Uncovering The Hidden Value In Bi Assets Thru Six Sigma Business Intelligence - A New Perspective

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ABSTRACT

A New Perspective: Focus on the Customer, Strive for Near Perfection and Evolve Toward Six Sigma Business Intelligence. Applying Six Sigma principles to business Intelligence requires strong management support and a recognized Six Sigma action program.

Six Sigma business intelligence (BI) [1] is a customer-focused, measurement-based approach to improving business intelligence. Six Sigma refers to a better and smarter way of managing business. Six Sigma means putting the customer first and striving for a product that is near perfection. Six Sigma principles have been used in the business world for years and have produced significant and frequently amazing results. In the late 1990s, Jack Welch at GE demonstrated just how successful Six Sigma can be. From 1996 to 1998, GE went from costs of $200 million and returns of $150 million to costs of $400 million and returns of more than $1 billion. Jack Welch was a Six Sigma convert who led his company in changing the way they did business. From his unique position, he transformed his company by focusing on customer needs and working smarter using Six Sigma principles and processes.

Despite continued success in the business arena, Six Sigma principles and methods have not been freely translated over into information technology. Business intelligence is an excellent place to begin and the time is now. A rigorous program that focuses on the customer, measures and uncovers hidden costs and problems, and uses the Six Sigma business intelligence approach to auditing and improving current BI assets can provide more value to an organization than any number of new business intelligence applications.

1. FACETS FOR BUSINESS INTELLIGENCE

Information technology has been caught up in a rapid race to create more and more new business intelligence applications figure 1. There is no question that the needs for business intelligence are critical and the push from the business community and information technology management is strong. However, we have completely bypassed that stop in the road where we critically assess the quality of the business intelligence being produced. Follow-through and support for the customer post-delivery of the business intelligence application has been minimal, at best. Service level agreements, where they exist, usually provide limited troubleshooting remedies for the most basic of customer issues. The value in business intelligence lies not just in a continuing stream of new applications. Improving the creation process and the current infrastructures and systems should be a priority. There is a real value that is hidden in the current applications and asset base. Improving the process and the product and extracting that hidden value are keystones or a Six Sigma business intelligence initiative.

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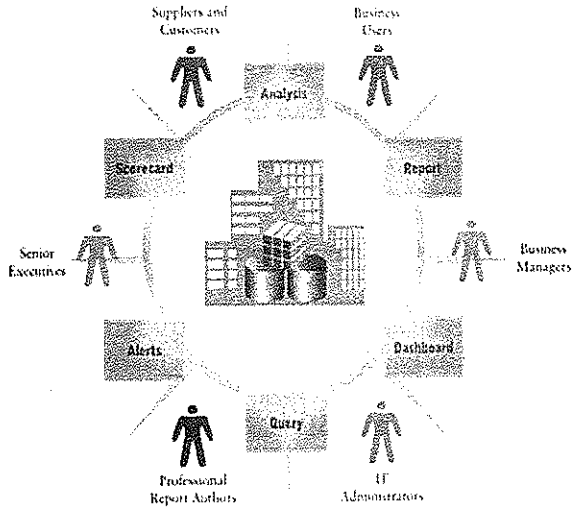
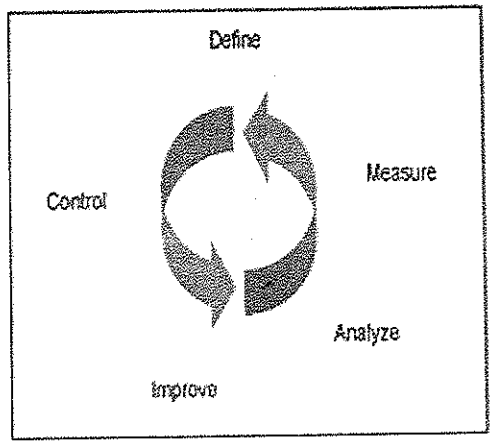


Figure 1 : [*]Dashboard for BI

How do we achieve the highest quality business intelligence? A Six Sigma program clearly identifies and recognizes *the customer* as the focus for business intelligence and uses metrics to ensure that customer needs are defined and satisfied. Just as the organization must concentrate on satisfying the requirements of the external customers of the business, information technology must apply those same levels of concentration and professionalism to satisfying the needs of the internal customers for the business intelligence product. Six Sigma programs have proven extremely successful in other parts of the business. This customer-focused, metrics-based approach can be used just as successfully in the business intelligence arena. The first step is to define a Six Sigma program for business intelligence.

