Considerations Regarding Project Selection for Technical Training

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Abstract

Implementation of continuous improvement initiatives (e.g., Sigma Science®[2] Six Sigma[3], Lean, Total Quality) is a widely recognized approach to realizing enhanced business results. These initiatives typically include a deployment and a sustaining phase. The deployment phase includes education and application to justify and convince the organization of the potential benefits. Application of the methodology utilized by the initiative is imperative to demonstrate the effectiveness of the initiative. Initial questions organizations ask when they embrace a new initiative concern advice on project selection. Providing guidance regarding project selection is a challenge. The selection of appropriate projects is highly dependent on the situation. In this paper I provide recommendations on considerations for project selection for various situations. It may be useful to create a *process* for project selection as criteria for project selection will no doubt be dynamic over changing business conditions.

Introduction

Achieving results in business is a fundamental requirement. The question is how to most efficiently and effectively achieve results. Using projects as a basic deployment strategy for planning, organizing, allocating resources, and ultimately meeting objectives is common in business. It seems nearly every business objective is realized through some type of *project*. Launching a new product, implementing a revised cost accounting system or improving a production process are activities typically accomplished via some type of project. Key elements to being successful at using a *project-based* scheme include understanding:

- Motivation (Why is the project being started? What does success look like?),
- Definition (What questions need to be answered),
- Organization (Who will be involved, accountable?),

[1] Bill is the founder and CEO of Sigma Science Inc.
[2] Sigma Science is a registered trademark.
[3] Six Sigma is a registered trade mark of Motorola

- Resource allocation (What resources are available? What is the sense of urgency?),
- Measurement (How will success be measured?), and
- Follow-up (What are the key learnings and next steps of investigation?).

Considerations for project selection include:

- the organizational needs, culture, structure, and abilities,
- the intent of the effort,
- development of individuals,
- time and resource constraints.

The remainder of this paper assumes projects are being selected for use with Sigma Science training, although the ideas may have much broader applicability. It has been observed organizations tend to **select projects** for use in *application* training for at least one of the following reasons:

1. Support organizational strategies,
2. Achieve some short-term financial or improvement objective,
3. Emulate the training content,
4. Meet corporate educational metrics,
5. Out of convenience, and
6. With little thought at all.

Clearly the last three selection methods are deficient. Choosing to use one of the first three selection criteria requires thoughtful consideration.

Execution	**Discovery**
Implement	Understand
Answer	Question
React	Plan
Intuition	Data
Enumerate	Analytic
Fire fight	Prevention
Roadmap	Critical Thinking
Explain	Predict
Linear	Synergistic

Figure 1: Project Continuum

Discovery Projects

An overly simplified description of the project continuum is illustrated in figure 1. At one end of the continuum are *discovery* projects, at the other end are *execution (or implementation)* projects. Most projects start somewhere between the extremes of the continuum. It is hoped parts of the project will move from discovery to implementation after sufficient knowledge is gained.

Projects that start on the implementation end of the continuum are primarily completed as a function of project management skills (e.g., resource allocation, organizational alignment, communication, and risk management). Implementation projects are the compilation of the successful execution of tasks that are well understood (often accomplished by following a set of pre-determined steps). These types of projects are designed to implement solutions or “fixes” (whether the solutions are right or wrong). Examples include capital installation of equipment, replacing a failed subassembly with another type of subassembly, reduce the gauge of the metal used in the product, meet regulatory requirements, etc. These projects tend not to lend themselves to a Sigma Science class. They typically do not include an element of discovery. This is not to say project management training for particular tasks or on the organization of tasks (e.g., action plans, Gantt charts) is not useful.

The greater the element of unknown, the closer a project is to the discovery side of the continuum. For instance, many projects found in design engineering, research and development environs are close to the discovery end of the continuum. In general, the concepts underlying Sigma Science deal with the fact process and product variation is known to be a strong factor affecting manufacturing lead times, product and process costs, process yields, product quality, and ultimately customer satisfaction. A crucial part of Sigma Science work is to define and measure variation with the intent of *discovering* its causes (Y=*f*(x)) and to develop efficient, operational means to reduce and control the variation or make products robust to such variation. The majority of projects for use in training individuals on Sigma Science Methodology are biased towards the discovery side of the continuum. There should always be an element of discovery involved. Projects; *Understand the sources of variation on a manufacturing* *line or understand what factors affect the product performance*, are projects where there is certainly an element of discovery, and there likely will be an implementation phase where a solution to control or mitigate the sources of variation is put in place.

