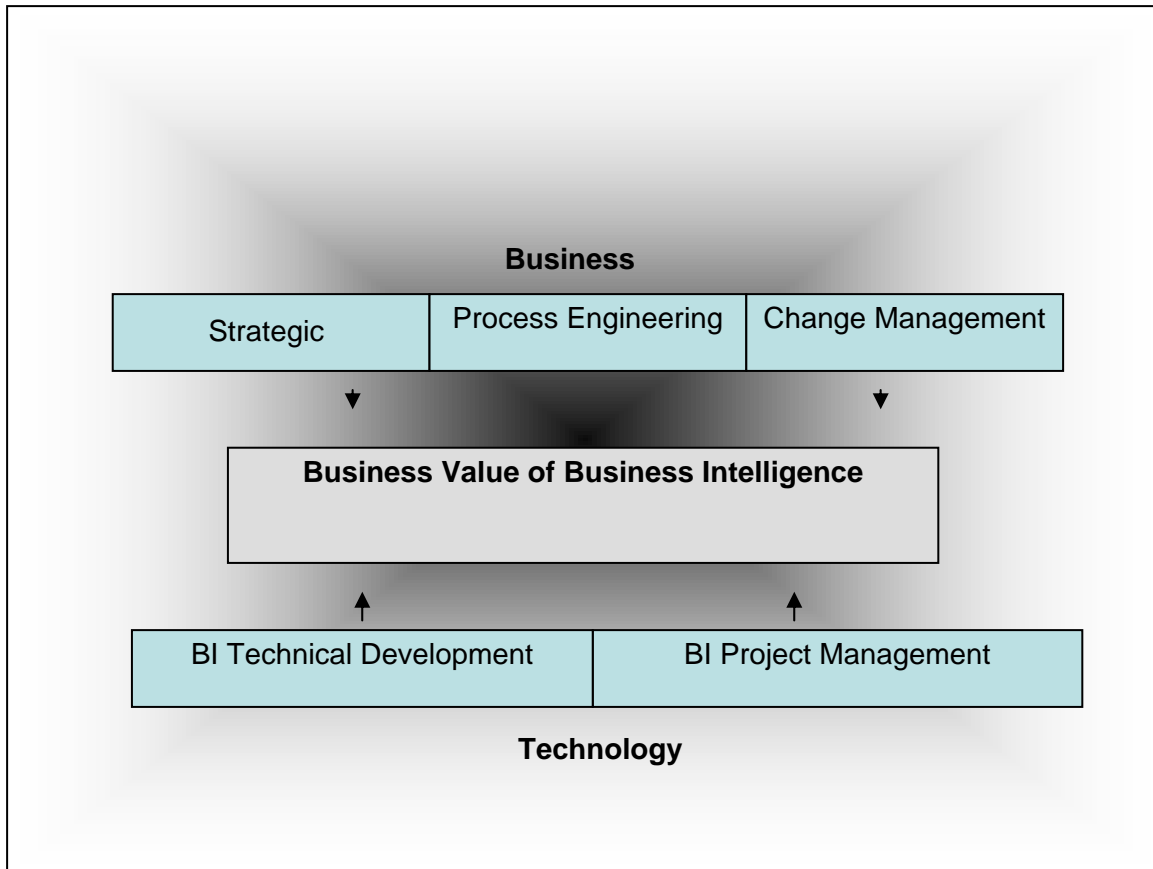


Figure 4. Environment of Building ROI in Business Intelligence.

The authors recommend that, whenever possible, start a BI project with tangible goals that can be translated into “after tax cash flow associated with the investment” (p 31) such that it leads to an increase in revenue, a decrease in costs or both. As an example, if the BI project improves forecasting, then inventories may decrease resulting in a cost reduction. Alternatively, if customer segmentation is successful, customer acquisition costs may go down, customer lifetime may increase and revenues may increase. These results can be measured and the impact on the operating income and earnings calculated.

Is it Time to Offshore?

