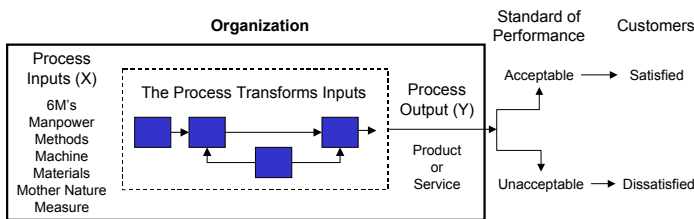


# USING SIX SIGMA TO CREATE A KNOWLEDGE BASED ORGANIZATION

By Andrew Milivojevic, The Knowledge Management Group Inc.

All work is a process. A process seeks to transform inputs into useful products or services as shown in Figure 1. The state of the product or service is judged by comparing a critical feature of the product or service to a specific standard of performance. When a process cannot yield a product or service that meets a desired standard of performance, the customer is on the receiving end of a poor product or service. Such an organization cannot efficiently transform inputs through a process and deliver a capable product or service. Ultimately, the organization responsible for the process loses credibility with its customer, shareholders and employees.

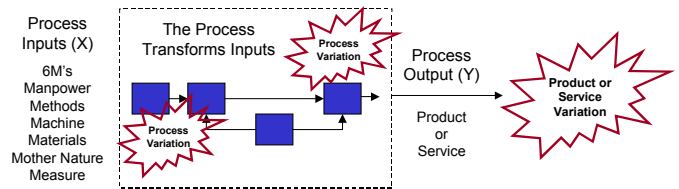
**Figure 1** A Process Transforms Inputs into Outputs



In a business environment, we seek to fulfil the needs of the customer through processes that transform inputs into useful products or services. However, we must keep in mind that all processes are subject to variation as shown in Figure 2. Such variation affects the state of a product or service. If the variation is excessive, the product or service will not meet the customer's expectations. Since variation is a fact of life, in all processes, an organization must seek to identify and quantify process variation thereby understand its effect on product and service performance.

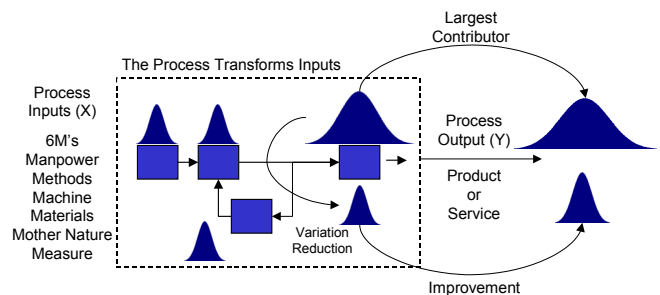
Process variation may be effectively described using statistics. We may better understand

**Figure 2** Processes are Subject to Variation



how a process behaves through data collection and the subsequent analysis of such data to create information. Only in this manner, can we hope to develop appropriate process knowledge. With such knowledge we may change or control the appropriate process step thereby reduce variation as shown in Figure 3. If we apply this to each and every strategic business process, we will not only improve the performance of each and every process but also the overall performance of the organization. When the state of an organization improves the result will be loyal and satisfied customers, shareholders, and employees alike.

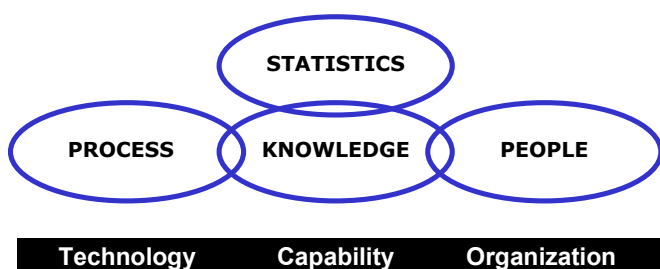
**Figure 3** Control the Appropriate Process Step & Reduce Variation



Since an organization is a collection of processes, management must identify those stra-

tegic business processes that create value for both itself and the customer. They must then strive to create a learning organization that has the ability to acquire process knowledge. With such an infrastructure, management can optimize each critical process to assure the organization's products or services not only meets the standard of performance desired by its customers, but also assures the long term increase and consistency of revenues and retained earnings. To this end, management must intimately understand an organization is a collection of processes and people. Since people acquire knowledge, it must foster a learning environment whereby its people can acquire process knowledge through the application of statistics as shown in Figure 4. In this manner, new methods and technologies may be applied to create improved processes. Consequently, management and employees alike have a responsibility to contribute to the future well being of an organization through efficient well-run processes. The result will be a world-class organization of products and services.

