Factors Affecting Six Sigma Project Selection In The Information Systems/Information Technology Arena

James J. Divoky, University of Akron, USA

ABSTRACT

The success of Six Sigma organization-wide requires that projects be resolved in a successful fashion and that the organization realize the benefits that these projects are supposed to deliver. The success of information systems (IS) and information technology (IT) projects depends on these projects being developed in such a way that they are deployed error free. The two development methods are different and the result is that many IS/IT personnel do not see where or how Six Sigma can be applied to their area. In this paper, we discuss factors that are unique to the IS/IT environment that need to be considered when selecting Six Sigma IS/IT projects so that both sets of objectives can be successfully realized.

Keywords: Six Sigma, IT projects, Project Selection

INTRODUCTION

The Six Sigma concept was introduced in the 1980's by Motorola in a revolutionary effort to reduce the number of defects in a manufactured product to the level of only a few parts per million. Since then it has, in general, come to mean a program of targeted excellence in an organization aimed at the elimination, or near elimination, of errors in performance from products, manufacturing processes and administrative processes. To embrace Six Sigma means to hold a common focus on excellence in everything done throughout an entire organization.

Bob Galvin's conviction that "if you take care of the customer better than your competition, the business will take care of itself" [17] has been borne out by many firms. General Electric, Sony, AlliedSignal, Motorola and Honeywell are but a few examples of Six Sigma success and the effects of that success on the bottom line. Because there is strong evidence that the successful implementation of a Six Sigma program in an organization can positively affect the bottom line, there has been a considerable body of research done to determine how to successfully implement such a program.

As more business transactions are conducted electronically, the impact of a properly operating Information Systems (IS)/Information Technology (IT) function increases proportionately. However, in an informal survey at the 2001 Annual Quality Congress, 80% of the attendees who were interviewed stated there IS/IT departments had advised them that quality initiatives did not apply to the IS/IT function! [16] The general feeling was that IS/IT did feel quality was important but they lacked the tools and techniques to apply and implement the Six Sigma philosophy.

In this paper, factors that influence the selection of successful of Six Sigma IS/IT projects are presented. Experience has shown that consideration of these newly identified factors can aid the IS/IT manager in applying Six Sigma thinking successfully in a wide variety of IS/IT settings.

OVERVIEW OF SIX SIGMA

Six Sigma is a well known approach to solving problems associated with quality and has been used extensively in manufacturing settings. At its most basic level, the approach seeks to apply a scientific methodology to a known problem with unknown causes and resolve the problem in such a way that the solution is sustainable and not just a short term fix. Concurrent with the investigation of a specific problem and implementation of a specific solution is the desire to capture and retain the organization learning that occurs regarding the management of quality.

Applying the Six Sigma methodology to a problem changes the problem into a project which encompasses five phases: define, measure, analyze, improve, and control. A project is defined through a stated charter that sets the scope of the investigation and identifies key process inputs. Metrics are established by which the process can be objectively measured. An analysis of root causes to the problem under investigation is undertaken, improvements made and controls established to ensure that the problem is solved in a sustainable manner.

Six Sigma is functionally deployed through training and mentoring with a project focus. Training provides the uninitiated with the basic tools needed to tackle projects. Successful projects result in the organization benefiting from improvements, and in promotion of the project leader to green, black or master black belt status. Individuals who have earned the higher designations then mentor the lower levels in the Six Sigma hierarchy which provides the organization with a Six Sigma knowledge base.

In a manufacturing setting, the results of a root cause problem can be obvious – for example, a part does not pass inspection. The metrics tend to be relatively easy to determine and the results of the improvement can be easily quantified. Oftentimes, organizations that embrace Six Sigma as a methodology to improve the manufacturing side of the house also couple it with other programs, such as lean manufacturing, so that a critical review of all aspects of a business process is undertaken. Here too, the results are relatively easy to observe, measure and appreciate.