As BI applications continue to grow in popularity and the ROI demonstrated, there will be cost pressure to find “the right BI resources at the right price” (Dodds, 2003). In addition, as BI activities become less idiosyncratic and more enterprise-wide, there will be larger costs associated with implementation. As such, offshoring is beginning to be an option. Presently, many companies consider BI as a strategic asset and are reluctant to move efforts offshore. According to Dodds (2003) not all aspects of BI should be migrated offshore. As with the earlier efforts to off-shore other IT intensive processes, there is a learning curve. Currently, some of the application technology is becoming common. This includes online analytical processing (OLAP) and Extract,

Transform and Load (ETL) and Database Administration (DBA). These might be good processes to move off shore. The author suggests asking 4 questions before making any decision to offshore BI work.

- Is the project large enough to justify the transaction costs?
- Do you have experience in off-shore project management?
- Are you considering one country or several?
- What if it does not work out?

The answers to these questions will help guide management if appropriate resources are found over seas.

BI Applications

Key Steps you Need to Know

BI application software is evolving from a specialty business to more standardized platforms. The early users depended on specialized BI application software to link different data sets. These data sets were often customized requiring the linkage to be customized as well. With the maturation of large business applications, the ability to link the data is becoming more standardized as well although we feel that the great majority is still customized.

There are several backbone processes that are integral to most BI initiatives. The first is the concept of the **data warehouse** (http://en.wikipedia.org/wiki/Data_warehouse). As the name implies, the data warehouse is the storage component of the BI process. Often, the data warehouse is subdivided into smaller components called data marts. The data stored in a data warehouse is in a “relaxed” format. This is in contrast to data stored in traditional databases where the format is “highly normalized”.

Since BI applications are intended to search and compare data from many different sources, the method of moving data from those separate sources is critical. The general process is “**extract, transform and load**” or **ETL** (http://en.wikipedia.org/wiki/Extract,_transform,_load). The application needs to be able to read the different file formats in the different origin databases. The transform function then makes sure that extraneous data from the original database is not included or sometimes combines data from different origins into an appropriate format for the data warehouse. The “load” function populates the data warehouse with the newly extracted and transformed data.

The final component is **OLAP** or **Online Analytical Processing**. OLAP is a method of performing complex searches and queries. The key is to manipulate relational databases into dimensional database format before running the actual query (<http://en.wikipedia.org/wiki/OLAP>). The advantage is speed. Complex searching of relational databases would be very slow without this step. The process can be depicted graphically as in Figure 5. (http://www.iwaysoftware.com/products/etl_data_migrator.html).

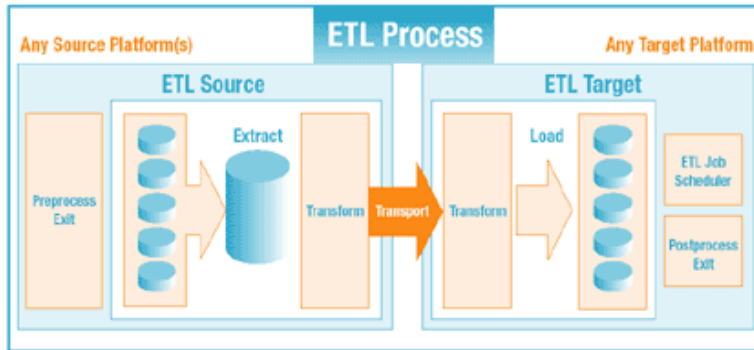


Figure 5. The ETL Process.

Importantly, these processes are not static. New data is continuously processed as it becomes available. The goal is to provide the manager with real-time information from all available sources that allow the business to gain a competitive advantage. At the end of the process is a portal that allows the end user to access the information, generate reports, set alerts and monitor the flow of business processes.

A comparison of hypothetical legacy information flow (on the left) and proposed BI based information flow (on the right) is summarized in Figure 6 from InfoWise solutions (<http://www.iwise.com/pdfs/InSiteOverview.pdf>).

