Improving the Information Technology Service Management with Six Sigma

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Summary

Over the last few years, the number of organizations that deliver information technology (IT) services is increased. There are some frameworks such as Information Technology Infrastructure Library (ITIL) for IT Service Management that consists of a set of guidelines that specify what an IT organization should do. However, they don't explain how to do it. For example, they specify that IT should allocate a priority for each incident that comes into the service desk, but they do not specify how to allocate those priorities.

Six Sigma defines a process improvement approach that is based on statistical measurement, drives quality improvement, and reduces operational costs that companies such as Motorola, Allied-signal and General Electric have used to produce millions of dollars in bottom-line improvements. It helps in developing detailed work instructions, and it defines a methodology for continually mapping, measuring, and improving the quality process. Six Sigma can help to determine, how an IT organization manages its services in order to increase the quality of IT delivery processes. Our objective in this article is to improve the quality of Information Technology Service delivery and support processes with Six Sigma.

Key words:

Information Technology (It), Six Sigma (6σ), Information Technology Infrastructure Library (ITIL), Information Technology Service Management

1. Introduction

There are two approaches that can be used to improve information technology service management (ITSM): the ITIL and Six Sigma.

Many followers of these seemingly mutually exclusive approaches exhibit a nearly religious zeal in defending their way as being the only way to go. Rather than being opposing approaches, however, Six Sigma and ITIL are complementary.

The organizations are now so dependent on IT, they will fail without it. And yet, it is a reality: when critical IT services are not available, the business suffers. As a result, organizations have launched a search for tools and processes that will help them guarantee service. Some organizations have turned to outsourcing, hiring a third-party to handle this risk, while others have found value in over capitalizing on their IT infrastructure using redundancy to eliminate bottlenecks and other performance problems.

The ITIL provides a library of "best-practices" for IT service management. It defines a framework for ITSM. It based on industry best practices indicate IT organization's roadmap without clarifying the way to do it. With ITIL, it's up to the IT staff to flesh out the details of process flow and create detailed work instructions, all in a way that makes sense for their organization.

Six Sigma tells how, but it doesn't tell what to do nor does it specify any best practices specifically for ITSM. In summary, ITIL defines the "what" of service management and Six Sigma defines the "how" of quality improvement. Together, they make a great combination for improving the quality of IT service delivery and support. This paper presents a description of ITIL and Six Sigma, and discusses how they can be used together to improve IT service through best practices.

The ITIL manuals themselves embrace many aspects of service level management: from service delivery through to cost management. In its current manifestation, ITIL is touted more as a set of guidelines rather than the standard that is ultimately necessary to ensure the success multiple teams of people working on service improvements throughout the organization.

Proxima Technology believes that services delivered though ITIL processes can be further optimized by the Six Sigma quality management method. Six Sigma ensures the service improvement program is focused on critical business areas (called critical to quality), provides tools and techniques for continuous improvement, and a measurement system that provides valuable metrics. In addition, Six Sigma also provides a tangible way of reporting on the successes achieved with ITIL, without which the program may fail [1].

The paper illustrates the methodology of the combination of ITIL and Six Sigma. The outline of this paper is as follows. Section 2 explains about ITIL. Section 3 clarifies the Six Sigma (6σ). Section 4 describes combining Six Sigma and ITIL. Section 5 is about developing the

methodology and finally section 7 gives the conclusion for this paper.

2. The ITIL overview

ITIL documents best practices for ITSM and is used by many organizations around the world, though originated as government initiatives in the UK and Holland [1]. ITIL consists of a series of books giving guidance on the provision of quality IT services, and on the accommodation and environmental facilities needed to support information technology. It contains an integrated set of well-documented modules that include [1]:

1. Service Support: This set describes: Configuration Management, Incident Management, Problem Management, Change Management, Release Management, and Service Desk Function.

2. Service Delivery: This set describes: Service Level Management, Availability Management, Capacity Management, Financial Management, IT Service Continuity Management, and Security Management.

3. Planning to Implement Service Management: Explains the steps necessary to identify how an organization might expect to benefit from ITIL and how to set about reaping those benefits. It helps organizations identify their strengths and weaknesses, enabling them to develop the former, and overcome the latter.

4. ICT (Information and Communications Technology) Infrastructure Management: Covers Network Service Management, Operations Management, Management of Local Processors, Computer Installations Acceptance, and Systems Management.

5. Applications Management: Deals with software life cycle support, testing of IT services and business change with emphasis placed on clear requirements, definition, and implementation of solutions to meet business user needs.