The Six Sigma Process

The [4] Six Sigma process is based on the application of rigorous rules and the measurement and monitoring of carefully identified data. One of the most relevant Six Sigma methods for business intelligence may be simply designated as the DMAIC process figure 2. The name is derived from the steps of the process.



The DMAIC Process

(i) **Define** the goals. These should be based on the factors that have been identified as *critical to quality* (CTQ) for the customer. They must be specific and measurable.

(ii). **Measure** the identified factors, i.e., collect the data. For example, *performance* may be one of the *critical to quality* factors for customer satisfaction.

We might define a measurement for performance as response time (i.e., the time from the point where a request for information – e.g., a query – is made to the time the information is returned to the requestor). describing expectations in specifics, the performance goal becomes tangible and measurable. Next, we will need to monitor and measure the CTQ factors to determine whether the defined customer needs are being met.

In order to determine what is causing any fluctuation in these CTQ measurements, we need another set of measurements. This second set of measurements is defined and collected using an audit of business intelligence assets at a detailed level for all components. The TBIA Business Intelligence Capability Maturity Model, which is a blueprint for the business intelligence

[*]LogiXML BI Dashboard & Converging BI with Six Sigma Through Dashboards

[*]http://www.isixsigma.com/library/content/c001211a.asp

audit, may be used to perform the detailed audit of the business intelligence asset base.

(iii) **Analyze.** Determine what the CTQ measurements tell us about how the customer needs are being met. What do those CTQ measurements tell us about the response times? How well we are performing and are the customer quality needs being met? Then, we have to identify all the factors within the business intelligence asset base that can and have impacted those response time numbers. Thus, we review the results from the business intelligence audit and correlate each to the *critical to quality* (CTQ) needs of the customer. What has been identified during the business intelligence audit that is relevant to and/ or impacts the customer CTQ needs? What exactly are the reasons for performance that is anything less than our Six Sigma goals? That might translate, for example, into any number of items, from some infrastructure malfunction to the wrong analytical software. The audit will help identify specific "pain points" and impacting factors.

Then, we need to plan for improvement. What can we do to make things better? What should we do? Identify the actions required for improvement based on the business intelligence audit. Prioritize the improvement action plan based on the impact and relevancy of each identified issue to the *critical to quality* factors for the customer. We can rate the customer CTQ factors. Then we can build a prioritized plan to improve business intelligence based on resolving the underlying issues in order of their importance to the customer.

(iv) **Improve.** The improvement process includes taking all the actions necessary to make the business intelligence product meet the quality expectations necessary to the customer.

(v) **Control.** We need to make sure that the business intelligence continues to meet the highest quality standards. Performance levels could decline again unless there is a program for regular monitoring of quality goals. There should be a standard action response program in place for response and correction of any further problems.

2. A Six Sigma Initiative for Business Intelligence

The Six Sigma Initiative[5]

Pursuing Six Sigma business intelligence in any meaningful way requires a program that is recognized, understood and has strong support from management at the CIO level. The are a number of routes to success, but the most likely path is a formally adopted Six Sigma business intelligence initiative. The results will, most likely, include some significant changes in business intelligence infrastructures, systems and development methods. Information technology [8][17] best practices, standards and business intelligence application methodologies will be directly impacted. The business intelligence direct customers and, in fact, everyone who creates, manages and uses business intelligence within the organization will be impacted. Each will be asked to understand, agree and participate in achieving Six Sigma business intelligence for the organization.

The Six Sigma business intelligence initiative requires at least the following:

- Strong management support
- A management sponsor
- A Six Sigma business intelligence team
- Trained resources to assist in business intelligence project development, customer CTQ monitoring, and business intelligence audits

- A clearly defined Six Sigma action program
- Training for the team and organization
- A communications and marketing program to inform everyone of the goals, principles and organization impacts

