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11F. Aligning Six Sigma and ITIL: Implications For IT Service Management

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Abstract

Today's executives are challenged to deliver value to their shareholders in a global market place. Technology organizations must deliver interoperation of processes, people and technology to the entire enterprise. To design, deliver, and manage IT services to meet an agreed level of quality, Organizations are implementing IT Service Management (ITSM) and creating quality standards, which uses the best practices of IT Infrastructure Library (ITIL). ITIL tells IT management what needs to be done and how it will get done from the process perspective. When under- taking an ITSM a project to implement ITIL, ITIL does not provide a method for measuring quality or identifying and completing process improvement projects. By integrating Six Sigma, which is a quality methodology, IT management will have the methodology and tools for measuring quality and improving processes. Adopting Six Sigma principles also will help IT focus on their customers and the business strategy, manage proactively based on facts, and reinforce collaboration across the enterprise. The purpose of this paper is to introduce the reader to the concepts of ITSM, ITIL and Six Sigma individually. Additionally we will make the case for leveraging ITIL and Six Sigma with ITSM in practice and opportunities for future research.

Keywords

ITIL, Six Sigma, ITSM, Design for Sigma Six, Quality Management, IT Business Value Management

1. Overview of IT Service Management (ITSM)

The rise of services oriented architecture, client server computing, virtualization and distributed applications have created a plethora of *moving targets* in the IT organization. IT organizations have had to deal with a business that have historically been isolated by function or department and have been separated from the business. But as organizations have adopted an enterprise approach to running their businesses, IT managers can no longer run an IT organization as a technology-based organization. They must be able to migrate to being a value-based service provider and contributor to the enterprise strategy instead of an overhead cost. IT managers need to adopt a service management approach consisting of well-defined IT processes and a continuous improvement program in order to meet their customer's expectations and contribute to the enterprise's goals.

To meet the challenge, American IT managers are adopting a practice that has been used by their European counterparts for over 24 years, information technology service management (ITSM). According to Salle (2004), the evolution of IT organizations typically mature through three stages: technology provider, service provider and strategic partner.

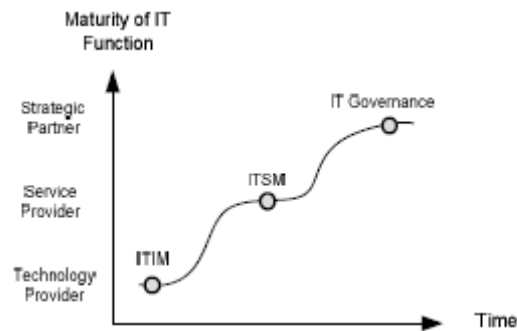


Figure 1 Evolution of the IT Function within organizations (Salle, 2004, p. 1)

Continual maturity occurs as the IT organization moves through each stage. In the initial stage the IT organization operates as a technology provider and it is using IT infrastructure management (ITIM). In this stage, the focus is to manage and provide a solid infrastructure to the enterprise by maximizing the return on technical assets and controlling the infrastructure including its hardware and data. As an organization moves to becoming a service provider it will use ITSM which leverages ITIL to identify the “services its customers need and focusing on planning and delivering those services to meet availability, performance, and security requirements. In addition, IT is managing service-level agreements, both internally and externally, to meet agreed-upon quality and cost targets. Ultimately, when IT organizations evolve to IT business value management (IT Governance), they are transformed into true business partners enabling new business opportunities. In that stage, IT processes are fully integrated with the complete lifecycle of business processes improving service quality and business agility.” (Salle, 2004, p. 1).

2. What are ITIL and ITIL Service Management Practices?

The U.K. government’s Central Computer and Telecommunication Agency created ITIL. It is a framework and does not require a license to practice and it is independent of any commercial solution or platform. In the last 24 years, ITIL has become a de-facto standard and most widely used accepted approach to define processes for IT service-oriented organizations. It aligns IT processes to overall business goals. ITIL is a guide for establishing common processes, roles and activities, with appropriate reference to each other and how communication lines should exist (ITIL, 2007). Although processes dictate how services are delivered, processes are of little interest to customers because they are not visible. ITIL is a public domain set of books that describes comprehensive and consistent best practice guidance in the area of organizing a coherent process for IT Service Management. In the late 1980’s when it was originated it consisted of more than 30 books, but the release of ITIL V3 condensed the framework into 5 books.

