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Managing IT Services: Aligning Best Practice with a Quality Method

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Managing information technology services is becoming an increasingly difficult task. To support the management of IT services, different standards and methodologies have been developed. ITIL (short for IT Infrastructure Library) is the most commonly used best practice approach to effective IT Service Management to date. ITIL focuses primarily on what to do in order to ensure value of IT services, but it does not explain how to achieve this effectively. This shortcoming can be overcome by complementing the framework with other quality approaches to service management. In this context several methodologies are mentioned including the use of Six Sigma (6s) methodology. The statistical nature of the Six Sigma methodology enables us to analyze the vast amount of data gathered from the field of IT. Only after these value-based metrics are obtained can the overall health of the IT service be determined and the necessary improvement measures made. The aim of this paper is to analyze in detail the two approaches. We will establish a common link between them, with it the opportunity to complement ITIL with the Six Sigma methodology, and consequently set foundations for introduction of necessary measurable changes.

Key words: IT Service Management, ITIL, Six Sigma methodology, DMAIC, continual improvement

1 Introduction

Many organizations are already becoming largely dependent on information technology and its services and therefore require proper management and support of these services. The broader context of this paper focuses on IT Service Management (ITSM). Service management can be defined as a set of specialized organizational capabilities for providing value to the customers in the form of services (Cartlidge, et al., 2007). These capabilities are actually processes, methods, functions, roles and activities that enable a service provider to deliver a specific service. But IT service management is much more than just a mean of providing a service to a customer. It also focuses on defining, managing and delivering IT services with a clear intention of supporting the organization's business objectives and customer needs. IT service management is therefore a broad term that considers the entire lifecycle of a service, starting from strategy through design and transition to operation use and continual improvement.

Fleming and others note (Winniford, et al., 2009) that IT Service Management accounts for between 70-90 percent of the total cost of owning information technology. Therefore it is not surprising that the use of individual standards, frameworks and methodologies which enable effective management of IT services, is on the rise. Taking this into consideration, more and more organizations are recognizing that the step towards greater business competitiveness also lies in using the aforementioned approaches. These ultimately allow for continuous improvement and greater quality of services while reducing costs.

ITIL (OGC, 2007) is one of the most widely used approaches for service management in the world today. It originates from the so-called good practice and is essentially a set of recommendations with descriptions and instructions for deployment and quality management of services based on information technology. It was created back in 1980 through the initiative of the Office of Government Commerce in Great Britain, but became globally recognized only after major software manufacturers such as Microsoft, HP, IBM and others, started using it (Pollard & Cater-Steel, 2009). ITIL, in a nutshell, describes processes and their realization in the organization for more effective IT services and ensuring optimal use of these services by the users. It can be seen as a manual which in a systematic way explains the relationship between processes and their activities needed to implement and manage IT services.

Many authors (Aazadnia & Fasanghati, 2008; Kukuljan & Kukuljan, 2008) have asserted that the basic question of ITIL is "what" to do to ensure effective IT services, but it does not explain "how" to achieve this. Aware of these short-

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comings, an independent research house Forrester (Morgan & Ho, 2009), as well as other experts (Taylor, et al., 2007; Ho, 2008a) have highlighted the need to extend or to complement the framework with other approaches that would add a quality aspect to IT services management. To this end, the inclusion of proven methods such as Six Sigma, Total quality management and others have been proposed.

Six Sigma is a quality improving method developed by Motorola in 1985 (Hsieh, et al., 2007). It is designed for all levels of the organization's management, which want to continually improve the quality of their products and services with the aim of increasing the satisfaction of its customers. For this purpose, the method uses a number of tools, techniques and statistical analysis to help to identify those areas for improvement the customer is most concerned about.

This paper first provides a basic understanding of ITIL and the Six Sigma methodology. Their concepts are explained along with an overview of Six Sigma in IT, including its techniques that have proven to work for IT Service Management. Furthermore, an explanation of how to align ITIL and Six Sigma is given, and the advantage of using an integrated approach to IT service management is discussed. The final goal of the paper is to set foundations for introduction of necessary measurable changes.