2.1 Six Sigma Terminology

There are some basic terms that have been coined within Six Sigma, and you should consider making them part of your own program. It should be easier to communicate program goals and methods using terms that already have established definitions and application to the program. Even though it may seem strange to label a Six Sigma expert as a Black Belt, there is industry recognition of the role. Since Six Sigma has been recognized and well accepted in the business world, officially adopting the terminology will also communicate the importance and something about the methods for the Six Sigma business intelligence initiative. A few of the most helpful of these words concern the roles and responsibilities of the people involved. It has become customary to label skill levels for the people involved with martial arts terms (e.g., a Six Sigma Black Belt has the expertise of a master, and for lesser degrees of mastery, the Green and Yellow Belts). These labels generally refer to mastery of the techniques and statistics involved in the Six Sigma programs. Other terms that will be helpful and can readily be incorporated into the Six Sigma business intelligence Initiative will be discussed in the following sections. Most of these relate to methods and processes (i.e., including DMAIC, CTQ and the process X and Y's). You will need these to define and describe the Six Sigma methods and principles to be used.

2.2. The Three Aspects of Six Sigma Business Intelligence

Applying Six Sigma to the business intelligence world requires a new approach to the creation and management of business intelligence assets. Understanding the business intelligence customer, the goals for business intelligence, and the Six Sigma principles are keys to success. Customer needs are top of the list. Near perfection is the goal. Data, measurement, analysis, and control is the process blueprint for achieving Six Sigma level business intelligence.

The three aspects of a Six Sigma business intelligence initiative are:

1. Strive for a Six Sigma business intelligence product.
2. Identify the customers for business intelligence and define their *critical to quality* (CTQ) needs.
3. Define and follow a Six Sigma improvement process that:
   - Has strong management support,
   - Focuses on the customer's needs,
   - Is based on Six Sigma principles, including data, measurement, analysis and control,
   - Is iterative and evolutionary, and
   - Is pervasive across the business intelligence arena.

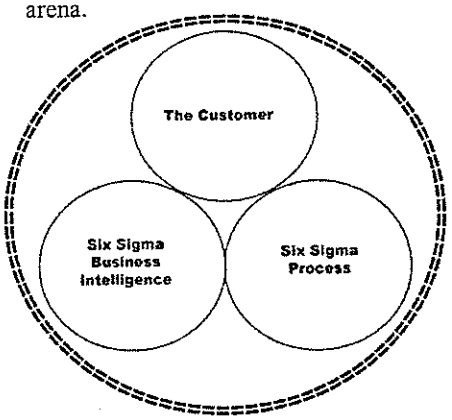


Figure 3 : The Three Aspects of Six Sigma Business Intelligence

*Dorothy Miller

Six Sigma describes a measure of quality that reflects a goal of near perfection. The Six Sigma Way is a disciplined, data-driven approach and methodology for eliminating defects and improving quality. Six Sigma is a statistical term that, in effect, translates as "near perfection." A Six Sigma goal means the product is 99.9997 percent defect free (68 percent = 2 Sigma; 93 percent = 3 Sigma, 99.4 percent= 4 Sigma; 99.5 percent= 5 Sigma). Sigma means standard deviation which is a statistical term that describes how much variation exists in a set of data. Thus, we may set a goal of 3-second response time for a certain category of query. Striving for Six Sigma quality would mean that if we measure response time for 10,000 queries, we want to find that 9,997 of those queries would meet the goal of a response time of 3 seconds or less. (Actually, we usually speak in terms of a million opportunities (i.e., queries). So, the definition is not quite accurate. There are also other aspects to the measurement process – i.e., short-term versus long-term variations in the data, etc. However, the basic principle is to strive for a near perfect product.)

Applying Six Sigma to BI requires a new approach to the creation and management of BI assets. Understanding the BI customer, defining the goals for BI success, and the integrating the Six Sigma principles are all keys to success. Customer needs are crucial. Near perfection is the goal. The blueprint for achieving a Six Sigma level BI includes an iterative improvement process, which is based on metrics, monitoring, analysis and control. Three primary aspects of a Six Sigma BI initiative are:

(i) **Focus on the customer.** Who is the customer? What are their perceptions and expectations for a quality BI product? We will need to define and monitor the product factors that are critical to quality for the customer.

(ii) **Push for perfection.** Develop and use a rigorous, iterative, metrics based program for creating, monitoring, managing and improving the BI product and assets.

(iii) **Understand the BI assets.** Define, understand, audit and assess the BI assets. Identify and relate the underlying factors within the BI asset base to those factors which have been identified as critical to quality for the customer in the product.

In this first column on Six Sigma BI, I will concentrate on the first aspect: focus on the customer. Who is the customer? How exactly do we focus on the customer and where does this fit into the program for improving the BI product and the creation and management process.