The latest version is ITIL V3 and it is designed to address the significant shortcomings of ITIL V2. ITIL V3 has a broader scope and contains everything that was included in Version 2. Version 3 pays more attention to the areas of designing services suitable for the business and creating a strategy around this. Version 3 gives more advice on Continual Service Improvement (Damiano & McLaughlin, 2005, p. 253). ITIL V3 addresses the life cycle of service management. It embraces a more holistic service management practice that includes business and IT at strategic, tactical, and operational layers. While in comparison, ITIL V2 focused just on the operational layer of IT operations. The new version provides best practice guidance to implement a true life cycle of service management in five best practice guides. Version 3 of ITIL library consists of 5 five sets of books:

Book	Responsibility of Book
Service Strategy	Defines the policies and strategies to implement Service Management in line with the overall business strategy. It focuses on the planning aspect of the policies and strategies.
Service Design	Describes how to use the strategy to create design and specifications for the service. This book has more structure and explains a step-by-step approach to designing services. Much of what was in this book was already addressed by ITIL v2 with the exception of security management.
Service Transition	Covers configuration, change and release management. Change management focuses on how to assess and plan for changes. Configuration management has been extended to include service assets or IT assets, which are important for IT to be aware of. This book also Details how to get the specification into the live environment.
Service Transition	Defines how to best support the support the day- to-day running of the service throughout its life cycle. Provides guidance on running a live production environment.
Service Operation	Provides a framework for Continual Service Improvement. Service performance is measured at each stage ensuring that IT align and continually realign to the needs of the business. This book makes it clear that, for organizations to become more proactive, assessments must be a continual process, rather than one that only happens when a failure occurs.

2.1 Benefits of ITIL for Service-oriented organizations

ITIL's framework of best practices can be used to assist organizations as their needs and technology evolve around processes. ITIL Service Management Practices offer benefits that demonstrate their value and ROI. Organizations can use ITIL to add more value to their business, be more agile in with their responses, define standards, implement new technologies, adopt new trends, regulate compliance, and improve the quality of IT services. Additionally, companies gain higher productivity from both business and IT staff. These best practices for the support and delivery of IT services can help a company document IT processes as required for Sarbanes-Oxley (Worthen, 2005, n.p.).

2.2 What does ITIL not do?

ITIL does not focus on a specific industry segment or restricted geographically. ITIL does not address *who* within the organization is going to be in charge of implementing each process. It does not address the *how* to use the tools that are needed to implement these processes. ITIL does not offer corporate or organization certificates but rather personal certification. Certification does not guarantee service quality and this is a common misconception within IT organizations. Many vendors and consultants offer services in restructuring ITIL, and many customers seek such guidance. However, ITIL does not promote an organizational structure, or require any particular management. Nor does the ITIL mandate any particular workflow design or process. Here is a quote from ITIL: "For each of the processes described in this book, one or more roles are identified for carrying out the functions and activities required. It should be noted that organizations may allocate more

than one role to an individual within the organization, or may allocate more than one individual role. The purpose of the role is to lace responsibility rather than to create an organizational structure” (ITIL Organization, 2006)

2.3 What you need to know before adopting ITIL?

ITIL’s core practice guides are adaptable and applicable within a variety of organizational context. However, every organization is different and should have its own unique requirement. ITIL can be intimidating to understand and organizations should realize that you can not conform to, adopt, comply with or implement ITIL because it is not a *set* standard and you can not use what ITIL says verbatim.