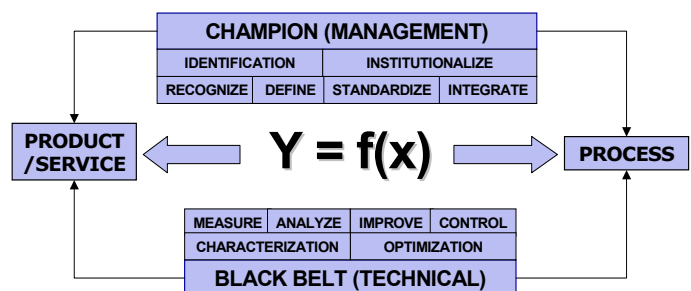
**Figure 4** People Acquire Process Knowledge Through Statistics



The hierarchy of an organization is such that multiple levels of management exist. The levels of management differ according to the number of strategic business processes under their control. Those people without management responsibility are typically responsible for the management of a local process. For example, a business unit manager in an or-

ganization is ultimately responsible for the collection of strategic business processes within that business unit. Such a business unit may have 10 strategic processes that each yields a number of different products or services. A cell leader may be responsible for a particular process that yields a specific product or service. Clearly, the business unit manager has a larger degree of process responsibility as compared to that of a cell leader. In this respect, we may say that the business unit manager and cell leader have global and local process responsibility respectively. In this regard, the business unit manager is a strategic process champion, an individual responsible for the collection of processes that defines the organization under his or her influence. Such an individual champions the deployment phase of Six Sigma. Alternatively, the cell leader having local responsibility of a single process may be a Six Sigma Black Belt candidate. A Black Belt candidate possesses the technical ability to learn Six Sigma methods and acquire process knowledge thereby suggest how to control, reduce or eliminate process variation hence create a superior product or service. In Six Sigma, Champions and Black Belts play an important role in the deployment of Six Sigma within an organization as shown in Figure 5. The goal of such a deployment is to foster the creation of a knowledge-based organization with a goal of achieving product, service, process and organizational excellence.

**Figure 5** The Role of Champions & Black Belts

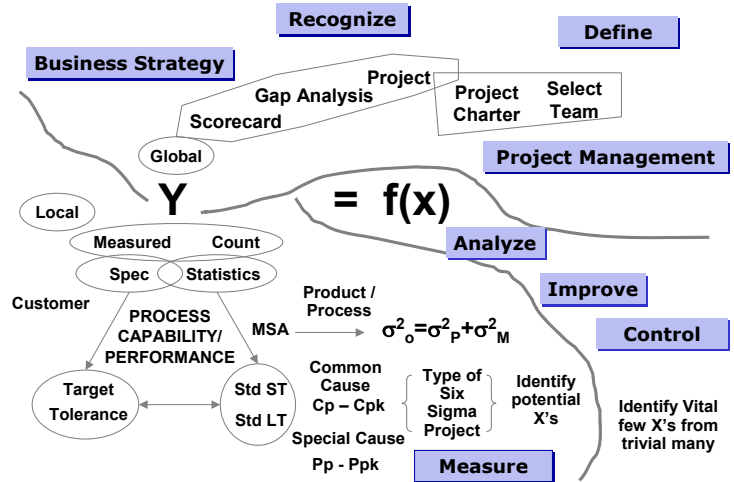


There is a strong correlation between process knowledge and a Champion's ability to succeed in his or her role. A strong Champion is a manager that has an intimate knowledge of the collection of processes under their influence and of the products and services thereof. Such a champion is aware of the state of the products and services from such processes and seeks to effectively control those strategic processes that create value for both the customer and organization. He or she can speak from a position of authority and people will naturally want to follow. Such a manager has the capacity to share knowledge and create a loyal following. They can effectively remove roadblocks that may prevent a Black Belt from successfully completing a Six Sigma project.

Since a Champion is a manager responsible for the collection of processes that defines an organization and Black Belts are individuals assigned to a process, each Black Belt individual must manage and understand how its process behaves. To this end, management Champions have a responsibility to RECOGNIZE and DEFINE those products and services that are critical to the well being of an organization. Collectively, this identifies and defines the strategic business processes of an organization that requires improvement. This ultimately translates into strategic goals for an organization. Once the improvement goals are properly understood and improvement targets established, Champions can appropriately identify Black Belt candidates to educate, in Six Sigma and statistical methods. As a consequence of such education, Black Belts can acquire an understanding of the variation in a process and utilize such knowledge to control, reduce or eliminate unwanted process variation hence improve the performance

of a product or service through an efficient process. This is illustrated within the business strategy and project management region in Figure 6.