2 ITIL framework

ITIL (IT Infrastructure Library) is a source of best practice in IT service management. Since its creation in 1980 through the initiative of the Office of Government Commerce in Great Britain, ITIL has grown to become the most widely accepted approach in IT service management in the world. To this day, it has been kept up to date within a constantly changing service management environment. ITIL, which was composed as a common sense approach to service management (do what works), is currently available in its third edition (ITIL V3) (OGC, 2007).

The ITIL V3 library consists of two components. The first is the so-called ITIL Core. The Core provides best practice guidelines for organizations that provide services to a business. The guidelines are generic and applicable to all IT organizations regardless of their size or the technology they use. The second part is the ITIL Complementary Guidance. It is essentially a complementary set of publications with guidance specific to industry sectors, organization types, operating models and technology architectures.

For the purpose of this paper we will take a closer look at the Core structure of ITIL. The Core structure itself is in the form of a lifecycle. It is iterative and multidimensional. It is basically an integrated set of five stages or a set of five publications. Each of the five core books cover one stage in the service lifecycle (Figure 1) (Adams, et al., 2008), from the initial definition and analysis of business requirements in Service Strategy and Service Design, through migration into the live environment within Service Transition, to live operation and improvement in Service Operation and Continual Service Improvement.

We will discuss in detail the final and probably most important stage of the lifecycle of IT services, the Continual