Consideration One: Sigma Science projects should involve an element of the unknown. An element of discovery (and the tools associated with discovery) is required. The project should be considered "a study".

Organizational Deployment Strategy

As more organizations initiate improvement efforts, variations in organizational approaches have become apparent. "The concepts and tools also vary across organizations. It would be just as unreasonable to think a single deployment strategy would be effective across all organizations as it is to argue only one set of tools is needed regardless of process or product."[4] The deployment strategy an organization chooses has implications in terms of project selection. What is the organization trying to accomplish and how will training align with these objectives? A list of potential organizational objectives:

- Reduce cost
- Increase throughput
- Expand market share
- Become more competitive
- Open new markets
- Add functions to the product
- Improve product performance and reliability
- Improve customer satisfaction

Overly simplified examples of various overall deployment strategies:

I. Company-wide involvement

I have been involved with organizations whose intent was to energize the organizational *quality* culture. Sometimes these companies use the new initiative to replace the

[4] Sanders, Doug and C. Hild, "A Discussion of Strategies for Six Sigma Implementation", Quality Engineering, Vol. 12, No. 3, 2000.

current *quality* process. Since this type of strategy usually involves training everybody in the organization at some level, wide variation in project application is required. It would not make sense to assign a clerk responsibility for the optimization of a product line, nor would it make sense to assign a manufacturing supervisor the responsibility for implementing a new cost accounting system. An unfortunate artifact of many *company-wide* efforts is a training curriculum is pre-determined independently from the individuals participating in the course. If everybody regardless of job description, process or functional area, or individual experiential and educational background receives the same training, the depth of material coverage is necessarily compromised for breadth. The emphasis is on awareness across all functions and levels of the organization. Much of the training is motivational in nature, primarily communicating the philosophy, fundamentals, and vocabulary. It does not focus on the understanding of the tools and their situation dependency. Curiously it seems the majority of ill selected projects I have seen are in this setting. As an extreme example one organization required individuals to select their own projects with no knowledge of the company objectives! If this deployment strategy is the choice for an organization, there should be projects available that mostly require effort and attention using existing skill sets rather than the need for an enhanced skill set to complete the project. In essence the curriculum need not be modified for the classes or the individuals.

II. Technical focus

Organizations where an identified need is the enrichment of the skill set of the engineering (or technical) part of the organization, both manufacturing and design. These disciplines have the desire to be more efficient and effective. In this setting, where a technical set of skills to supplement engineering knowledge is taught, there is a commonality to the projects selected for inclusion into the training. The project objectives are almost always based on new product development, selecting appropriate product changes, or on problem-solving efforts on the manufacturing floor. There is likely an element of discovery. Identifying sources of variation or refining knowledge concerning variation for either product or manufacturing performance. The criteria for project selection usually center on the expansion of process and product knowledge (a useful byproduct of which is increased operational efficiencies or product improvements.) I refer to this implementation strategy as a *Technical* in nature. Here the strategy is associated with a set of skills meant to supplement engineering knowledge. I have been involved with similar strategies where the training content is designed to augment a specific type of knowledge (e.g., chemistry in the development of a new ink, physics in the optimization of air flow). This commonality of scientific background allows in-depth teaching of specific technical tools, which in turn allows project selection to focus on issues that require an enhanced skill set to solve the problems more efficiently and effectively than has historically been the case. The implication on curriculum is customization by project (situation) application.

III. Application specific focus

Another less commonly used deployment strategy is *application specific.* In this strategy emphasis is on short-term problem resolution. Some what like just-in-time training. A certain set of individuals are chosen, where projects align with specific problems. Projects are selected to support specific parts of organizational initiatives, site objectives and mostly resolution of specific issues. Since these are typically one-offs, the curriculum must evolve with the project iteration. There is less focus on the individuals understanding the material and more emphasis resolving the problem.

IV. Becoming Self-Sufficient

This deployment strategy seeks to internalize the deployment of the methodology. Typically select individuals are meant to learn and master the methodology and be involved in the expansion of the use of the methodology inside the organization. In this case, emphasis is on multiple repetitions augmenting the individuals' skill set. Projects are chosen with the intent of individual development. Curriculum is modified to the needs of the individuals in the training.