**Figure 6 Business Strategy, Project Management & Execution**



Typically, a Champion may form a steering committee with the purpose of identifying strategic processes, metrics, and standards of performance. Metrics describe a characteristic of the product or service and must be meaningful to both the customer and organization. Such metrics may be described statistically and compared to a standard of performance, called a specification. This determines the capability of the process to produce a product or service to specification. If the capability of a process is insufficient, such a process becomes a strategic business project and initiative. Such an exercise forms the basis for the implementation of an effective strategic business process scorecard. Using a strategic business process scorecard, the capability of all strategic business processes may be evaluated and projects appropriately allocated for improvement. Once such initiatives are identified they may be formally documented within the framework of a project charter and the appropriate team may be assigned to engage such projects. To this end, management

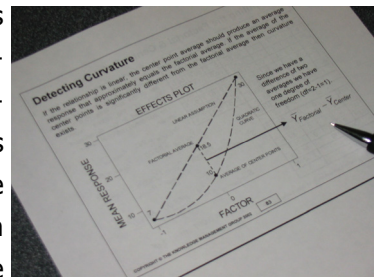
must assign technically competent individuals that have an ability to acquire knowledge and exercise their imagination to create innovative solutions that seeks to improve the strategic business process and produce a superior product or service. As such, the selection of Black Belts is increasingly important. The return on knowledge must be of a magnitude that demonstrates a return on the investment in an employee to acquire Black Belt certification. Therefore, the first and perhaps most important aspects of an effective Six Sigma program is the identification of strategic business processes that require improvement, the effective documentation of the project, and subsequent identification of the appropriate Black Belt and team to improve such a project. Essentially, the role of the management Champion is effective project management. This includes:

1. Identifying Strategic Business Processes.
2. Selecting products or service for improvement.
3. Defining metrics that will be monitored.
4. Managing Strategic Business Projects.
5. Managing & Maintaining Project Charter's.
6. Identifying Six Sigma Black Belts & defining their educational needs.
7. Eliminating roadblocks that may hinder successful project completion.
8. Driving organizational excellence.

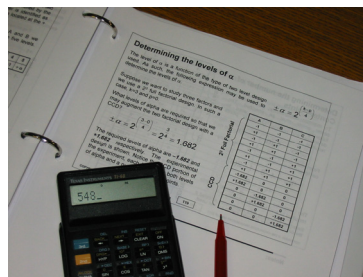
Once the project charter has been properly documented, the Black Belt begins their investigation of characterization and optimization. The purpose of the characterization exercise is to MEASURE the current state of the product or service and to ANALYZE the process. In the measure phase, the Black Belt measures the current state of the product or service using metrics that describe critical product or service features. This is followed

by the analyze phase where the Black Belt will develop, analyze, and test process theories. The optimization exercise seeks to IMPROVE and CONTROL those vital few process factors that are critical to the behaviour of the process. Such process improvements must be significantly better than that quantified in the measure phase of the project. Ultimately, Black Belts recommend and implement solutions and establish a system to assure improvements are sustained.

A Black Belt is a technically competent individual that can formulate a problem and proceed to investigate such a problem in a scientific manner so as to effectively diagnose and administer a remedy. As shown in the MEASURE section of Figure 6, the



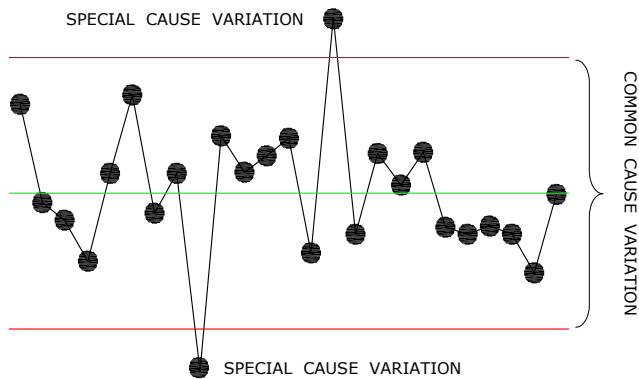
Black Belt will begin such a process by collecting data about a product or service feature that is not compliant to a specification. Depending on the type of data they may count defects or even better yet, employ a measuring device and collect numerical data that describes the product or service feature. With such numerical data the Black Belt may compute summary statistics that may be compared to a specification. In this manner, the Black Belt may determine the degree of compliance to the customer's specification. Collectively, this describes the capability of a



process. However, before any investigation is undertaken to identify the sources of variation in a process, a Black Belt

must be assured the numerical data obtained is free of significant measurement error and that its contribution is minimal. This is critical, since the numerical data collected is the sum of process and measurement error. Once the measurement system has been evaluated and its source of variation discounted, the Black Belt will analyze the data in time order so as to better understand the structure of variation present in the data. This is important since the data may be collected from a process that is either behaving under the influence of common or special cause variation, as shown in Figure 7. Common cause variation is the natural inherent variation in a process. Such variation, when present in a data set, will be