6. The Business Perspective: Helps business managers understand IT service provision. Issues covered include Business Relationship Management, partnerships, outsourcing, continuous improvement, and exploitation of ICT for business advantages.

7. Security Management: Helps the IT Security Officer provide the level of security necessary for the provision of the total service to the organization. The guide focuses on the process of implementing security requirements identified in the IT Service Level Agreement, rather than considering business issues of security policy. The relationship between these documents is shown in Figure 1.

Each module facilitates the quality management of IT services and of the IT infrastructure in the organization. The codes of practice are intended to assist organizations to provide quality of IT service in the face of budgetary constraints, skill shortages, system complexity, rapid change, current and future user requirements, and growing user expectations.

The ITIL provides the foundation for quality ITSM. The widespread adoption of ITIL guidance has encouraged organizations worldwide, both commercial and non-profit, to develop supporting products as part of a shared ITIL philosophy. The Information Technology Service Management Forum (ITSMF) is a global consortium of more than 400 international corporations and 4,000 individual members responsible for advancing IT best practices through the utilization of the ITIL, which provides a structured framework consisting of systematic and professional road maps for managing complex IT environments.

The books that make up the ITIL library are delivered under the overall guidance of the UK Office of Government Commerce (OGC) although ITSMF members play such a significant role in the development of these manuals, that this should be seen as a collective effort. Any notion of "ownership" becomes at best irrelevant and at worst, counter productive.

ITSMF consists of both individuals interested in IT service management as well as corporations such as IBM and HP. As a supplier of products and services that lead to continuous improvements in IT service, Proxima Technology are clearly a player within the ITIL arena and are corporate members of ITSMF. The British Standards Institute are also involved in this arena and have published a standard, DISC PD 0005, A Code or Practice for IT Service Management and a supporting self-assessment workbook [4], [5].
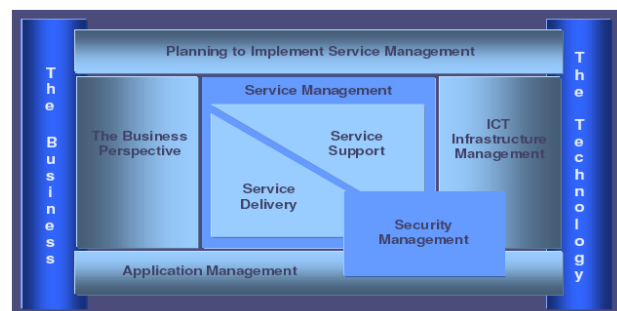

Figure 1: The ITIL Publication Framework [6].

It is important to recognize that ITIL Service Delivery is still in its early stages and OGC, ITSMF and the other proponents of ITIL are clear to use words like "road-map", "philosophy" and "guidelines" rather than "standard"

when referring to the Manuals. Subsequently, the first step for any organization adopting ITIL will be to establish a process for service level management – essentially to determine how ITIL should be adopted in their organization. This may sound like a lot of work, but in reality the ITIL manuals have been designed with this mind. The elements of implementation include:

1. Creating a steering committee to oversee the implementation of ITIL and to specifically set the goals (against which the success of the overall program will be measured) and the scope of the activities;

2. Running a pilot to determine the aspects of ITIL that are appropriate and where the return on investment will be greatest; and

3. Creating a manual that outlines the process in terms of key activity phases and the tasks and deliverables of each. Any techniques used during each task need to be specified and a standards manual established that defines what measurement data needs to be taken, how they are captured and other validation rules that ensure consistency not only within a project team but also between projects.

Of course, this all sounds very tedious and time consuming but it is necessary that everyone follows a common process in order that an organization does not just rely on the skills and experiences of their practitioners, measurements taken are consistent throughout the project so that service improvements are clearly shown, and to ensure consistency between members of the same project team.

ITIL Service Delivery describes in some length that a process (or framework) needs to be established before an organization will realize any benefit from this approach. Generic processes are described together with their inputs and outputs and how these may relate to any quality initiatives. However, we have been careful not to back any particular approach, presumably to remain neutral in these discussions and be sure that ITIL is broadly applicable across a wide application area. We believe that the answer to this problem is Six Sigma.