A number of factors have been identified that influence the success of Six Sigma initiatives in an organization. Key factors include upper management support, training, organizational infrastructure, correct application of statistical tools, and appropriate rewards [1, 13]. When initiating a Six Sigma program, the 'why' and the 'how' of it should be clearly explained to increase the comfort level of the participants [14]. These high level factors are not sufficient to guarantee successful implementation, however. What they do is serve to set the organizational climate for a cultural shift to putting quality goals in everything that the organization does. In many organizations, this involves not only the production side of the business but the administrative and support sides as well.

The leap from manufacturing to non-manufacturing settings for the Six Sigma methodology is intuitively easy. An incorrect invoice amount, a less than helpful answer from a help desk, or not correctly changing a customer name and address are all failures of business processes that can and should be corrected. Resolving these 'transactional' problems, as they are commonly known, in a permanent, sustainable fashion can lead to greater organizational efficiency and effectiveness, which is exactly what Six Sigma strives to do.

There are significant challenges in applying the approach to transactional business processes. These may include a lack of historical data, administrative processes may not well documented, and measures of performance may be at the qualitative or attribute level. The last somewhat limits the application of all of the Six Sigma statistical tools commonly used in manufacturing settings. These success inhibitors can result in a sense of frustration for the project team. If the team is not successful, that experience can hinder the growth of the Six Sigma effort in the firm. Proper project selection and management can serve to minimize this type of Six Sigma project failure from occurring.

SIX SIGMA PROJECT SELECTION

Six Sigma projects reside in the gap between current performance and performance goals, as stated by either the organization or the customers of that organization. As such it is recommended that a portfolio of projects be available for selection [7, 10]. Recognizing that managing the selection among these projects is itself a critical business process can only improve an organization's understanding of and benefiting from the Six Sigma methodology.

There are many characteristics of good Six Sigma projects that have been identified in the literature. We will discuss four major, recurring ones. The first of these is the duration of a project. Projects should have a relatively short time frame. That is, they need to be able to be completed within six months and should specifically state the desired completion date [6, 8, 12]. A 2002 survey of 43 companies with newly implemented Six Sigma initiatives revealed 75 percent did not have a project selection methodology that assured on-time completion [3]. Other major themes in the literature are commitment of senior management, measurable outcomes, and a clear linkage to organization goals [3, 5, 6, 8, 12]. Each of these three will be examined in turn.

Senior management buy-in can be operationalized by including a champion on each project team, an individual with organizational power who is committed to the success of the project. This commitment should be demonstrated both in the short term and after the completion of the project, during the control phase (although the process owner, if other than the champion, will be involved at this stage, also). It is one thing for an organization to profess a commitment to the Six Sigma methodology, but quite another to assign a member of senior management to aid in sheparding projects through to their successful conclusions.

A measurable outcome returns us to one of the original challenges in applying Six Sigma to transactional processes: quality of data collected. Desiring more quality in business processes is not enough. Quality must be rigorously measured using metrics such as accuracy, completeness, error rates, cycle time, and cost. As John Crager, a project manager at APQC and a Six Sigma Master Black Belt, has stated, "...management must require that process measurement be treated with the rigor that it deserves. The decision making aspects of choosing and carrying out Six Sigma projects are based on strong, defined, and consistent measurement practices. To be successful, a strong measurement system must drive decision making." [8].

The final overall desirable project characteristic is a clear connection to the organization's strategic and operational goals. A quick way to check for this characteristic is to identify who the "customers" are who use or receive the output of the process being improved. If this identification is difficult to accomplish, all the process improvements in the world are not going to get noticed, and certainly will not be reflected in the organization's bottom line.

Jackenthal [6] and Pyzdek [10] have independently proposed structured project selection methodologies. Each recommends defining evaluation criteria such as the four characteristics discussed above, and then assigning a score for each proposed project on each criterion. A subjectively weighted average score can then be computed and the items in the project portfolio ranked according to this composite. The exercise itself will in many cases be enough to help guide the selection of the next project. Pande, et. al. [9] also provide three categories of selection criteria: business benefits criteria, feasibility criteria and organizational impact criteria. These can be seen to somewhat proxy the three characteristics of satisfying the customer/increasing profits, time duration, and linkage to organizational goals.