Consideration Two: The strategy selected for Sigma Science deployment dictates, to a great extent, educational curriculum and therefore project characteristics. I recommend alignment with the deployment strategy.

Development of Individuals

Many organizations deploying Sigma Science have as a primary, or more typically an ancillary objective, the enhancement of individuals' skill sets. In this case, projects are selected to support the learning of the course material. These projects may or may not be immediately critical to the organization (although often they can be selected to support organizational objectives – a building block strategy). This strategy can yield return on investment superior to other strategies, but an organization must be fully committed (i.e., willing to compromise short-term financial or improvement objectives for the long-term benefit of the individuals). Interestingly, but not surprising, large-scale projects are approached with more confidence by an individual with repetitions of the methodology under their "belt". Here project selection is partially dictated by curriculum (usually selected for organizational reasons). Therefore success of this strategy partially depends on the depth of understanding of the curriculum by the organization. Because development of individuals is often an ancillary objective, a common strategy is to assign multiple projects to each participant in the training. At least one of these projects is deemed of scope and scale such that a complete iteration of the new methodology is possible over the course of the training cycle.

Consideration Three: At least one project, or phase of a project, should be selected with the primary intent of developing a new set of skills in the individual.

Organizational Motivation

In concert with the development of the individual is the need to motivate and involve the organization as a whole. A long-term objective of Sigma Science deployment is a highly motivated and technically capable organization. Some deployment strategies attempt to dictate (or force through policy deployment) motivation, "pushing" programs on the organization. These programs are rolled out with much fanfare and little content. They ultimately result in a frustrated, apathetic organization with people looking for whom to blame rather than how to improve. There is little doubt success breads success. Success is, unfortunately, usually measured in dollars. It is certainly advantageous to select projects that will achieve some early quantifiable results to motivate further efforts. There are, however, potential pitfalls when money is the only consideration for project selection (e.g., Missing greater opportunities, process sub-optimization, difficulty in quantifying actual dollars, conflict over whether savings are real or not). However, given the current state of business, financial considerations will be the biggest motivator.

An alternative approach is to create a *pull* for the use of the methodology. People want to be associated with those things they deem worthy. They will be willing to go above and beyond if they feel there is something in it for them. Identification of and establishing success criteria for project areas agreed upon by all participants is essential. Also this may be accomplished by selecting projects likely to be successful. Criteria may include:

1. improving historically poor performance,
2. small scope application (e.g., area of impact), and
3. understanding measurement uncertainty (or improving ways to quantify the phenomena).

Consideration Four: Do not try to solve the company's biggest problems first. Select projects that will result in some quick success. Set quantifiable, measurable goals. Success breeds success.

Cross-functional Cooperation

Resources available for continuous improvement are limited. Often functional areas are competing for the same resources. Perhaps management wants certain groups or functional areas to co-exist and communicate better. Projects that cross organizational boundaries will require communication, behavior and attitudinal changes to complete. Selecting projects that **require** coordination across departmental or functional boundaries will facilitate cooperation. Establishing measurable "common" goals and defining success for projects, and including these in individual and management performance criteria, will drive the cooperative effort. These projects will also provide an opportunity for the individual to hone their facilitation and leadership skills.

Consideration Five: Select at least one project that will cross functional boundaries and will require organizational cooperation. Recognize the interrelationships of aspects of the project with other functions competing for resources.

Project Definition

The first stage of project deployment is definition. An important reason for defining a project, as far as management is concerned, is for resource allocation and to calculate return on investment. The resources include the amount of time (see table 1), people and money committed to achieving a specific result. Traditional management systems require the ability to "cost justify" any activities in the business. An interesting dichotomy is uncovered in project definition. The project needs to be defined in terms that cannot be understood *á priori*. To have enough information to clearly define a project's results and necessary resources before the project is started is virtually impossible (if this could be accomplished, the project probably does not need to be done!). However, there are some important aspects relating to project deployment that are assisted by thoroughly describing the project in the definition stage.