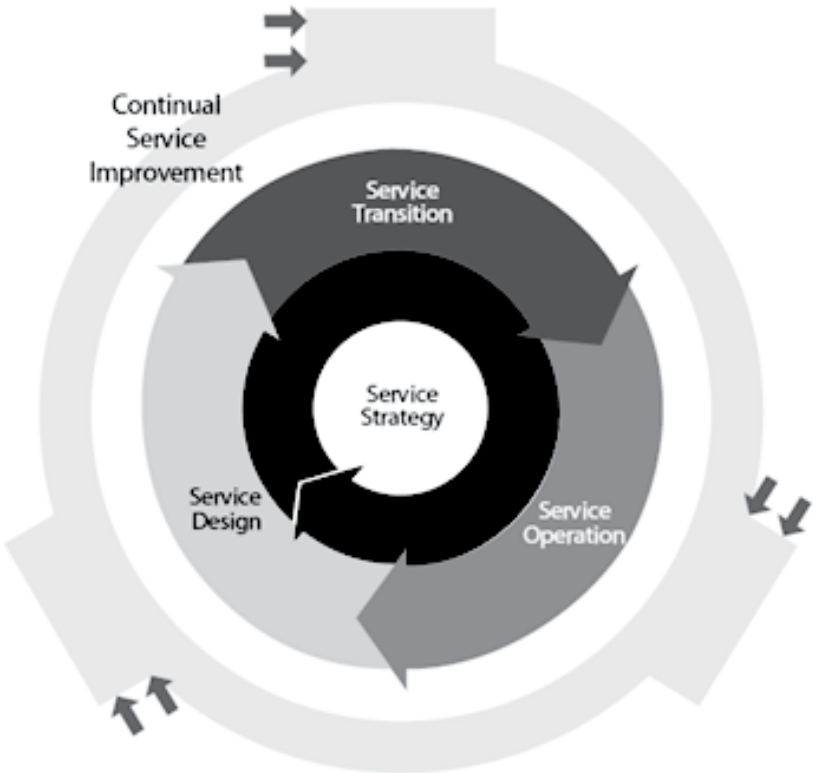

Figure 1: Core structure of ITIL service lifecycle

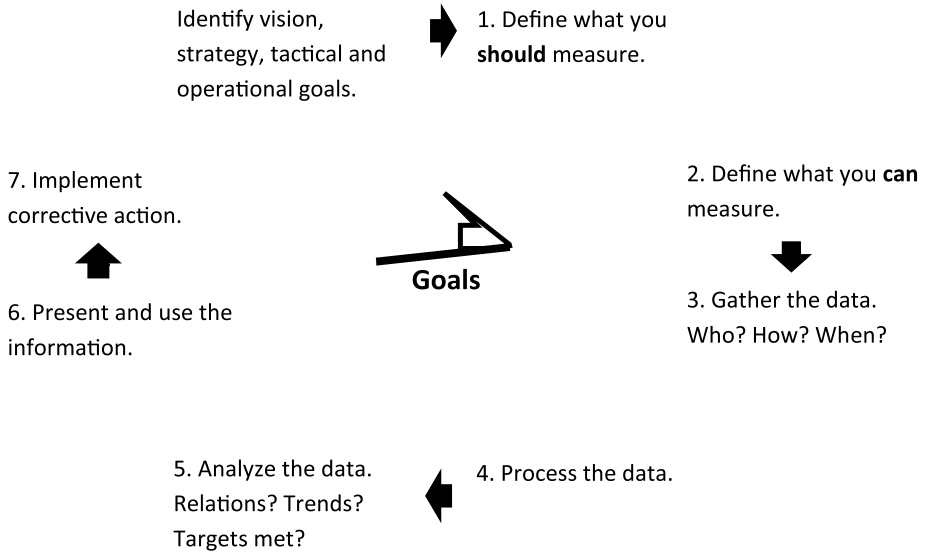

Figure 2: Seven step improvement process

Service Improvement stage (CSI). CSI focuses on continually measuring and improving the quality of already-delivered IT services, from both the business and the customer perspective. The service lifecycle stages rely on processes to execute each element of the ITIL practice in a consistent, measurable and repeatable way. Each core publication identifies the processes it makes use of, how they integrate with the other stages of the lifecycle, and the activities needed to carry them out. For the CSI stage this is the Seven step improvement process (Figure 2) (Adams, et al., 2008).

The Seven step improvement process covers all the steps required to collect meaningful data, to analyze this data with the goal to identify trends and issues, to present the information to management for prioritization, and to implement improvements.

The Seven step improvement process is fundamental in supporting CSI efforts and operates across the entire service lifecycle. Its objectives are clear: identify and develop a set of measures that are relevant to business requirements and support the identification of improvement opportunities, to adopt a structured approach to gathering, processing and analyzing the data in order to identify improvement opportunities, and finally to communicate those improvement opportunities to allow decisions to be made. This focus on continual measurement and improvement of the quality of IT services delivered is a major factor in ITIL's worldwide success because it clearly contributes in achieving benefits; for instance: increased user and customer satisfaction with IT services, improved service availability, directly leading to increased business profits and revenue, financial savings from reduced rework, lost time and improved resource management and usage, improved decision making and optimized risk (Cartlidge, et al., 2007).

3 Six Sigma methodology

The Six Sigma methodology is defined as an approach to solving problems and optimizing key processes in the organization. The objective is clear and simple – elimination of all defects or defective products (Božič, 2009). The numerically expressed objective of Six Sigma is 3.4 defects or defective services per million opportunities (labeled as 3.4 ppm). In essence,the Six Sigma methodology is a quality technique to identify and eliminate errors in manufacturing processes. Eventually the technique has expanded and now includes service activities as well. Since its introduction, the methodology has gained in followers, including organizations such as General Electric, Honeywell, 3M, Air Canada, Caterpillar, Dell, EMC, Lockheed Martin, DHL, Samsung Group, Siemens AG, Starwood Hotels, TRW, McGraw-Hill Companies and others. The success that these organizations have achieved has also aroused interest in other industries and countries in Western Europe. In 2007, 82 percent of the companies on the 100 Fortune list have already adopted and implemented this methodology. However, the use of Six Sigma in Slovenia is still in its early stages. The approach has been successfully addressed by only a handful of organizations. Among the highlighted are: Johnson Control, BSH Home Appliances, Gorenje, Kovinoplastika Lož, Sava Tires, Hidria AET, Iskra Avtoelektrika (Hohnjec, 2009).