3. Focus on the Customer

3.1. Who are the customers of BI? We need to identify them and clarify their roles and responsibilities. From the perspective of the Six Sigma process, there are two classes of customer who are crucial to the quality improvement process:

(i) **The end user of the BI product.** The end users of the BI product are most often people within the organization who rely on the information to do their jobs. This class of customer may also include people outside the organization who use the BI in ways that have been designated by the organization. For example, they may check their account information, pay bills, etc. The customer could also be an automated system which uses the information to manage and/or control some set of functions for the organization. Each of these customers will have specific requirements for their BI product.

(ii) **The organization**. The organization is an important customer, with very specific and crucial requirements. In order to clarify, understand and meet these requirements, we must translate this customer into a tangible entity which can speak for the organization. The most helpful way will be a team of management and specialists who can define and clarify the organization requirements.

3.2. Identify the critical to quality factors[4]. Focusing on the customer requires that we describe the BI product and identify those factors which are critical to quality for each customer. What are the most important factors of the BI product to the customer? Improvement of the product can best be accomplished when we can identify what the customer perceives as critical to product quality. If we believe that five characteristics of the BI product need improvement and the customer believes that only one of these characteristics is important, then we will know where to concentrate our efforts to the best results for the customer. We also will need to monitor these critical to quality factors in a program which seeks to both improve the product quality and to ensure that the product continues to meet the defined level of quality.

3.3. Translate the CTQ factors into metrics[4]. In order to use the critical to quality factors in any monitoring and improvement process, they must be stated in tangible and measurable terms. The CTQ factors must be metrics which are relevant and reflect the requirements which have been identified by the customers. In other words, we need to translate the customer requirements for quality within the product into measurements that can be used to monitor product quality. A simple example of such a measurement for the end-user customer might be time required for a query response. For the organization customer, the quality factors will more likely include factors like alignment to business goals. (Review more CTQ factors in the next section of this column.)

3.4. Create service level agreements and monitor the CTQ quality factors[2][4]. The factors that are identified as critical to quality should be described as tangible metrics and incorporated into agreements with the customer. This will help to ensure that there is a real understanding of the quality factors and that there is a common agreement related to levels which can be monitored.

***Critical to Quality Factors[2][4]**

Within the Six Sigma BI process for quality improvement, those factors that are identified as critical to quality for the customer are most often designated as the "X Factors." (The "Y Factors" refer to the related causal factors which can usually be identified during an audit of the BI assets.) Some of these X factors are

For the category 1 customer (i.e., the end user):

- **Performance**. Response time is the probably the most relevant performance factor for the customer (i.e., time from request/query for information to receipt of the information).
- **Quality of information**. Is the information accurate, timely, clear, and usable?
- **Meets business requirements**. Does it satisfy the requirements that were defined initially? Is there enough flexibility to meet future expanded requirements?
- **Format**. Is it intuitive and easy to use, from simple reports to power user analytics?
- **Velocity**. How soon is the data available (i.e., from time of data entry into the system to time that quality information is accessible)?

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- **Availability and comprehension**. Is the desired information in our information library? Do we have all of it?
- **Support and training**. Do the users get help when they need it?

For the Category 2 Customer (i.e., the organization):

- **Satisfaction of business objectives**. Do the available information and analytics satisfy the organization business goals (i.e., alignment with business goals)?
- **Quality of information**. What are the expectations of management? Is the information accurate, timely, integrated and up to date?
- **Velocity**. How soon is the data available (i.e., from time of data entry into the system to time that quality information is accessible)?
- **Availability and comprehension**. Is the desired information available when it is needed? Do we have all of it (i.e., comprehension and accessibility of "integrated, harmonized information")?
- **User understanding and satisfaction**. Are the service level agreements for end users accomplishing the goals? Are users being trained? What is the category 1 customer satisfaction level?
- **Cost to benefits received**. Can we afford it? Is it worth it?