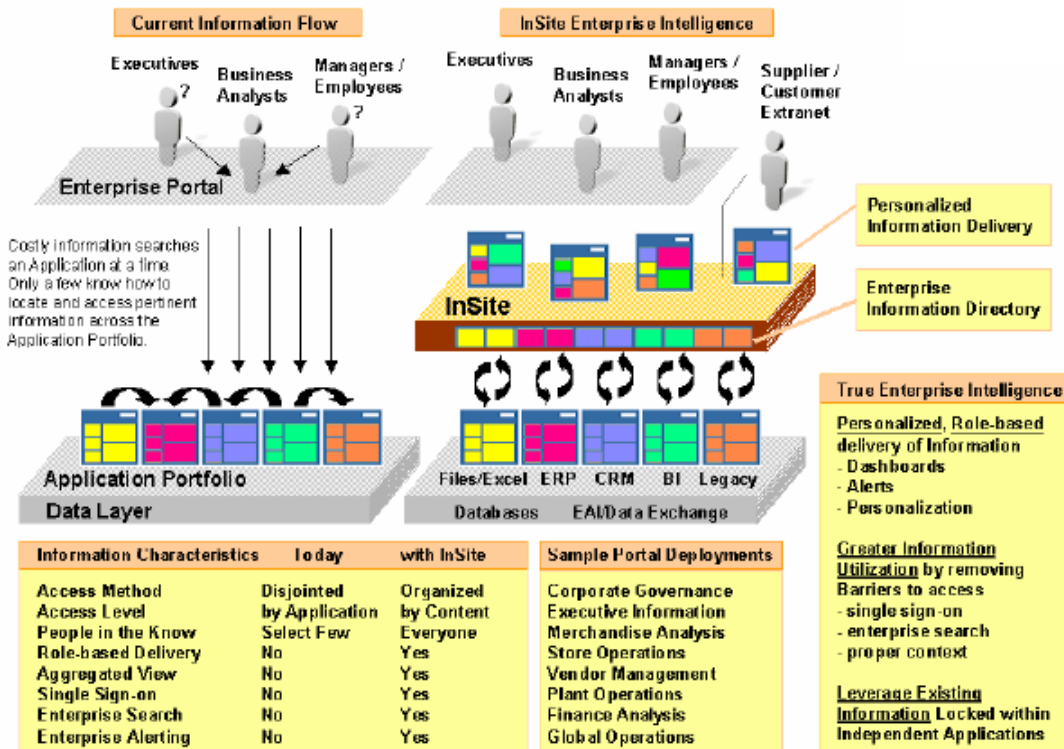
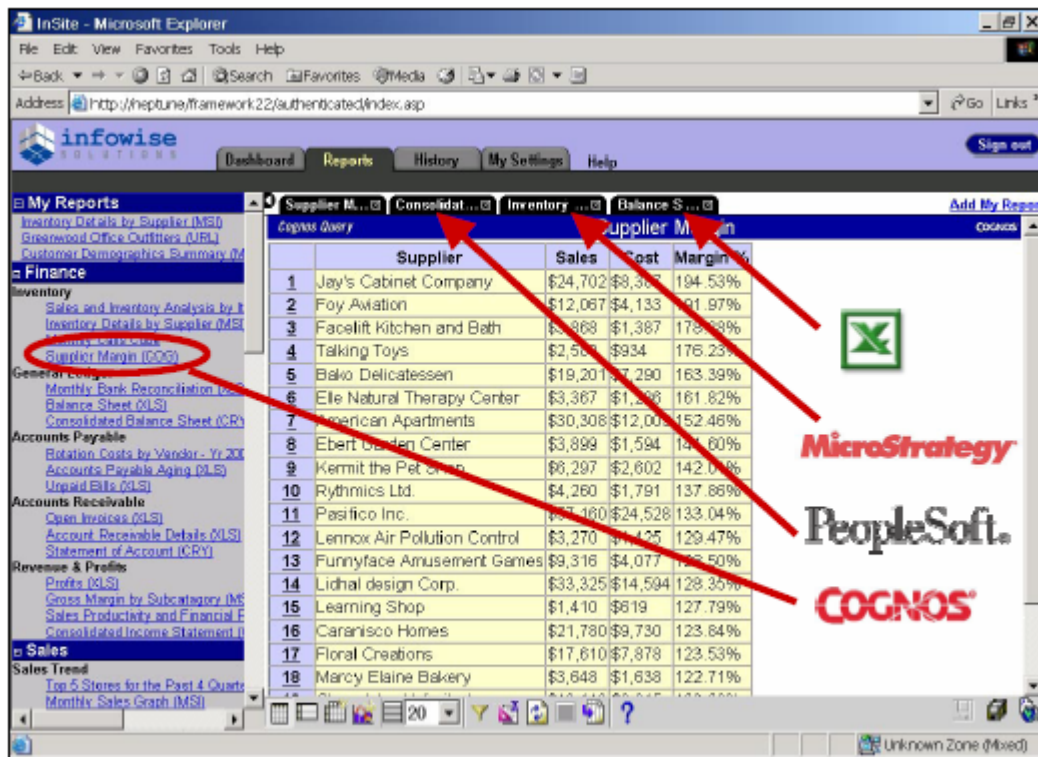


