



GUEST ESSAYS

Six What?

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If you've been to the bookstore within the last several years, looking for some sage advice about how to operate your a/e business more successfully, you've probably noticed the preponderance of books and periodicals written by well-respected management gurus on the subject of *Six-sigma quality systems*.

"Six- sigma..what's that all about?"

If your first reaction is "that's all Greek to me", you would be at least partly correct. Sigma is the Greek letter "s" and, you probably recall, it is used in statistics to represent variation. The operative term is variation. The *Six-sigma* approach to managing business operations applies statistical analyses, in a systems-wide context, to help you identify and understand variations in the outputs and the performance levels of business "processes". By understanding business operations as processes and by understanding their interactions within your overall *operating system*, you can identify and implement changes that *really* improve performance. You'll get more than a flurry of activities that just look good or feel good without delivering any long term documented value.

Where did six-sigma start?

Sometime back in the mid 1980s, Motorola coined the term Six-sigma and applied it to the firm's quality system. Later in the 1990s, GE adopted the term to describe its own continuous improvement initiatives. Now, in the new millennium, organizations across the globe are using the term.

Why the term six- sigma?

Six-sigma has a statistical meaning that is very specific. Here's a quick statistical refresher: If you collect data from a process that is stable, 99.73% of the data will fall within +/- three sigma of the process mean. The Six-sigma reference describes the idea that processes can be so dramatically improved that the new bell curve of plotted data would represent variations so slight that it would be almost unheard of for errors to occur. The object is to provide improved products and services resulting in increased business and profitability.

You are undoubtedly thankful for the refresher in statistics but you also may be wondering what this all means to your business. After all, we're in the a/e industry and all that statistical stuff is for manufacturing, isn't it? The answer is no. What's more, *Six- sigma* is not only about statistical analyses. Simply put, the application of Six-sigma is a business approach that focuses on continuous improvement. If you recall, the terminology of continuous improvement is generally attributed to Total Quality Management (TQM). You might consider Six-sigma as a sort of TQM on steroids.

We think Six sigma has potential value as a management tool for your a/e business. In the following sections we'll tell you where we see that value and we'll share some ideas about how you could integrate this approach into your business.

Six-sigma is not only for manufacturing...

Every business enterprise operates as a system of interrelated processes that interact and produce "outputs" that are delivered to clients (customers). Motorola, GE, GM and other well-known corporate giants operate complex manufacturing processes that produce and "output" finished products to their customers. Their applications of advanced quality improvement programs like TQM and Six-sigma to their consumer products manufacturing operations is widely reported. What is not so widely publicized, however, is that these same firms rigorously and effectively apply these same quality improvement approaches to the non-manufacturing divisions and units with equal and sometimes better results that is measured in real performance improvement.

A/e firms perform projects within their own unique operating environments (systems) that produce products such as plans, specifications reports, certifications etc. and services that might include expert testimony, advice, regulatory liaison, public presentations etc. that are "output" to their clients.

Managing the process to achieve prescribed outputs (performance goals)...

In a manufacturing process, dimensions, strength, appearance and cost are common criteria that define the performance "output" (finished product spec) of the process. Pressure, temperature, and viscosity are examples of in-process characteristics or variables that can and must be controlled so that the quality of finished products meets "spec". For a/e consulting firms, technical soundness, compliance with regulatory requirements, computational accuracy, timeliness, and cost are typical criteria that define the quality of the "outputs" of their project production process. Scope, staffing, schedule, budget and background data/info are typical process variables that can and must be controlled to produce project "outputs" that meet "spec". One key to business success in a project-based organization is to understand the project production/delivery processes and those other interrelated processes such as human resources accounting and information technology that exist to enable the organization to carry out its core mission which is to successfully complete projects.

How and where can you best deploy Six Sigma?

Practitioners within the Six-sigma discipline often speak in "holistic" terms about improving their organizations across-the-board. They consider the broad vantage points of all the stakeholders. Stakeholders include: clients, shareholders, owners, principals, technical professionals, support staff, sub consultants, suppliers and insurers. A powerful question is often asked, one that focuses energy on important issues and which is the pivotal question in understanding the application of Six-sigma technologies within your a/e firm: Where are we experiencing pain within our organization? Once this is defined, the technologies of Six-sigma, a toolbox full of techniques, is available to help remove the pain. Here are a few examples.

Are too many of your projects being completed late and/or over-budget? Is turnover of key employees excessive? Is employee morale or lack of responsibility and effort a problem? Is chargeability (billability) too low and, therefore, overhead too high? Are your work backlog and/or the hit rate on new project selections too low? Is marketing cost excessive? Are there too many technical and/or computational errors being made on projects? Is the cost of production rework and/or your liability claims expense too high? Are clients not sufficiently satisfied with the services you provide to them? Are your systems (e.g. computer network, telecommunications, filing/recordation, business information) performing inadequately

to properly support your business? Is your firm not meeting the ROE targets/expectations of its shareholders? Is cash flow a problem?

Regardless of whether or not you are currently feeling pain in one or more of these areas of your business, you should consider at least looking into the Six-sigma approach to continuous quality improvement to improve your business performance. Think of it as holistic medicine for organizations.

An Example...

Here's how one 300 person engineering firm used Six-sigma methods to solve a nagging staffing problem that was a point of significant organizational stress and pain...

This firm made its staffing decisions based on a work backlog reporting system that was woefully inadequate. Improvements to this system became a priority during a recessionary period when the backlog report projected the need to add 85 more technical staff. Each month, the firm's managers felt the pain as they wasted valuable time working up numbers that fed into a system that they knew was broken. The backlog reporting system was the CEO's sacred cow. When finally confronted about the ineffectiveness of the system, the CEO proclaimed that he would not abandon it until someone stepped forward with a new system that provided a better tool for predicting staff size needs of the operating units.

With the CEO's blessing and directive, two managers of the firm formed a Six-sigma team and used existing management information plus a proven Six-sigma tool called control charting to develop a new method for predicting staff size requirements. Control charts use simple statistics to signal changes in the system. Two of the key signal mechanisms are runs and trends in the data. Another is a spike in the data that is a single point above or below predictive limits derived from the firm's data called control limits. Through the use of control charts management can determine whether or not weekly variations in utilization numbers reflect natural (random) variation or are truly caused by action or inaction attributable to the technical personnel.

The team first assessed the firm's staff management needs and assessed the data that was already being compiled by the firm. They then worked closely with the CEO and the unit managers to develop a system that used selective sales, marketing and operations data as inputs for a series of control charts. Input data included weekly staff utilization (chargeability) rates, the net additional labor fees for work placed under contract each month and the amount of net labor billings by the firm each month. The system used a composite view of the control charts to give the CEO and most importantly the unit managers who control staffing, a more realistic view of future workload. The new method was also a predictive tool for identifying future staffing needs to meet future workload demands. The control chart technique provided a way to more clearly see trends and variations that were not visible in the old system. The unit managers and the CEO became accustomed to asking the basic statistical analysis question. Has anything changed in the overall system? If not, i.e. the overall system was stable and they had achieved an optimal staff size, change to staff size was not needed. Only a signal of change on any of the control charts would trigger the question.

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