The Six Sigma Business Intelligence Product[9][6]

Six Sigma is a statistical term that, in effect, translates as "near perfection." A Six Sigma goal means the product is 99.9997% defect free (68% = 2 Sigma; 93% = 3 Sigma, 99.4%= 4 Sigma; 99.5%= 5 Sigma). Sigma means "standard deviation." Standard deviation is a statistical term that describes how much variation exists in a set of data. Thus, we may set a goal of 3-second response time for a certain category of query. Striving for Six Sigma quality would mean that if we measure response time for 10,000 queries, we want to find that 9,997 of those queries would meet the goal of a response time of 3 seconds or less. (There are other aspects to the measurement process – i.e., short-term versus long-term variations in the data, etc. However, the basic principle is to strive for a near perfect product.)

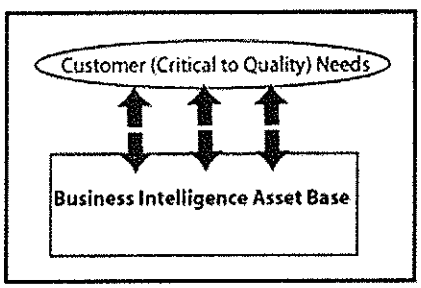
There are a number of reasons to set a goal of near perfection for the business Intelligence product:

Setting the goal high means striving to achieve excellence.

The business intelligence end product is created from and comprised of a spider web of parts. The business intelligence product is only the end result that is seen by the customer. There are infrastructures, processes, and a myriad of "under the hood" systems that allow for the creation, management and presentation of that business intelligence product. Each of these underlying components may have defects that impact the final product. The quality of each of these parts and the resulting combination impact the quality of the business intelligence end product. Setting a Six Sigma goal of near perfection for each means that there can be a reasonable expectation for the highest quality of the end product.

Business intelligence is of critical importance to the organization. The inherent quality of the business intelligence product can dramatically impact the success of the organization.

4. The Business Intelligence Customer and CTQ Goals



4.1. The Business Intelligence Customer. Identifying the customers for operational business intelligence within the organization is an important first step in any Six Sigma initiative. Who are they? The direct customer for the business intelligence product is the end user. These are the people within the organization who operate and manage the business to meet the needs of their external customers (i.e., those who buy the organization's products and/or services). If we focus only on this end user, though, the organization does not get the full value of business intelligence. Special umbrella requirements, such as the alignment of business intelligence to business goals, may be neglected. So, there are two categories of customer for business intelligence:

4.2 The End Users of Operational Business Intelligence

The people and systems that use operational business intelligence are most often called the "end users." These customers may be internal to the organization. They use the business intelligence in the operations and management of the business. These are the people (and, sometimes, systems) who are responsible for managing the organization to meet the needs of the external customers. There may also be direct users of business intelligence who are external to the organization. These customers use the business intelligence in ways that have been designated by the organization. For example, they may check their account information, pay bills, etc.

4.3 The Organization

There are many factors that are *critical to quality* for the organization, which will not be addressed at the parochial level of the individual business intelligence end user. The organization must also be recognized and treated as a customer for business intelligence. Only at this level can we begin to envision, define and achieve those overall organization goals that will translate into success in a competitive, [11] global marketplace.

Critical to Quality Goals. For each category of customer, we need to identify and describe business intelligence goals and objectives that can be monitored. These should be specific, measurable, and *critical to quality* (CTQ) for the business intelligence product for that customer. These CTQ factors should be documented, and there should be a signed, formal agreement between the information technology (IT) department and the business intelligence customer. In most cases, there are already some clear best practices and industry standards that support a service level agreement (SLA) for individual business intelligence applications between IT and customers. In the Six Sigma business intelligence initiative, the CTQ factors within these SLAs will be rigorously monitored. The *critical to quality* goals (along with specific measurements) for these customers should include, for example, topics such as:

- Performance (e.g., response time)
- Quality of the information, (e.g., accuracy, timeliness, clarity)
- Availability and comprehension of the data
- Satisfaction of business requirements

Aiming for Six Sigma business intelligence means redefining and expanding these service level agreements to include the organization customer. The organization-level customer will have to be transformed into a tangible entity by creating a management team with Six Sigma business intelligence responsibilities.

Relevant CTQ factors should be identified with the help and agreement of the customers. Service level agreements should be written. There are two major criteria for the CTQ factors:

1. They must, in fact, be critical to a quality product, and
2. Each must be measurable, and the measurement data to be used must be clearly described.