3. Six Sigma (6σ)

Motorola was facing the same problems as the industry at this time, but found that they were losing a large portion of their business and productivity through the cost of non-quality. This includes not only the 2,600 parts per million loss in manufacturing, but lost business due to defective parts and support of systems in the field that were

unreliable [3]. Motorola's chairman at the time, Bob Galvin, decided that a much more intense effort was needed to address their problems. A Motorola engineer, Bill Smith, found that the quality level associated with a measure of Six Sigma corresponds to a failure rate of two parts per billion and adopted this as a standard. The program to achieve this lofty goal was developed at Motorola and coined "Six Sigma", which included many of the systematic and rigorous tools associated with the Six Sigma programs of today. Incidentally, "Six Sigma" is a federally registered trademark of Motorola. To illustrate why 99 per cent quality level is not acceptable, consider the following facts [1]: at major airports, 99 per cent quality means two unsafe plane landings per day, in mail processing 99 per cent quality means 16,000 pieces of lost mail every hour, in power generation, 99 per cent quality will result in 7 hours of no electricity each month, and in medical surgery, 99 per cent quality means 500 incorrect surgical operations per week.

Six Sigma is a process improvement methodology that focuses an organization on customer requirements, process alignment, analytical rigor, and timely execution. It is a highly disciplined methodology and practice that provides the tools required to achieve consistent, high-performance results from products and processes. By increasing performance and decreasing variation, Six Sigma allows organizations to make customer-focused, data-driven decisions that ultimately yield a reduction in product defects, increased profits and employee morale, and high-quality products [5].

Six Sigma methodologies include a proven tool set for driving and achieving transformational change within an organization. The tool set provides a variety of templates for measuring, collecting, and summarizing data, as well as for creating process maps. The methodology and tools can be used for mapping, measuring, improving, and managing processes [5].

Using a universal measurement scale, Six Sigma defines and estimates the opportunities for error and calculates defects in the same way every time, thus offering a means for measuring improvement. The Six Sigma methodology incorporates this data and statistical analysis into a project-based workflow that allows businesses to make intelligent decisions about where and how to incorporate improvements.

3.1. Why Six Sigma is required in the service industry?

Research has shown that most of the service processes like payroll processing, billing, invoicing, shipping, order entry, response to service requests, baggage handling, etc.

are performing at yield 97.7 per cent [4]. If we improve the sigma quality level of any of the above mentioned service processes to four sigma quality levels, the defect rate will be dropped. This clearly indicates an improvement in process performance. The process yield will be increased to 99.38 per cent. This would bring significant financial returns to the bottom-line of any organizations (due to reduced defect rate, reduced number of customer complaints, improved customer satisfaction, etc.) engaged in powerful business process improvement methodologies such as Six Sigma. Many service-oriented companies still conform to the notion that Six Sigma is confined just to manufacturing companies. The best way to convince a service-oriented company to initiate, develop and implement Six Sigma strategy is through the three rudimentary principles of statistical thinking advocated by Hoerl and Snee [8]. These are:

1. all work occurs in a system of interconnected processes;
2. all processes exhibit variability; and
3. all processes create data that explains variability and it is our responsibility to understand the sources of variability and devise effective strategies to reduce or eliminate variability.

Service-oriented companies adopting Six Sigma will have the following benefits:

- Effective management decisions due to heavy reliance on data and facts instead of gut-feelings and hunches. Hence costs associated with fire-fighting and misdirected problem solving efforts with no structured or disciplined methodology could be significantly reduced.
- Increased understanding of customer needs and expectations, especially the critical-to-quality service performance characteristics which will have the greatest impact on customer satisfaction and loyalty.
- Efficient and reliable internal operations, leading to greater market share and satisfied shareholders. BPMJ 12,2 236
- Improved knowledge across the organization on various tools and techniques for problem solving, leading to greater job satisfaction for employees.
- Reduced number of non-value added operations through systematic elimination, leading to faster delivery of service.
- Reduced variability in service performance, leading to more predictable and consistent level of service.
- Transformation of organizational culture from being reactive to proactive thinking or mindset.

- Improved cross-functional teamwork across the entire organization.

Table 1 briefly presents the type of quality characteristics within various service functions where Six Sigma could be employed. This table would be useful for those service-oriented companies who are embarking on the Six Sigma journey for process performance improvement or cost reduction projects. One of the challenges in service processes is about "what to measure and how?" It is important to ensure that the characteristics which you measure from the processes are critical to improve customer satisfaction and the level of service quality.

Table 1: Potential applications of Six Sigma within service processes

Type of service function	Potential areas where Six Sigma may be employed
Banking	Wire transfer processing time, number of processing errors, number of customer complaints received per month, number of ATM breakdowns, duration of ATM breakdowns, etc.
Healthcare	Proportion of medical errors, time to be admitted in an emergency room, number of successful surgical operations per week, number of wrong diagnoses, waiting time to be served at the reception in a hospital, etc.
Accounting and finance	Payment errors, invoicing errors, errors in inventory, inaccurate report of income, inaccurate report of cash flow, etc.
Public utilities	Late delivery of service, number of billing errors, waiting time to restore the service after a fault has been reported, call centre of the utility company, etc.
Shipping and transportation	Wrong shipment of items, wrong shipment address, late shipment, wrong customer order, etc.
Airline industry	Baggage handling, number of mistakes in reservation, waiting time at the check-in counter, etc.