IT is a service organization providing effectiveness, value, and support to the enterprise and its strategy. Organizations should focus on service and business performance improvement first and not processes. Processes are intended to be a means to an end and not to become the end, in and of themselves. Organizations have been adopting ITIL for approximately 25 years. As demonstrated in the Hype Cycle chart (Govekar et al., 2007, n.p.), organizations are moving towards becoming service providers as discussed by Salle in 2004. According to the figure below, it will take another two years for ITIL to be widely adopted and mainstream.

3. Six Sigma

Although the beginning of Six Sigma is steeped in quantitative analysis, it is a misperception that Six Sigma is only a statistical measure with a goal of perfection. Pande and Holpp (2002, p. 14-16) assert that Six Sigma is more than a statistical and process methodology and discuss the following six themes of Six Sigma:

- Understand and focus on the customer.
- Be dependent on data- and fact-driven management.
- Master and improve your key processes.
- Manage proactively.
- Collaborate across boundaries within the organization.
- Drive for perfection, but tolerate failure

3.1 Six Sigma methodologies: DMAIC and DMADV

There are two key Six Sigma methodologies: DMAIC and DMADV. DMAIC is an acronym for Define, Measure, Analyze, Improve, and Control. DMADV is Define, Measure, Analyze, Design, and Verify (DMADV). According to Kerri Simon (2002) in the article, DMAIC versus DMADV, the DMAIC method is predominant in Six Sigma implementations and “should be used when a product or process is in existence at your company but is not meeting customer specification or is not performing adequately.” Practitioners when employing DMAIC, seek to “root out and eliminate the causes of defects” (American Society for Quality). Pande and Holpp (2002) agree that organizations needing to fix broken processes can reap benefits of implementing DMAIC. By using DMAIC organizations will have proven and identified the extent of the problem. By assessing and measuring problems, an organization will be spending time and resources solving high value problems. When the problem is proven and selected for resolution, its root cause is identified using data and facts, not intuition and gut feel. As the DMAIC team works to create a solution, their purpose is to affect real change to the existing problematic process. The resulting solution must be well tested to manage risks to the organization. After the solution is implemented within the enterprise, the organization measures the results validates that the solution is sustaining

change (2002, p. 30-31). In the table below, Chieh (2007), outlines in the chart below how DMAIC can be utilized to fix under performing processes....