**Figure 7 Common & Special Cause Variation**



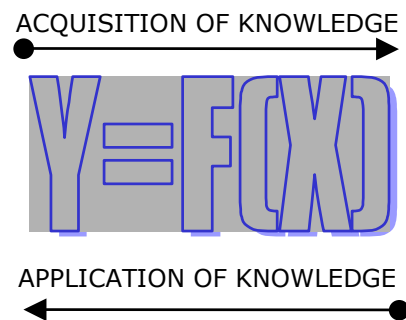
stable and predictable. Consequently, future predictions, about the process, may be made with confidence. However, in those cases where special cause variation is present the process will not be stable and predictable. In such a case, the time ordered data would display patterns or trends, excessive outlier's or a combination thereof. Therefore, future predictions cannot be made with confidence hence costs are unpredictable and the organization suffers financially. Understanding which sources of variation are present in a process is critical. It defines the nature of the Six Sigma project and provides details to the

types of variation that need to be addressed and the nature of the improvement activity required. Essentially, there are three ways to simultaneously reduce waste, cycle time, and costs, they are:

1. Control the process by eliminating special cause variation.
2. Improve the process by reducing common cause variation.
3. Design for variation by creating robust processes.

Identifying that source of variation we wish to address defines the nature of Six Sigma Project for the Black Belt. At this point, the Black Belt can begin to postulate and develop process theories. Such theories are then documented, hypothesised, and tested. Evaluated hypotheses will suggest which process factors contribute to the variation observed in a product or service. In this manner, we analyze the process factors and acquire process knowledge. This is the "acquisition of knowledge" as shown in Figure 8. Once those process factors that contribute significantly to the

**Figure 8 Acquisition & Application of Knowledge**



variation observed in our products and services have been identified we may apply such knowledge to control such factors. This is the "application of knowledge" as shown in Figure 8. We control such factors through specific process changes and specifications, along

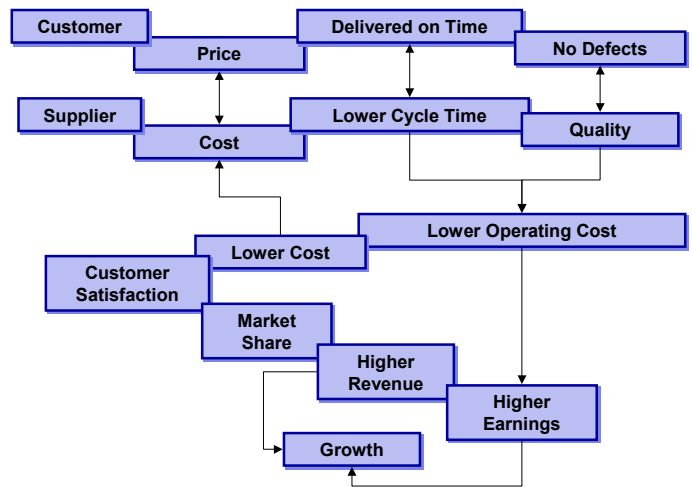
with continuous process monitoring. When a particular factor appears to be out-of-control we may appropriately respond to the process before the product or service becomes a victim of variation. In this manner, we have now designed controls and put in place a system that seeks to control those vital few process factors that affect the state of the product or service. The result is a product or service that meets specification and the expectations of the customer.

Once the improvement activity is verified, it must be validated continuously. This is the process management phase of Six Sigma. This becomes a management Champion's responsibility to assure the control plan for such a process is maintained and that improved levels of quality are realized. Additionally, the management Champion must communicate acquired process knowledge and assure methods and techniques are standardized and integrated across strategic business processes.

As more and more strategic business projects are complete, the number of strategic business processes, with improved levels of performance, will also increase. Depending on the goal of the strategic business project, an organization can expect to improve product or service quality, and show reductions in cycle time and cost. As operating costs decrease, with time, product and service savings may be passed on to the customer. Supplying the customer with a product or service on time, with high quality, at a reduced price will foster loyalty and repeat business. Such a customer will become an advocate. This will lead to customer satisfaction, additional market share, and the subsequent increase in revenues as shown in Figure 9. This will then add to the retained earnings of the organization.

The overall outcome will be a business with processes that can deliver a superior product or service, delight customers, shareholders, and employees alike. The result, is a truly world class organization.

**Figure 9** Six Sigma Creates Growth



Reprinted with Permission, 2003  
 © Copyright, The Knowledge Management Group 2002

Andrew Milivojevich is the Founder and President of The Knowledge Management Group, an organization specializing in the implementation of Statistical and Six Sigma methods to improve business performance.