3.1. Six Sigma methodology for service processes (DMAC)

As a problem solving methodology or process improvement framework, Six Sigma strategy makes use of a series of well-defined steps. This includes definition of the problem (D), measurement (M) of the problem (i.e. defects which are responsible for the problem), data analysis (A) to discover the root causes of the problem (i.e. analysis of defects), improvement (I) of processes to remove the root causes of defects and controlling (C) or monitoring processes to prevent the perennial problem [5]. The Six Sigma methodology for service processes is shown in Figure 1.
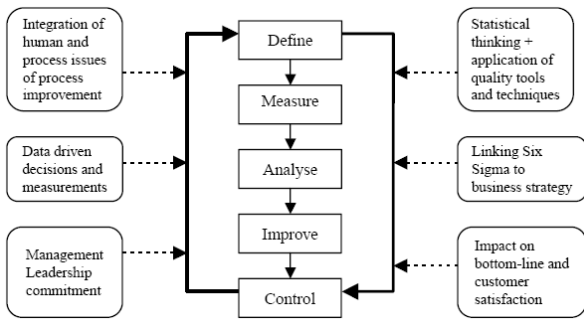
Figure 2: Six Sigma methodology

4. ITIL Based on Six Sigma

Six Sigma is a proven methodology for process improvement that organizations like GE and Motorola are attributing much of their success to in recent years. For organizations adopting ITIL best practices, Six Sigma brings three essential benefits [14]:

• It provides process for project implementation and management;
• It helps IT organizations focus service improvement on areas that will have the maximum payback;
• It provides a set of techniques that can be used to establish a rating of quality, isolate problems and then make changes to improve the process.

In addition, Six Sigma is proven, having been around at least 10 years. This means that there is already a supply of expertise—consulting organizations, training service providers and independent bodies that ensure a best practice [15]. Though Six Sigma and ITIL are often used independently, this article aims at combining the best of both worlds, by using the process approach from ITIL and the improvement model from February 2008Six Sigma with the intention of ITSM process improvement. The goal of the methodology is to transition from the current state to an ITIL-compatible state. Six Sigma provides the engine to help achieve this goal. The approach is to analyze risk, compare current processes to the goal state, and then determine the solution. The relationship between Six Sigma and ITIL is summarized in

Figure 3. Six Sigma is as an approach for identifying the important processes that impact customers, measuring how well or badly you perform them, using proven statistical techniques to rate your quality and identify trouble spots.
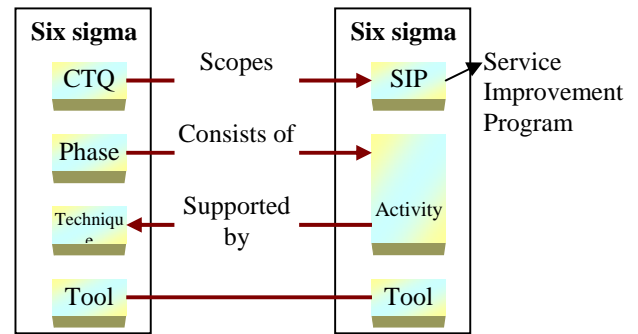

Figure 3: The relationship between Six Sigma and ITIL. Although Six Sigma provides a generic quality management process, it fits well with the structure of ITIL Service Delivery module.

Then, armed with this information collectively as a team, work out how you can solve recurring problems and do this continuously until you hit a level of quality that will help your organization to achieve its objectives while minimizing costs. It is a process of management that encourages you to stop what you are doing, look back at how well you have done it and then put in place improvements to clear up defects. Most organizations are focused only on the operational aspects of their business – seldom stopping to ask themselves: what went wrong? And what could be done better next time? Although Six Sigma can be applied to any (business) activity from which measurements can be taken, it is obvious from this description that it is well suited to service level management with ITIL[14,15]. The underlying statistical techniques of Six Sigma are proven having been around for many years. They include standard statistical analysis techniques, such as normalization and standard deviation, which form part of the curriculum of most higher education courses in statistics. This means they allow an organization to establish, unequivocally, a level of quality and whether this is satisfactory or not: it allows a CIO to know whether their team is doing a good job or a bad job. It eliminates subjectivity from the equation—where terms like good, bad, better, acceptable and good are all too often used. With Six Sigma, a service is either up to a standard or it is not.