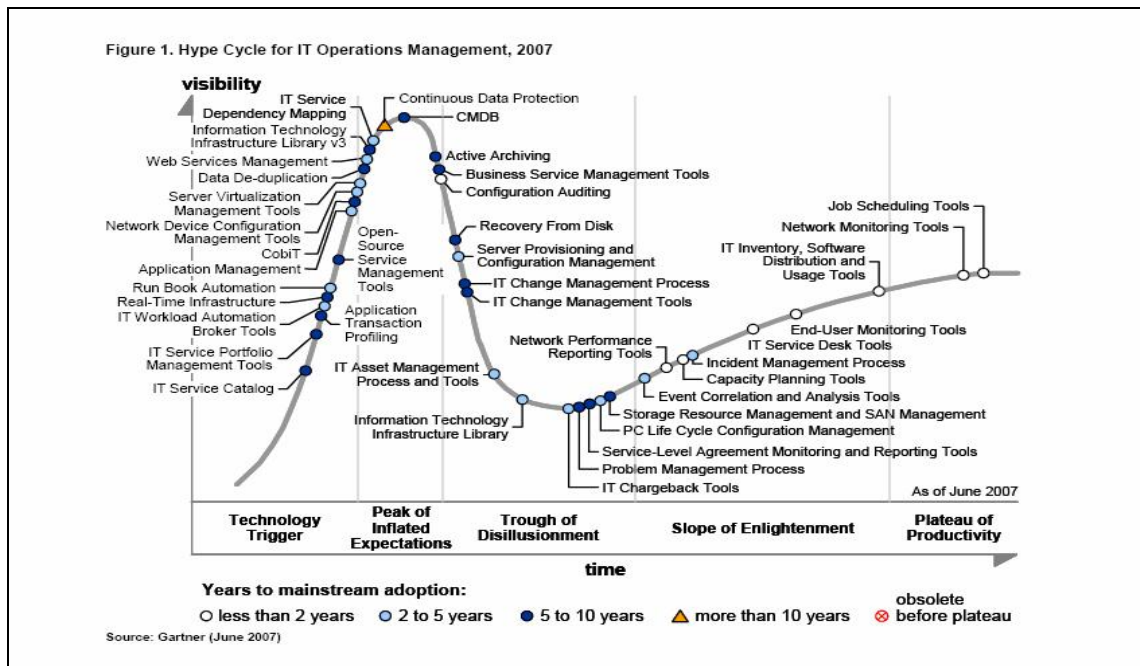


Figure 2: Hype Cycle for IT Operations Management, 2007, Source: (Govekar et al., 2007)

When designing new processes, the approach used is Design for Sigma Six (DSFF). DSFF uses DMADV not DMAIC in order to design and move to market “new products or services measures by customer-based critical-to quality metrics” (Foster, 2007, p. 463). Simon expands the uses of DMADV beyond the creation of new products or services and advocates using DMADV approach after optimizing an “existing product or process” fails to meet “customer specification or Six Sigma level” (Simon, 2007).

3.2 Tools of Six Sigma

The teams once formed will use a series of tools, which are employed with the Six Sigma methodology. The expansive toolset, which teams leverage to complete their work, is a primary benefit Six Sigma. Pande and Holpe (2002) recommend teams limit the use of tools to only those that help “get the job done” (p. 67) and categorize the tools as follows:

3.3 Criticism of Six Sigma

There is a recent debate of whether Six Sigma has a place in companies embracing the new innovation economy. The argument is that it is difficult for innovation and Six Sigma practices to coexist because by their very nature they are opposite. Six Sigma requires the organization to focus and direct its resources on operational excellence and perfection; it has a very low tolerance for risk because imperfection is increased when risk is introduced. On the other hand, innovation is by its very nature a high risk because it is dealing with new concepts (Rae, 2007, n.p.). Management professor Tom Davenport contends that the time for Six Sigma has passed as companies are embracing innovation:

“Process management is a good thing. But I think it always has to be leavened a bit with a focus on innovation and [customer relationships].” The discipline was developed as a systematic way to improve quality, but the reason it caught fire was its effectiveness in

cutting costs and improving profitability. That makes it a powerful tool—if those are a company's goals. But as innovation becomes the cause du jour, companies are increasingly confronting the side effects of a Six Sigma culture.” (Grow & Hindo, 2007).

Steps	Phase	Questions
1. Understand what process is to be improved and set a goal.	Define	> What is the Y or the outcome measure?
2. Measure the current state.	Measure	> What is Y's current performance?
3. Develop cause-and-effect theories of what may be causing the problem.	Analyze	> What are the potential Xs or causes? > What may be causing the problem?
4. Search for the real causes of the problem and scientifically prove the cause-and-effect linkage.		> What are the real Xs or causes? > What is really causing the problem?
5. Take action.	Improve	> How can the understanding of the real causes of the problem be exploited to eliminate or reduce the size of the problem? > How can this $Y = f(X)$ understanding be exploited?
6. Measure to verify improvement has taken place.	Control	> Did Y really improve?
7. Take actions to sustain the gains.		> How can the Xs be controlled so the gains in Y remain?

Table 2: DMAIC in Mathematical Terms Source: (Chieh, 2007)

Davenport’s opinion is supported by research conducted by “Wharton School professor Mary Benner and Harvard Business School professor Michael L. Tushman. Benner and Tushman’s research “suggests that Six Sigma will lead to more incremental innovation at the expense of more blue-sky work. The two professors analyzed the types of patents granted to paint and photography companies over a 20-year period, before and after a quality improvement drive. Their work shows that, after the quality push, patents issued based primarily on prior work made up a dramatically larger share of the total, while those not based on prior work dwindled” (Hindo, 2007, n.p.).