TABLE 1: Temporal characterization of Projects

Short-term *temporal continuum*	**Long-term**
🗎 specific and concrete	🗎 general and ambiguous
🗎 focused on one objective	🗎 impacts multiple metrics
🗎 easier to measure	🗎 quantification difficult
🗎 special cause action	🗎 common cause action
🗎 lower level in hierarchy	🗎 crosses multiple levels
🗎 less resource intensive	🗎 resources/patience needed
🗎 problem resolution	🗎 problem prevention

Project definition is helpful to both the individuals/teams working on the project and to management responsible for orchestrating multiple projects. The definition should suggest the scope of the work. What areas will be included in or be affected by the results (e.g., design, supplied materials) of the project and what areas will not. What factors can be changed and which cannot be modified? Hypotheses on what project completion will look like (When will the results justify ending the project?). How will success be measured? Success in terms of short-term goals (e.g., cost savings, cycle time reduction) and long-term objectives (e.g., improved ability to satisfy the customer, better prediction of market requirements, increased understanding) should be discussed and established. The link and relationship between the different metrics used to measure the project should be clarified. There are many cases where a project is considered successful by achieving short-term success only to recognize later it has sabotaged long-term improvement. Advice on project definition includes:

1. State projects in the form of some question (or set of questions) that need to be answered. This drives discovery work.
2. The scope of the project needs be aligned with the resources available and the timelines established.
3. The level the project is directed at (e.g., one step in a manufacturing process or the entire design process) must be commensurate with the person's abilities assigned the project.
4. Projects that require teamwork, and many do, should not be personified (i.e., they should not be called *someone's* project).
5. Projects should not be labeled *Sigma Science* projects as this sends the message the tools should only be used on such designated projects.
6. There must be some measure of progress and results. Including metrics in the definition of the project may be beneficial.
7. The project definition must not include the solution. This would prevent thorough investigation and learning (discovery).
8. Ensure the rationale for project selection is understood and communicated.

Note: In practice, the probability of selecting the "right" project from the start is fairly low. Therefore, assign more than one project to begin with in hopes somewhere in the host of projects there is a "good" one. Expect the project definition to iterate.

Consideration Six: Define projects and success before the project begins. Ensure the definition and intent is appropriately communicated within and between functional areas and that success is operationally understood.

Organizational, Individual and Project Alignment

Most organizations are trying to improve. The question is when, where and by how much? Has there been enough improvement for the time being? It is a question of the level of knowledge that can be demonstrated. Selecting projects consistent with continuous improvement, recognizing how each project fits together and how projects augment each other, requires great foresight. Often the results cannot be measured in short time frames. If results are the culmination of many projects it may take years to come to fruition. This is particularly true for transactional type projects.

There exists today, in many organizations, disconnect between individual and organizational performance criteria. Understanding the relationships between the mission of the organization, the objectives of the management team, and the goals of the individuals is essential to suitable project selection. Ultimately there will be a need for resources to be allocated for the project to be successful (e.g., a measurement study, an experiment to be run). The resources will only be made available if there is a return on investment link established (In terms of the manager responsible…What's in it for them?).

It is recommended for the project to be selected first as it is easier to align the project with the needs of the organization, however this may depend on the depth of organization engineering talent. The individual is then selected based on their abilities to coordinate the project. The individual should be at the appropriate level in the organization to implement changes, possess the necessary *fundamental* product/process knowledge (e.g., engineering, scientific theory, first principles), command suitable interpersonal skills (e.g., communication and organizational), and be open-minded.

Consideration Seven: Align project goals with the organization first, then with the individual. Set goals for Project Managers and Candidates (These can and may be different).

Individual Learning vs. Corporate Focus

Yet another way to look at the issue of project selection is by contrasting the educational and corporate objectives (see table 2). The challenge is to appropriately mix the needs of the corporation with the needs of the individual.

Table 2: Individual vs. Corporate Objectives

Individual Learning *continuum*	**Corporate Results**
foundation based on theory	results oriented
start remedial, lots of reps.	work on current issues
iterate, scientific method	complete project on-time
projects support learning	projects affect bottom line
allow time to practice	do it right the first time
optimize learning	optimize return on investment
individual focus	corporate focus

Conclusion

Project selection is a process that will be repeated many times regardless of the motivation or initiative. Therefore, like any process, it makes sense to document it, measure it, understand it and improve it. It is recommended to establish a *seedbed* of projects often the result of problems uncovered while working on another project. In the selection process then, specific criteria, appropriate at that point in time, can be applied and projects selected. This paper attempts to provide some elements of project selection that should be considered to be more effective. Certainly the considerations are overly simplified and generalized as each situation may require some fine-tuning. Although “all models are wrong”[5], hopefully these considerations are useful.

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