4.4. The Six Sigma Business Intelligence Team[9][10]

Establishing the Six Sigma business intelligence team is the second step in pursuing a Six Sigma program. The first step is the recognition of the need for such a program. The team cannot be created without the support of executive-level management. The next requirement is the identification of a manager sponsor who is high enough in the corporate structure to support the team requirements, as they are recognized. The Six Sigma team should be composed of the sponsor, the team leader and several well trained team members who will be responsible for implementing the preliminary program. The most likely candidates for the team positions will be people who currently have responsibilities in using, creating and managing business intelligence. If chosen from this business intelligence arena, however, each one must be capable of stepping back and objectively assessing the processes and products. There may be some value in adding team members who have not been actively involved in creating and managing business intelligence in order to ensure an added level of objectivity for the team.

There are several aspects of the Six Sigma team that should be defined at the beginning.

Term and participation of team members

The members of the initial team should be full time, with each team member assigned for the term of the initial program definition. However, once the initial goals of the Six Sigma initiative are met, then much of the Six Sigma responsibility will be transferred to those who create, manage and use the business intelligence. However, there will still be a continuing need for the expertise from a support level Six Sigma team.

Training

For the team, there should be a formal and rigorous training program – in Six Sigma principles, processes, and business intelligence best practices and methods. There should also be introductory training for those involved in the current business intelligence operations world. As the Six Sigma initiative progresses and there is more and more involvement by those who are part of the current business intelligence operations, then the training for them in the new methods and practices should be intensified.

Responsibilities of the Six Sigma business intelligence team. The initial team will define and set in place the Six Sigma principles and practices required to reach and maintain Six Sigma-level business intelligence. They will provide the Six Sigma foundation (e.g., identification of customers, the factors that are critical to quality for those customers and all the relevant metrics and processes for Six Sigma business intelligence). This will include all the analysis, prototyping and incorporation of the proven metrics and processes into the business intelligence standards, methods and best practices for the organization. Moving into the next stage of continuing operations, the team will be transformed and take responsibility for providing expert advice and support for the business intelligence community. This "post implementation" team will also monitor results and ensure that the Six Sigma program stays on track.

4.5. The Six Sigma Business Intelligence Program [8][17]

Developing the Six Sigma methods, metrics, best practices, and tools for use in a continuing Six Sigma business intelligence program is the paramount role of the Six Sigma team. The initial work of the team requires the creation

and testing of principles and processes that can be successful in creating and managing Six Sigma business intelligence. The process should incorporate the best of the Six Sigma industry experience, the organization assets and culture and the business intelligence industry best practices and knowledge base.

Some of the tenets and processes of the Six Sigma business intelligence program are discussed in this section.

Focus on the Customer : We need to identify and describe the customer for business intelligence. There are two categories of direct customers for business intelligence – the end user and the organization. The end users are the people and systems who directly use the business intelligence product in the operations and management of the business. It is also important to designate the organization as a customer. Only at the organization level will there be a recognition and definition of umbrella factors, such as alignment of business intelligence with the business needs, including the satisfaction of overall business objectives.

Define the factors that are critical to quality for the customer. One of the most crucial of the jobs of the Six Sigma team is to determine what the factors are inherent in the business intelligence product that reflect what is critical to quality for the customer. (CTQ is another of those standardized Six Sigma terms.) The goal of the team should be to identify and define five to eight core level factors that can be measured and provide a template. These critical to quality factors for the customer are called the inputs or X factors. They will be translated into metrics that can be used to monitor customer satisfaction and the quality of the business intelligence. In defining these factors and associated metrics, we should keep in mind both the customer perception of quality and what is realistic and achievable within the constraints of technology and organization resources.

Some examples of CTQ factors that might be identified are:

For the Category 1 Customer (i.e., the end user)

- Performance – Response time is the probably the most relevant performance factor for the customer (i.e., time from request/query for information to receipt of the information).
- Quality of Information – Is the information accurate, timely and clear?
- Meets Business Requirements – Does it satisfy the requirements that were defined initially; and we might possibly ask: Can it meet expanded requirements with minor enhancements?
- Format – Is it intuitive and easy to use, from simple reports to power user analytics?
- Velocity – How soon is the data available (i.e., from data entry into the system to user accessible)?
- Availability and Comprehension – Is the desired information available? Do we have all of it?
- Support and Training – Do the users get help when they need it?