To improve the quality of a process or a service, the Six Sigma methodology uses the DMAIC (Define, Measure, Analyze, Improve, and Control) model (Probst & Case, 2009). Six Sigma's DMAIC is a quality improvement model, divided into phases. It helps to improve a process or a service by focusing on the customer or end-user's experience through the voice of the customer (VOC) — e.g. surveys, interviews, etc. By doing so, VOC helps identify critical to quality (CTQ) requirements of the customers. We have to note that the model is specifically used to improve the quality of already existing processes and services (Morgan & Ho, 2009). In other words, only when a certain activity, process or service has been implemented, can the model be used to focus on specific problems, identify potential source of errors, and thus eliminate them. DMAIC is a reactive approach. It reacts to performance data

Table 1: Overview of the DMAIC model

Phase	Objective	Tasks	Techniques
Define	Identify problem. Define measurable objectives and end results.	Brainstorm and understand the impact of the problem. Define process to investigate. Ensure common understanding across the project.	Voice of the Customer (VOC): surveys, interviews. Affinity Diagram: brainstorming, categorizing ideas.
Measure	Benchmark current process performance.	Collect data. Identify critical to quality measures (CTQs). Baseline these measures and identify process areas that fall outside CTQ upper and lower thresholds.	Pareto Charts: identify key bottlenecks and prioritize improvement initiatives. Cost of Poor Quality (COPQ): impact on bottom line. Process sigma value: quality of service status.
Analyze	Identify root cause of problem.	Take data and analyze the process map for improvement opportunities. Determine root cause of problem.	Failure Modes and Effects Analysis (FMEA): identify risk and mitigate risk through prioritization system. Control charts: control and predict process performance behavior. Pareto charts. Correlation diagram. Kepner -Tregoe or Ishikawa diagrams: cause and effects analysis.
Improve	Recommend and implement solutions.	Brainstorm solutions to the problem. Produce action plan with owners allocated. Develop new process and pilot it.	Hypothesis Testing: test/brainstorm potential solutions. Cost/benefit analysis of proposed solution.
Control	Sustain improvement. Predict process behavior.	Measure impact of improvement. Continuously monitor process performance. Take action when thresholds are breached and bring back into control.	VOC. Control charts. Process sigma value. COPQ.

gathered through the measurement of existing processes and services.

An overview of the DMAIC model can be found in Table 1 (Ho, 2008b; Morgan & Ho, 2009). Since there is a vast amount of tools and techniques used by the Six Sigma methodology, we have decided to give an overview of only its key objectives and proven techniques applicable to IT service management. This illustration makes the DMAIC model easier to understand.

4 Aligning ITIL and Six Sigma methodology

With the basic explanation of ITIL and Six Sigma given, a pressing question remains: how can we align or combine both approaches? In order to understand the link between ITIL and the Six Sigma methodology, it is first necessary to understand the concept of the service. ITIL defines a service as "a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks" (OGC, 2007). This is an extremely important concept, especially in conjunction with the principles of the Six Sigma methodology. The idea of a service, as a means of ensuring value, actually implies that the customer finds the delivered service of sufficient worth. In other words, the service has to be of a good enough quality for the customer to pay for it. Of course the degree of value, as Probst and Case (2009) point out, can vary depending on who the customer is, their business circumstances, the availability of substitutes for the service and so forth. In any case, when certain customer expectations relative to the service are met, then the service is of a good quality and therefore valuable enough to purchase. This statement can be easily confirmed by the quality definition as seen by ITIL. Quality is "the ability of a product, service, or process to provide the intended value" (Taylor, et al., 2007). The second important concept in relation to Six Sigma is that the service "facilitates the outcomes customers want to achieve". This actually implies that any service improvements have to be clearly aligned with the customer or, in the words of Six Sigma, can be measured in terms of the voice of the customer (VOC) (Probst & Case, 2009).