The goal of these evaluation criteria is to provide a portfolio of Six Sigma project opportunities to the organization that can be successfully completed. This should reduce the chance of a project failure and better ensure that what the project is designed to accomplish is actually realized. In the next section we look at project risk in the IS/IT area and propose new factors that should be considered when selecting Six Sigma IS/IT projects.

IS/IT SIX SIGMA PROJECTS

A traditional IS/IT project is typically the development or deployment of a new software or hardware configuration. The difference between how such a configuration should operate and how it does operate upon cutover is termed project risk. Moreover, an organization needs to determine where on the technology curve they desire to be. Thus, many organizations have developed a portfolio approach to categorize projects so that the growth and direction of IS/IT can be better managed. As is true for Six Sigma projects where projects need to be carefully selected to maximize current and future benefits, IS/IT projects need to be carefully selected as well.

There have been a number of research studies that have focused on the area of IS/IT project risk. Cash [4] proposed assessing project risk along three dimensions, size, cost and structure. Barki et al [2] looked at the organizational environment including task complexity, extent of changes, resource sufficiency and potential loss. Keil et al [7] developed a four quadrant framework that could be used to examine the risk associated with software projects. Sumner [14] examined the issue of risk within the context of enterprise-wide projects. The goal of these research efforts has been to uncover underlying sources of IS/IT project risk and to propose some management tools or combination of management tools that can be used to mitigate some of that risk. Winklhofer [15] notes however that IS project management during a time of organizational change is different from project management in a stable organization.

The factors that have been identified that contribute to IS/IT project risk have traditionally been for the development or deployment of new systems. Six Sigma IS/IT projects are fundamentally different. These projects involve IS/IT **processes** and primarily deal with existing systems or procedures and as such are not net new systems. This fundamental difference is not well understood by IS/IT professionals. They are familiar with their own methodologies for selecting and then developing and deploying systems in an error free fashion. These development methods include such well known strategies as prototyping, the life cycle approaches, rapid prototyping, as well as variations of these methods. From the IS/IT perspective, these tools are all that are necessary to effectively produce error free results. From a Six Sigma perspective, which is more overarching, these tools only seek to eliminate error in the outputs that the IS/IT department produces. They do not effectively address other sources of error. The narrower definition of error that IS/IT departments use thus gives rise to the advice that quality initiatives did not apply to the function [16].

Six Sigma **can** be successfully applied in the IS/IT environment. The first obstacle to overcome however is resolving the differences between the definitions that the two groups use for 'project' and 'error'. This can be accomplished through training and conversation aimed at expanding the IS/IT professional's perception of how Six Sigma actually works.

The second obstacle to the successful implementation of Six Sigma in IS/IT is for the leaders of the Six Sigma IS/IT initiative to better understand the interconnectedness and the independence of typical IS/IT activities. Typical process activities under IT control include stand-alone services such as the help desk, networks and pc repair. Developmental activities include the development and deployment of either hardware or software over all or part of the organization Last are maintenance activities of long standing applications and systems that are referred to as legacy systems.

The third and most difficult obstacle that needs to be dealt with is managing the risk associated with Six Sigma IS/IT projects such that the objective of managing the Six Sigma project portfolio – sustained improvement - and the objective of managing the IS/IT portfolio - forwarding/managing the IS/IT growth of the organization – can be accomplished. Overcoming this obstacle requires that the Six Sigma mentor become familiar with issues of risk that combine both project perspectives. Our experience indicates that there are three major project dimensions that need to be considered to successfully manage Six Sigma IS/IT project risk.

The first dimension when assessing the risk of IS/IT Six Sigma projects is the degree of project independence. The more independent the process that the project investigates, the lower the risk associated with the project. Independent projects, in a stable environment, benefit from the traditional project management tools that

serve to formalize the control mechanisms of the project. Among these tools are PERT, CPM, milestone setting, formal presentations of both progress reports and milestone/variance reports. Also, because these projects are tied to a specific function, a formal change mechanism should be in place that can be reviewed if the charter of the project is to be altered as it progresses. Projects that display a high degree of interconnectedness; that is result implementation can cause a 'shockwave' of change in existing systems, will benefit from a team that has a solid working relationship with each other and with the areas that can be tangentially affected. Experience has shown that the team leader should have strong technical skills to better appreciate and diminish the shockwave effect.