5. Developing the methodology

We executed DMAIC, the five-phase process improvement methodology of Six Sigma, to meet the objectives set for the ITSM improvement project: Phase 1: Define opportunities, Phase 2: Measure performance, Phase 3: Analyze factors impacting performance, Phase 4: Improve performance, and Phase 5: Control performance.

5.1 Phase 1 - define opportunities

The Define phase is to make clear understanding of scope and objective to publish project charter; so, all relevance stakeholders have been understood. Also, the organization's purpose and scope will be defined during this phase.

One of the key success factors of Six Sigma is that it starts with an understanding of what service processes are critical to an IT based organization in achieving its objectives. These are called the critical to quality (CTQ). With such a structured approach and with clarity as far as the phase goals, tasks, deliverables, and techniques are concerned; it should be immediately obvious that the Six Sigma methodology yield the greatest return both financially but also in terms of visibility for the project team and the value of ITIL.

Understanding the cost of service delivery process is an important index that makes us to evaluate the process based on and scoring the mentioned process.

The goal is to align ITSM strategy with the business, organizational, and technological strategies. Moreover, identifying the problems and defining the measurable objectives and results are the most important objectives of this phase. The desired result is to set a definitive vision, scope, and strategic approach for ITSM operations.

Six deliverables has been produced in the Define phase:
1) Project charter;
2) Data collection plan;
3) Stakeholder analysis;
4) Critical to Quality (CTQ) outline;
5) Cost of poor quality;
6) Overview of the process to be improved.

5.2 Phase 2 - measure performance

Measure performance phase focused on the distribution, anthology, and refinement of ITIL. Planning for collection of the measurements has been done in the Measure phase. It defines the imperfections of ITSM, evaluate the "as is" process, and create a current-state assessment of the current service delivery. This phase will help the organization rank the potential causes, which would be useful in investigation through benchmarking the current process performance.

This phase creates four deliverables as follows:
1) Process capability and performance;
2) Critical input and proves variables that can affect output quality;
3) Service delivery defects;
4) Critical Success Factors (CTQ) summary chart.

5.3 Phase 3 - analyze factors impacting performance

The Measure phase produces the baseline performance of the service delivery process. Indeed, in this phase the collected data in the Measure phase have been examined to generate a ranking list of the sources of variation in ITSM and identify the root cause of problems.

Eight deliverables has been formed in the Analyze phase:
1) Cause and Effect Diagram;
2) Frequency plots;
3) Affinity diagram;
4) "As is" data and information flow diagram;
5) Critical Success Factors (CTQs) benchmarked against ITIL best practices to identify opportunities for improvement;
6) Regression analysis;
7) Scatter plots;
8) Treats and opportunities.

5.4 Phase 4 - improve performance

The aim of improve performance phase is to identify options for solutions which can be useful for the identified problems during analysis phase. So, the alternative policies could be rank and select for improvement. Recommendation and implementation the solutions, therefore, are the most important objectives of this phase.

In this phase five deliverables has been produced:
1) "To be" data and information flow diagram;
2) Design of experiments;
3) Risk Assessment;
4) ranking solutions;
5) Improvement planning.

5.5 Phase 5 – control performance

Even if, the problem has been assessed and an improvement put in place, putting a solution in place can fix problems for the moment, but the work in phase 5 is designed to ensure the problem stays fixed. Also, the obtained knowledge in the improvement project can be published in other areas to help accelerate improvements of service delivery [14]. Sustain improvement and

prediction the process behaviors are the objectives of the control performance phase.

Seven deliverables would be obtained:

1) Control charts
2) Quality control process charts
3) Standardization
4) Process metrics defined
5) Full solution implemented
6) Control/Response Plan implemented
7) Risk mitigation actions complete.

6. Conclusion

Six Sigma is such a process that brings additional benefits to ITIL and help organizations to adopt best practices for service delivery by a quality process which ensure its success. In particular, its business orientation will ensure that service improvement activities are focused on dealing those services that impact the customer. As a result, the impact that ITIL has on the business overall will be greater. At first glance, ITIL and Six Sigma appear to be mutually exclusive. However, as this paper discusses, these two approaches are highly complementary and can be used in combination effectively to continually improve business processes. Process optimization, continuous improvement, measuring quality of service and process improvement, and maximizing the payback of IT organizations with finding the best services are the most important point for combining the Six Sigma and ITIL in this paper.

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