VOC, or the external aspect of quality, as Božič (2009) likes to call it, is the underlying assumption which allows the extension of ITIL using the Six Sigma methodology. Voice of the customer actually dictates which services are perceived as being of a good quality or value. Six Sigma therefore complements ITIL in a way that it helps to reduce the gap between what the customer requires and the services already provided. By reducing this gap, the organization can now focus on only those processes and services which are crucial for improving the customer's or end-user's experience. However, to properly decide which processes to improve or which characteristic of a process to improve, it is imperative that we understand what is critical to quality (CTQ) for the customer's point of view.

CTQ is essentially the customer's specification, which clearly expresses expectations of how a service should be in terms of quality. Despite the fact that there is no mention of VOC in any of the ITIL publications, Probst and Case (2009) believe it can be considered at two levels. For the purpose of this paper we will only consider the lower level, where service defects impact the customer's satisfaction. These defects usually have a negative effect on organization's reputation or customer goodwill, thus the need to emphasize customer-facing issues. And, in doing so, ITIL and the Six Sigma methodology do not undertake improvements for their own sake, but with the clear intention of improving the customer's experience. To sum up, voice of the customer is the link between the two approaches (den Boer, 2006).

So what is the key for improving the customer's experience? Well, the key to improvement, and also one of the requirements of the Six Sigma methodology, is the ability to measure and report against the performance of services. Even the ITIL's concept of Continual Service Improvement (CSI) is based on the same idea. Metrics and measurements are the guiding principles for the improvement of IT services. If we flick thorough the extensive ITIL publication we will stumble upon the following observation: we cannot manage something that we cannot measure (Taylor, et al., 2007). So if we cannot manage something, we cannot control it, and if we cannot control it, we cannot improve it either. Thus, measurement is essential for the quality improvement efforts of both approaches. But what is most important, from a Six Sigma perspective, is that multiple sources for measurement exist in the lifecycle of a service. ITIL identifies three types of metrics: technology, process, and service metrics (Taylor, et al., 2007). Technology metrics are often associated with component and application based metrics such as performance, availability etc. Process metrics are captured in the form of CSFs (Critical Success Factors) and KPIs (Key Performance Indicators) for the service management processes. These metrics can help determine the overall health of a process, as well as answer questions regarding the quality, performance, value and compliance of following the process. Service metrics are the results of the end-to-end service. They represent the service as seen by the customer or end-user. It is important to note that any measurements from the aforementioned metrics can be used as input in

Table 2: DMAIC model complements the Seven step improvement process

Seven step improvement process (ITIL v3)	**DMAIC model (Six Sigma)**
step 1 – Define what you should measure?	**Define:** Identify the problem. Define measurable goals and end results.
step 2 – Define what you can measure?	
step 3 – Gather the data. Who? How? When? Integrity of data?	**Measure**: Benchmark current performance. Collect data.
step 4 – Process the data. Frequency? Format? System? Accuracy?	**Analyze:** Identify root cause of problem. Analyze the data and identify improvement opportunities.
step 5 – Analyze the data that IT can make decisions during the next steps.	
step 6 – Present/assess the data analyzed, draw recommendations for improvement and take corrective actions.	**Improve:** Recommend and implement solutions. Produce action plan.
step 7 – Implement corrective actions.	
///	**Control:** Sustain improvement. Predict process behavior.

Six Sigma's endeavor of identifying improvement opportunities. But in order to apply the Six Sigma methodology there is one basic requirement. Six Sigma requires the existence of a process, or at least the intention to design one. Without the focus of the repeatability of a process, the methodology has little applicability in conjunction with service improvements.

Since business demands evolve and change over time, both approaches try to continually meet the customers and business expectations. For this purpose, ITIL introduced the Seven step improvement process, which goes hand–in-hand with the Six Sigma's DMAIC model (den Boer, 2006). Each of the seven steps actually represents a task which can be typically assigned to the DMAIC phases. Table 2 illustrates how Six Sigma's DMAIC model complements ITIL's Seven step improvement process (Ho, 2008a).

ITIL does not provide an eighth step to sustain improvement (Ho, 2008a). The Six Sigma methodology complements it by adding the Control phase to the Seven step improvement process. By doing so, Six Sigma sustains improvements until new opportunities arise. This provides a continual cycle for service quality improvements.