Examples of Six Sigma’s fall from extreme favor can be seen at many fortune 100 companies including Home Depot, GE and 3M. The new Chief Executive Frank Blank has scaled back the strictness of the Six Sigma implementation enacted under CEO Robert Nardelli by giving more decision making to store managers. After the departure of James McNerney, 3M’s leadership has changed its implementation of Six Sigma. Even GE, who under Jack Welsh popularized Six Sigma within the United States, is working to change how Six Sigma is used. Jack Immelt is attempting to move his team to “innovate around a theme of “ecomagination,” with mixed results (Grow & Hindo, 2007, n.p.).

This debate does not mean that Six Sigma can’t provide value to organizations. It does mean that Six Sigma cannot be implemented in a vacuum. Multiple methodologies are needed support the enterprise strategy. For example, companies that are looking to innovate while supporting and improving processes and products are adopting the “Ambidextrous

Organization” proposed by Charles O’Reilly III and Micheal Tushman, business-school professors at Stanford and Harvard. O’Reilly and Tushman’s (2004) research shows successful companies pursuing innovations because “they separate their new, exploratory units from their traditional, exploitative ones, allowing for different processes, structures, and cultures; at the same time” (p. 74). The organizations “maintain tight links across units at the senior executive level. In other words, they manage organizational separation through a tightly integrated senior team” O’Reilly & Tushman, 2004, p. 75). To describe these organizations, O’Reilly and Tushman (2004) have coined the term "ambidextrous organizations” and believe that the organizations have provided a “practical and proven model for forward-looking executives seeking to pioneer radical or disruptive innovations while pursuing incremental gains. A business does not have to escape its past; these cases show how to renew itself for the future. Their study showed that “90% of the ambidextrous organizations achieved their goals” (O’Reilly & Tushman, 2004, p. 76).

Category	Tools
Gathering Ideas and Organizing Information	<ul style="list-style-type: none"> ✓ Brainstorming ✓ Affinity Diagramming ✓ Multi-voting ✓ Tree Diagram ✓ High-Level Process Map ✓ Flow Chart (Process Map) ✓ Cause and Effect (Fish Bone) Diagrams
Data Gathering	<ul style="list-style-type: none"> ✓ Sampling ✓ Operational Definitions ✓ Voice of the Customer Methods ✓ Check sheets and Spreadsheets
Process and Data Analysis	<ul style="list-style-type: none"> ✓ Process Flow Analysis ✓ Pareto Charts ✓ Histograms (Frequency Plot) ✓ Run (Trend Chart) ✓ Scatter Plot (Correlation) Diagram
Statistical Analysis	<ul style="list-style-type: none"> ✓ Test of statistical significance ✓ Correlation and regression ✓ Design experiments
Implementation and Process Management	<ul style="list-style-type: none"> ✓ Project Management Methods ✓ FEMA ✓ Stakeholder Analysis ✓ Force Field Diagram ✓ Process Documentation ✓ Balance Score Cards and Process Dashboards

Table 2: Categorization of Six Sigma Tools, Adapted from Pande and Holpe (2002, p. 51-67)

4. Implications for Practice

So far we have provided background on ITSM, ITIL and Six Sigma individually. However, the question is, can an organization’s ITSM implementation benefit by integrating ITIL and Six Sigma? We conclude that ITIL and Six Sigma should be leveraged in tandem by IT organizations. Together with the ITIL best practices model and Six Sigma continual

improvement and measurement, IT will be able to set boundaries and provide control elements for the senior IT management. ITIL is needed to provide the framework and best practices for ITSM. ITIL provides a set of guidelines to specify what an IT organization should do based on industry best practices. ITIL best practices process model is a key item to drive IT to meet the enterprises' expectations.

However, ITIL does not define for an organization how it should be accomplished. According to Fry and Bolt (2004) "Six Sigma provides a process improvement approach that is based on statistical measurement, drives quality improvement, and reduces operational costs. It helps in developing detailed work instructions, and it defines a methodology for continually mapping, measuring, and improving the quality process. Six Sigma tells how, but it doesn't tell what to do nor does it specify any best practices specifically for ITSM...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" (p.2). ITSM, ITIL and Six Sigma combined can also assist IT govern itself and ensure that it is meeting and sustaining the enterprises' strategies and objectives (Colbeck et al., 2005).