A second dimension that should be assessed for Six Sigma IS/IT projects is the extent to which the project results are expected to impact end user processes. For example, changing the work process at a help desk such that calls are documented and responded to within a given time frame affects the internal operation of the IS/IT department, but not necessarily the end user. Changing the process by which an end user requests help more directly involves action by the end user community and therefore has a direct effect on the success of the project. The risk factor that emerges as critical to the success of these projects is end user resistance to change. Resistance to change must be managed from the onset of a project. Failing to do so may result in the benefits of the project not being fully realized. Strategies to manage resistance to change include placing an end user on the project team, inclusion of end user training in the project scope, linking the success of the end user to the success of the project, and allowing for end user input to the project charter. In essence, in the Six Sigma environment, permitting the end user to also take ownership of a project that will eventually affect them reduces their resistance to change.

An example of successful end user involvement at one company involved running a repeatability and reproducibility analysis on a pricing task. Six managers were asked to quote prices to customers who qualified for various discounts and the resulting prices were then compared. The scenarios used were based on real customer requirements and the managers each did the pricing task twice, some weeks apart. Although each manager was repeatable (arriving at similar prices for the same scenario), there was very little reproducibility. That is, each of the six arrived at very different quotes for the same scenario. Once they realized how different the processes were that each had been using, their resistance to applying the Six Sigma methodology to the situation vanished.

A third dimension to be considered when examining Six Sigma IS/IT projects is that of revisitation. Revisitation refers to the time that has passed since the process under examination was last examined or established. It is basically a dimension of politics and trust in the IS/IT and Six Sigma projects that have been done in the past. Recall that Six Sigma projects have as a goal the correction of root cause problems in a permanent fashion. If the process for a project was recently established, either by a previous Six Sigma project or by the standard development process of the IS/IT department, then an early reexamination of the process contributes to a general feeling of 'why didn't they do it right the first time'. Reexamination of a process can be more easily handled when there is a change in the leadership of the IS/IT area, or when there is a significant change in the technology that would be used to implement the process that is under consideration.

An example of early revisitation occurred when a large company acquired another firm in the same business. Each entity had its own quality programs in place, as well as IS/IT departments, sales staff, etc. Upon acquisition and subsequent merging of common functions, the new entity found itself revisiting many Six Sigma projects that had had a successful conclusion in one of the formerly independent firms. The projects needed to be redone in order to establish common, good, business processes for the new entity. In this situation, although there was some frustration and a sense of 'didn't we just do this?', the projects were more easily conducted due to the recognized necessity of getting everyone on the same page.

These examples are from large organizations which have successfully implemented Six Sigma in manufacturing settings and also in some transactional settings. The organizations were experiencing difficulty in obtaining the same success rate in Six Sigma projects as in IS/IT projects. It was discovered that it was not due to the lack of the commonly recognized factors that contribute to Six Sigma success. Rather, it was due to the characteristics of the environment that surrounds the IS/IT function which in turn shapes IS/IT attitudes about the need for Six Sigma. By paying attention to these characteristics when selecting Six Sigma IS/IT projects, the ability of the organizations to realize the benefits from successful Six Sigma IS/IT projects increased considerably.

CONCLUSIONS

There are many factors that enable the successful transition to a Six Sigma organization. Without top management support, appropriate training, and proper mentoring, Six Sigma initiatives will not achieve the organizational benefits that are expected. In addition, because Six Sigma has a project orientation, it is critical that projects be successfully resolved. While typical project management tools assist in these efforts, they alone are insufficient to guarantee project success. A critical factor is selecting the right projects to pursue.

Typical IS/IT projects are developed according to some variant of a life cycle approach to IS/IT development. These development approaches are targeted at delivering an error free IS/IT project when it is first used. While these development approaches serve to reduce the IS/IT risk associated with those projects, it is not sufficient to reduce the risk of Six Sigma project failure.