Figure 6. Legacy and BI Information Flow.

Note that the advantages of an integrated BI project are many. These include:

- Enterprise wide information
- Enterprise wide access
- Easy access through a single, personalized portal
- More real-time information
- Decreased costs and time associated with typical report writing
- Ability to set up more complex alerts

The access portal is personalized for each user. The sales manager will have a different look to the portal compared to the operations manager however; each may have data gleaned from the same information. For instance, the sales person might want to know what the inventory is for a particular product and the operations manager might want to know what the weekly sales trends are so that inventory can be adjusted. Data can be displayed as graphs, tables or text. An example screen shot of an end user's workstation is shown in Figure 7 (<http://www.iwise.com/pdfs/InSiteOverview.pdf>).



Access multiple information sources from a single, integrated workbench.

Figure 7. End User Desktop Software Examples.

Case Studies: Implementation of BI

There are numerous white papers on the Internet that describe the use of BI related applications. These can be accessed through the vendor sites and are typically not

referred. Therefore, the data and conclusions may be less than rigorous but the papers serve as examples of how a company has instituted a BI process and benefited from it. The following two examples were taken from the TeraData website.

U. S. Postal Service Gains Huge ROI

In the 1990s the U.S. Postal Service (USPS) was losing money due to several factors. First, email was becoming a preferred method of correspondence by those linked to the Internet. Secondly, electronic banking and checking was stealing routine monthly business and lastly, independent shipping companies were direct competitors for much of the larger items as well as overnight delivery. With high fixed costs, approximately 38,000 retail outlets, the service needed to gather more metrics as to how the outlets were performing. Unfortunately, sales data was collected only on a regional basis and performance of any individual unit was nearly impossible. In individual offices, the type of sale was logged using tick marks which were totaled and added to a spreadsheet. Summary of the data took weeks. The USPS realized that it needed to implement new processes to achieve the following:

- Use transaction data for better decision making
- Control inventory costs
- Cross sell to customers better
- Track employee productivity
- Reduce fraud

The USPS worked with TeraData to implement a new system that allowed monitoring of individual outlets. In March 2000 approval was granted to build a retail data mart. From February to July 2001, training of the initial 500-600 users occurred. The project began to pay off almost immediately. For instance, during the holiday season, it was discovered that nearly 1500 point of sale terminals were not in use. The cost of the terminals was \$9 million. The equipment was redeployed to where it could be used more efficiently. A 5-year return on investment was projected based on cost avoidance, cost reduction and enhanced business processes. The calculations determined that the ROI after 5 years would be approximately 1400%. The payback period was an amazingly short 0.08 years (Morris et al., 2002).