4.1 Business Case – Integrating ITSM, ITIL and Six Sigma

Combining ITIL® and Six Sigma to improve Information Technology Service Management at General Electric (GE), the IT Solutions Enterprise Planning & Strategy consulting group was engaged to develop a process improvement methodology that combined ITIL and Six Sigma to migrate from the current state to "measurable, ITIL-compatible processes" (Fry & Bolt, 2004, p. 3). The group used Six Sigma to assess risk, compare current state and processes to the end goal, and then identified the solution which leveraged Remedy's "ITSM Suite to automate and improve ITSM processes" (Fry & Bolt, 2004, p. 3). The five objectives set by the team included 1) Achieve ISO Compliance for ITSM using ITIL for GE IT standards (ITIL is ISO 9000 compliant), 2) Use ITIL framework to define ITSM best practice standards, 3) Assess the current state of IT service by using the Capability Maturity Model (CMM) and Capability Assessment Tool against the ITIL standard, 4) Constantly improve ITSM processes using Six Sigma and Deming's Total Quality Management (TQM), and 5) Define measurement using Six Sigma to assure control and improvement (Fry & Bolt, 2004, p. 3)

To implement the methodology and meet the objectives set by the team, the team executed the Six Sigma DMAIC. Table 3 outlines the project phase, goal/purpose and deliverable.

GE's project to improve their IT service management demonstrates that ITIL and Six Sigma can be leveraged together to implement and maintain ITSM within an organization. The benefits that GE found included 1) reducing cost by minimizing "potential downtime and the adverse effects of system, network, and application failures and install, move, adds, change and decommission implementations". 2) "Improve decision-making ability by facilitating access to information throughout the organization, and by enabling the enterprise wide use of outputs from an integrated framework of processes and tools through such devices as cross functional IT service dashboards" and 3) "Improve IT service levels by creating operational efficiencies and enabling a linked IT Service Management process loop for defining, measuring, analyzing, improving, and controlling service performance" (Fry & Bolt, 2004, p. 9).

4.2 Lessons Learned

It was to be expected that GE, an organization whose culture under the direction of Jack Welch became entrenched in Six Sigma, leveraged Six Sigma when it implemented a project to use ITIL to improve its IT Service Management. But even organizations that are not Six Sigma implementations can benefit from using Six Sigma principles, methods, and tools. For example, the purpose of ITSM is to align the IT organization with the enterprise. This aligns to Pande and Holppe (2000) contention that within the Six Sigma implementation that there should be an emphasis and focus on the customer. Additionally, Six Sigma recommends collaborations across boundaries within the organization. Using the DMAIC project management approach provides the IT organization a methodology to establish a vision and strategy for ITSM within the organization, assess the current state and its effectiveness in supporting the ITSM strategy, determine what is most likely for not meeting the defined strategy, identify a solution and propose a plan for implementation ITSM. Alternatively, if ITSM and ITIL are currently in place within the organization, the Six Sigma approach to organizing and getting work done including identifying and selecting problems to be solved could be used. Additionally, the Six Sigma tool kit provides tools that assist IT staff identify problems, determine root causes, and recommend ITIL solutions to fix existing problems. To provide sound IT service management, organizations should use ITIL and Six Sigma combined to ensure strategic alignment with their organization.

5. Implications for Research

IT operations, as the production arm of IT departments, have been mostly ignored by IT research. There is a growing body of research on isolated aspects of operations services; but there is little research that is explicitly ITSM related. Despite the significant growth of ITSM practice in industry, there is no academic work or community of scholars that shares a common mission to understand how to advance it. Services are emerging in separate areas of academic, industry and government but few attempts to integrate them (Conger et al. 2007, p. 50). Six Sigma is a measurement-driven approach to continuous process improvement that focuses on reduction of variation, consistency and high product quality. Therefore, in terms of IT service oriented industry, combining Six Sigma with ITIL can migrate current processes toward usable, measurable, to ITIL-compatible processes as mentioned above with the case study on GE, however there is no research on version 3 because it was just released in May 2007. Based on this we have shown that Six Sigma tools can be used to improve ITSM processes using the DMAIC model.