The uniqueness of the environment that these projects reside in calls for a different perspective regarding Six Sigma project selection. We have identified three factors that are applicable to the Six Sigma IS/IT project environment, and have suggested managerial actions that can be taken in a proactive fashion to help negate the risk of project failure. These factors are the degree of project independence, project impact on end users, and project revisitation.

Reducing the risk of Six Sigma IS/IT project failure has three constituencies that will benefit: the organization as a whole, the IS/IT department, and the organization's Six Sigma initiative itself. The financial benefits to the organization from a successful project are obvious, and constitute the underlying reason for the project. The IS/IT department will benefit from increased credibility within the organization, and the Six Sigma movement benefits by demonstrating that Six Sigma projects can be successfully carried out in a non-manufacturing setting. This last benefit is more and more being recognized as critical to the efficient and effective operation of a Six Sigma organization.

AUTHOR INFORMATION

Dr. James Divoky is a faculty member in the Management Department at the University of Akron. His research interests include the application of quality assurance methodologies to the information systems area, statistical quality control and the deployment of course embedded rubrics to assess classroom learning.

REFERENCES

1. Antony, Jiju, Ricardo Banuelas. (2002) Key Ingredients for the Effective Implementation of Six Sigma Program. *Measuring Business Excellence*, 6(4): 20-27.
2. Barki, H., S. Rivard, and J.Talbot. (1993) Toward an Assessment of Software Development Risk, *Journal of Management Information Systems*, 10(2): 203-225.
3. Brice, Zachery and Jim Braddock. (March, 2002) The Importance of Project Selection: Why Six Sigma Projects Falter, How to Assure Success and Sustainability. *Six Sigma Qualtec White Paper*, www.ssqi.com
4. Cash, James, F. Warren McFarlan, James L., McKenney, Michael R Vitale. (1988) *Corporate Information System Management: Text and Cases* 2nd Edition, Irwin: Homewood, Illinois.
5. Di Nunzio, Enzo and Stephen Villaescusa. (2002) Six Sigma Project Selection, www.onesixsigma.com
6. Jackenthal, Ed. (2004) Six Sigma Project Selection: Don't Follow - "Ready, Fire, Aim", www.staffing.org/articles/
7. Keil, Mark, Paul E Cule, Kalle Lyytinen, Roy C. Schmidt. (November, 1988). A Framework for Identifying Software Projects, *Communications of the ACM*, 41(11): 76-83.
8. Leavitt, Paige. Lessons Learned In Six Sigma Implementation, APQC White Paper #110288, www.apqc.org
9. Pande, Peter, Roland Cavanaugh, Robert Neuman. (2000) *The Six Sigma Way: How GE, Motorola and Other Top Companies are Honing Their Performance*, McGraw Hill Professional.

10. Pyzdek, Thomas. (November, 2001) Six Sigma and Beyond: Scoring Six Sigma Projects, *Quality Digest*, www.qualitydigest.com
11. Rusin, Richard S., Anne-Marie Williams. (2001) Challenges in Incorporating a Quality Strategy into Information System Development Efforts, *Topics in Health Information Management*, 21(4): 21-29.
12. Snee, Ronald D. (March, 2001) Dealing With The Achilles Heel of Six Sigma Initiatives: Project Selection Is Key To Success, *Quality Progress*, 34(3).
13. Snee, Ronald D., William F Rodebaugh Jr. (September, 2002) The Project Selection Process, *Quality Progress*, 35(9): 78-81.
14. Sumner, Mary. (2000) Risk Factors in Enterprise-wide/ERP Projects, *Journal of Information Technology*, 15: 317-327.
15. Winklhofer, Heidemarie. (June, 2002) Information System Project Management During Organizational Change, *Engineering Management Review*, 14(2).
16. Young, Tim. (February, 2002) Merging Six Sigma and IT, *Six Sigma Forum Magazine*, pp 38-40.
17. http://www.pridepublications.com/cont/qualityquotes.html

NOTES

NOTES