Applebee's International Improves Neighborhood Image

Applebee's business model is to be a neighborhood restaurant and not a cookie cutter franchise with exact menu items in all locations. They have over 300 company-owned and 1,100 franchised stores in all parts of the country. They rely heavily on customer feedback regarding menu items so that the individual tastes of the locale can be incorporated into the menu. As part of this process they run 6 to 8 specials a year where different items are included. The company was looking for a process to integrate the following:

- Customer feedback

- Local sales data
- Financial systems
- Inventory
- Food cost avoidance systems
- Labor and staffing
- Management systems

After implementation of a Teradata Data Warehouse and supporting systems forecasting has improved for inventory and for predicting staffing levels needed in the stores at various times. This leads to better cost control. Moreover, better tracking of customer feedback and sales of “specialty items” helps keep customers coming back which leads to increased same-store sales. The time it takes to integrate the data has decreased from weeks to one day. (Applebee’s case study, 2004)

MSI Systems Integrators: An Interview with Providers in Unique BI Space

In addition to literature review, a telephone interview was held with two members of MSI, a business intelligence applications company based in Omaha, NE on 10/29/2004. Steve Grigone (Vice President of Sales, MO/IL) and Ernie Gubbles (Database Architect) gave an overview of the company’s approach to helping clients integrate their various systems by moving to more of a turnkey approach. They restrict their clients to three main areas: financial, catalog retail and athletics. In the financial area, they said that BI applications have been used to detect fraud and to help banking institutions to bundle products to customers. In the Catalog area, being discriminate about customers that receive catalogues can save shipping and handling costs. Therefore, customer spending habits, both quantity and type is very important. In the athletic area, they have evidence that past performance predicts future success. Therefore, they are developing methods to capture an athlete’s accomplishments and use that information to make better predictions. One can imagine that professional sports teams or Olympic trainers would be interested. MSI supports the design, build and implementation of the BI suite. This includes statisticians, data warehouse administrators and technicians to install the appropriate hardware. They work closely with the client to make the most out of the process and really encourage them to calculate an ROI.

Best Practices for Business Intelligence

We have introduced BI as a very broad range of activities designed to make businesses more competitive. These include the protection of trade secrets, the acquisition of external data and the compilation and integration of internal data. Each of these areas has their own best practices which are outlined below.

Protection of Trade Secrets:

- Maintain an internal education program regarding the needs of data protection
- Review all material to be externally presented

- Background checks on employees and contractors

Acquisition of External Information:

- Attend trade shows, conferences
- Consider using third parties such as members of SCIP (Society of Competitive Intelligence Professionals)
- Maintain high ethical standards
- Establish updated online search profiles and alerting programs
- Compile information in useful format

Compilation of Internal Data:

Best practice recommendations in this area are similar to other IT intensive efforts and are outlined in a CIO.com review

(www.cio.com/sponsors/090104sd/index.html?pa=11).

- Alignment from top to bottom on key metrics needed to measure company performance
- Incorporate change management to educate the end-users
 - Involve end-users in the planning
- “Think big, start small”
- Tie to corporate strategy, infrastructure, security
 - Technology is only an enabler, not the reason for BI
- BI solution must be easy to use.
 - Simplify your data and BI infrastructure
- Admit you have data quality problems
 - Consider using a specialized BI firm

Conclusions:

Your company practices BI on some level. Whether it's acquiring information, protecting information or massaging the data into a truly useful advantage, you need to be aware of the key developments and pitfalls that are outlined in this report. Business leaders have long appreciated BI but have only recently been able to harness its power using specialized applications and that show a measurable ROI. As these applications become more refined, look to the leaders in the field to help your company make the most of its collective data. Finally, be aware of the acceptable means of acquiring data and be cognizant of the means by which others can acquire information about your business. The opportunities may be huge but the mistakes can be devastating.

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We would like to thank Steve Grigone and Ernie Grubbs of MSI for their time, helpful comments and materials. We would also like to acknowledge the Fall 2004 Professional MBA class for their interest and discussion, Professor Mary Lacity for her feedback and suggestions and Kirk Garten for pointing us to a helpful website.

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