For the Category 2 Customer (i.e., the organization)

- Satisfaction of Business Objectives – Do the available information and analytics satisfy the organization business goals (i.e., alignment with business goals)?
- Quality of Information – What are the expectations of management? Is the information accurate, timely, integrated and up to date?
- Velocity – How soon is the data available (i.e., from data entry into the system to user accessible)?
- Availability and Comprehension – Is the desired information available when it is needed? Do we have

all of it (i.e., the data warehouse – comprehension and accessibility of "integrated information")?

- User Understanding and Satisfaction – Are the service level agreements for end users accomplishing the goals? Are users being trained? What is the Category 1 customer satisfaction level?
- Cost to Benefits Received – Can we afford it? Is it worth it?

The team needs to identify a set of these factors that can be generally used within the business intelligence continuing operations. The identified factors must then be tested to ensure that they do, in fact, capture the critical to quality requirements for the business intelligence customer.

Define the factors that impact and cause the fluctuations seen by the customer. Perhaps the most difficult of the tasks in a business intelligence Six Sigma program is to determine the exact causes of the quality issues seen by the customer. Once identified, the solution may be quite easily achieved. However, the business intelligence asset base is complex and difficult to analyze in any comprehensive way. These causal factors may be labeled Y or output factors in Six Sigma terminology.

Translate the X and Y factors into meaningful and relevant metrics. Six Sigma principles are based on metrics and statistics. One of the most difficult and the most basic responsibilities of the Six Sigma business intelligence team is to translate the identified X and Y factors into meaningful metrics. The X factors, used to monitor quality for the customer, may be measured in ways that are relatively direct and supported by metrics that are (or could be) collected by information technology operational areas. However, the Y factors, and relevant metrics, may not be so easily identified. An audit of the business intelligence assets may be the most successful way to uncover and provide measurements for these Y factors. The Six Sigma team should conduct a pilot business intelligence audit and extract relevant causal factors, metrics and methods for a continuing Six Sigma process.

Analyze, test and validate the X and Y metrics. Once the metrics have been identified and collection of the numbers has begun, then the Six Sigma team needs to determine the validity of the metrics. This should also include such topics as setting Six Sigma quality levels and tolerances. For example, in defining the response times metric for the CTQ factor, performance, we need to determine what represents quality. Does the customer need at least a 3-second response time for a certain category of queries? The metric levels and tolerances should:

1. Stipulate exactly which queries fall into the defined query category.
2. Define the percentage of queries, based on specific measurements over defined time periods, that must meet or best the 3-second response time. In addition, there must be a designation for exactly what level of deviation is allowed (i.e., if a single response time is 10 seconds, will we trigger an event to search for cause?).

Design and prototype the processes and methods for continuing operations. The Six Sigma X metrics should be incorporated into continuing operations through the use of templates, such as those for service level agreements. The methods for collection, analysis and response to these metrics should be defined and quantified. The metrics, the relevant statistics and processes should be tested and validated using several sample (i.e., pilot) business intelligence applications. The Six Sigma team needs to use business intelligence audits

to ensure that they can identify, prioritize and resolve problems with defined and relevant Y level metrics. The team also needs to create a program for conducting audits for continuing improvement to business intelligence.

5. Analysis

Pros

Research shows that firms who successfully implement Six Sigma typically deliver better return on investment, return on sales, employment growth, stock growth and value growth. General Electric executives report that their company realized approximately $8 billion in savings through its Six Sigma program from 1999 to 2002.

Thomas Pyzdek, Author of *The Six Sigma Handbook, says,* "Estimated savings per project varies from organization to organization. Reported results average about US$150,000 to US$243,000. Experience is that the average Six Sigma Black Belt project will produce a net benefit of around $200,000 in mature programs, but a single project in a new Six Sigma program net as much as $2.5 million."

Michael Marx, research manager for iSixSigma, tells "About 53 percent of Fortune 500 companies are currently using Six Sigma, which has resulted in an estimated $427 billion of savings over the past 20 years. Utilization rises to 82 percent when you look at just the Fortune 100."

In addition to the financial benefits, Six Sigma implementation can also improve an organization's ability to deliver value to their customers, create competitive advantage, improve job satisfaction, increase teamwork and communications, improve strategic alignment, improve systems performance and simplify process and workflow.

If implementing a Six Sigma environment in an organization can deliver so many benefits, why then isn't every company doing it?