6. Conclusion

Over the next decade, executives will continue to be challenged to deliver value to share holders. To support the organization, IT executives and managers will be challenged to transform their organization from delivering technology to providing service and ultimately becoming a business partner within the organization. To meet the challenge, we encourage the use of ITIL in combination with Six Sigma in IT Organizations with an ITSM implementation. IT managers need to leverage ITSM to develop, deliver and manage IT services to agreed upon quality standard. To have a sound IT management, managers should use ITIL v3 to guide selection of best practices. Six Sigma DMAIC should be used to make certain that ITSM is aligned with the customer and to provide the mechanism to deliver and monitor all the IT service management processes. The case study at GE shows that ITIL and Six Sigma can be used in tandem to deliver ITSM and meet the organization's business objectives. Nevertheless, delivering ITSM using ITIL and Six Sigma is a one building block for building a world-class company. As Dr. Foster (2007), world-class competitors do not

achieve the status because they adopted a “tool or technique.” They achieve the status because they are good in “performing the fundamentals “including understanding their customers, products, employees, competitors’ landscape, the market they are competing in and the enabling technologies. The world-class competitors succeed because they are creative and know how to make use of operations processes to their best advantages.” (Foster, 2007, p. 509). ITIL and Six Sigma are just two tools that should be used for the IT organization to deliver world class IT Service Management and meet quality targets. As the IT organization successfully delivers ITSM, it will become a business partner within the organization.

Phase	Goal/ Purpose	Deliverable
Phase 1: Define Opportunities	Align ITSM strategy with the business, organizational, and technological strategies. The desired result is to set a definitive vision, scope, and strategic approach for ITSM operations.	<ul style="list-style-type: none"> >Team charter that describes the purpose, goals, and resources for the project. >Data collection plan that includes such items as interview schedules and questions. >Critical to Quality (CTQ) outline that identifies the critical success factors. >Current situation analysis that was created using the CAT tool. >Customers/Output—Process—Input/Suppliers (COPIS) “as-is” process map outline that provides an understanding of the current processes to which the solution
Phase 2: Measure performance	Create a current-state assessment of how well the current environment supports the ITSM strategy. The desired result is to determine current processes, issues, and the critical success factors—or Critical To Quality factors (CTQs)—of the desired future state environment.	<ul style="list-style-type: none"> >An accurate assessment of current process performance. >Detailed “as-is” process maps derived from the COPIS outline created in Phase 1 > Critical Success Factors (CTQ) summary chart
Phase 3: Analyze factors impacting performance	Examines the data collected in the Measure phase to generate a prioritized list of the sources of variation. The Analyze phase focuses improvement efforts by separating the “vital few” variables (those most likely responsible for the variation) from the “trivial many” (those least likely responsible for variation).	<ul style="list-style-type: none"> > Opportunities Table: Solutions mapped to process gap > Critical Success Factors (CTQs) benchmarked against ITIL best practices to identify opportunities for improvement > Cause and Effect Diagram > Pareto Chart of Opportunities
Phase 4: Improve Performance	Define and refine recommended tactical solutions based on information determined in phases 1-3. The desired result is a documented recommendation based on strategic	<ul style="list-style-type: none"> > Risk Assessment/Failure Modes and Effect Analysis (FMEA)/Contingency Plan. > Prioritized potential solutions > Solution Pilot

Phase	Goal/ Purpose	Deliverable
Phase 5: Control Performance	fit, cost, and benefits. Propose a plan for designing and implementing the ITSM process improvement solution. The desired result is a true life cycle ITSM solution that allows for continuous improvement.	> “To Be” process maps > Multi-Generational Product Plan (MGPP) > Process metrics defined > Full solution implemented > Control/Response Plan implemented > Risk mitigation actions complete

Table 3: Project Phase, Goal/Purpose And Deliverable, Source: Adapted from (Fry & Bolt, 2004, p 4-8)

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