Cons

The reasons why every company doesn't implement a Six Sigma program are varied. Yet, when we think about it, all the reasons can be reduced to three primary factors. First, Six Sigma implementation requires many organizations to completely change the way the company does business, and, in the judgment of leadership, that may just not always be in the best interests of the company or their customers. Second, it's just plain hard work. Even if a company does decide to embark upon the Six Sigma path, it's not an easy process, and some companies may only achieve limited or unsustainable gains.

Dr. Jiju Antony of Glasgow Caledonian University writes, "When Six Sigma was introduced to many organisations , the initial reactions varied from a lot of enthusiasm to an absolute skepticism. The latter mood reflected incomments such as:

- It is another quality improvement initiative or flavour of the month
- There is nothing really new in Six Sigma compared to other quality initiatives such as TQM we have witnessed in the past.
- This too shall pass like others
- This won't work in our business
- It is nothing more than a hype
- It is not for us as Six Sigma requires complicated statistical methods"

Those types of opinions and perceptions usually are self-fulfilling prophesies. If a Six Sigma implementation is

going to be successful, it has to be embraced by everyone at all levels of the organization. And it is within this context that the primary difficulties of implementation lie.

Forrest W. Breyfogle III, American Society for Quality Crosby Medal 2004 recipient, and David Silverstein, managing partner at Breakthrough Management Group, list what they see as the primary Six Sigma pitfalls:

- Not building an effective Six Sigma implementation strategy
- Trying to implement a one-size-fits all metric within Six Sigma (Organizations should choose the best metric for each project situation.)
- Trying to "go it alone," using their own training material when implementing Six Sigma
- Having weak, uncommitted leadership
- Failing to recognize the need for a supporting infrastructure
- Not committing Black Belts 100 percent of the time
- Pursuing poorly defined projects that are too broad in scope

Conclusion :

In conclusion, Six Sigma and BI when implemented together will produce outstanding results for the purpose of organizational excellence. This is possible through the synergy achieved from these two remarkable methodologies that help to improve organizational performance the world over.

References:

1. Business Intelligence – A Practitioner's View.
2. Achieving total quality through intelligence - LM Fuld - Long Range Planning, 1992 – Elsevier.
3. Data Mining and Business Intelligence: A Guide to Productivity S Kudyba, R Hoptroff – 2001.
4. Applying Six-Sigma to Supplier Development-FK Wang, T Du, E Li - Total Quality Management & Business Excellence, 2004.
5. Business Intelligence Solutions: Six Sigma-www.businessobjects.com/solutions/enterprise_solutions/sixsigma.asp.
6. Implementing the six sigma Solution- JA Blakeslee Jr - Quality Progress, 1999.
7. The Six Sigma Handbook, Revised & Expanded-A Complete Guide for Green Belts & Black Belts & Managers at All Levels-Thomas PYZDEK-2003.
8. Six Sigma Best Practices: A Guide to Business Process Excellence for Diverse Industries-by Dhirendra Kumar
9. Implementing a Business Intelligence Strategy - www.dmreview.com.
10. Research Article Six Sigma Applied Throughout the Lifecycle of an Automated Decision System-Angie Patterson, Piero Bonissone *, Marc Pavese General Electric Global Research, Schenectady, NY 12309, U.S.A.

11. International Journal of Six Sigma and Competitive Advantage Issue: Volume 1, Number 3 / 2005 Pages: 323 – 354.

12. A business process context for Knowledge Management-T.S. Raghu and Ajay Vinze-Decision Support Systems Volume 43, Issue 3, April 2007, Pages 1062-1079.

13. Agents and Stream Data Mining: A New Perspective - KL Ong, Z Zhang, WK Ng, EP Lim - IEEE INTELLIGENT SYSTEMS, 2005.

14. Applying Six-Sigma to Supplier Development - FK Wang, T Du, E Li - Total Quality Management & Business Excellence, 2004.

15. Competing on Analytics TH Davenport - Harvard Business Review, 2006.

16. Essential characteristics of Six Sigma Black Belt candidates: a study of US companies-K Black, R McGlashan - International Journal of Six Sigma and Competitive Advantage, 2006.

17. Strategic Six Sigma: Best Practices from the Executive Suite - D Smith, J Blakeslee, R Koonce – 2002.

18. Six Sigma for Managers-G Brue – 2002.

19. Business Marketing Management: A Strategic View of Industrial and Organizational Markets MD Hutt, TW Speh - 1998 - South-Western, Div of Thomson Learning.

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