All organizations that use IT depend on IT to be successful. If the business wishes to achieve its objective then it is imperative that IT services are implemented, managed and supported in the appropriate way. A good way of doing this is to use the combined approach of ITIL and the Six Sigma methodology. In this paper we showed that ITIL and Six Sigma are complimentary to one other. Their combined benefits can be seen in Table 3 (Ho, 2008a; Kukuljan & Kukuljan, 2008).

5 Conclusion

ITIL's service management focuses on delivering value of IT services. It consists of five stages (publications) which support the lifecycle of IT services. Underpinning these five stages are

Table 3: Combined benefits of ITIL and the Six Sigma methodology

	ITIL V3	**Six Sigma methodology**	**Combined benefits**
Source:	Derives from information technology.	Arises from commercial waters (business area).	Better integration and alignment between the information technology and the business.
Objective:	Establishes consistent processes in field of IT (covers the whole service lifecycle).	Improves process and service quality.	Improved IT process efficiency and service quality while minimizing costs.
Focus:	ITIL focuses on IT–business integration.	Six Sigma focuses on what is critical to quality (CTQ), reduces variation or defects and with it costs.	Better coordination of the IT department and the business.
Implementation concepts:	Guidelines (ITIL tells us what to do). It has five stages (publications): Service strategy, Service design, Service transition, Service operation, Continual service improvement, and 24 processes supporting the life cycle of services.	DMAIC model (Six Sigma's techniques tell us how to improve the quality). It has 5 phases: Define, Measure, Analyze, Improve, Control. Techniques (how?): VOC (voice of the customer), Pareto charts, Failure modes and effects analysis, Control charts, Process sigma value etc.	Improved communication with the business counterparts and metrics selection. Baseline service quality. Prioritize and focus on CTQ. Quantify improvement for ROI. Sustain improvement.
Extension possibilities:	ITIL needs other industry accepted practices (Six Sigma, COBIT, TQM, ISO etc.).	Six Sigma is more efficient with available data to analyze.	Improvement projects are more effective due to the large volume of data in the world of IT, thus enabling advanced IT service management.

24 processes that define what has to be done in order to deliver value of IT services. The Six Sigma methodology on the other hand focuses on what is critical to quality. At its core is the DMAIC model. Each phase of the model provides know-how (variety of tools and techniques) for measuring, analyzing and reporting on the quality of IT services. This promotes improvements where it matters the most from the business perspective. But in order to achieve this, time and effort will be required. For a successful implementation, changes in the organizational culture will be required as well. These kinds of investments also represent a very large financial commitment. Dedicated infrastructure, tools and training of people will be needed.

Bibliography

Aazadnia, M. & Fasanghati, M. (2008). Improving the Information Technology Service Management with Six Sigma, *International Journal of Computer Science and Network Security,* 8(3), 144-150.

Adams, S. et al. (2008). *ITIL V3 Foundation Handbook*, The Stationery Office, Norwich.

Božič, S. (2009). *Kakovost in zanesljivost proizvodnje [Quality and reliability of production]*, Zavod IRC, Ljubljana.

Cartlidge, A. et al. (2007). *An Introductory Overview of ITIL V3,* The UK Chapter of the itSMF, London.

den Boer, S. (2006). *Six Sigma for IT Management*, Van Haren Publishing, Zaltbommel.

Hohnjec, M. (2009). *Poznate metodologijo Six Sigma* [Do you know the Six Sigma methodology], available from: http://www.vodja.net/index.php?blog=1&title=poznate-metodologijo-six-sigma&more=1&c=1&tb=1&pb=1

Ho, L. (2008a). *How to use Six Sigma to Complement ITIL V3*, Available from: http://www.eweek.com/c/a/IT-Management/How-to-Use-Six-Sigma-to-Complement-ITIL-v3/

Ho, L. (2008b). *Six-Sigma Techniques for IT Management*, available from: http://www.eweek.com/c/a/IT-Management/Six-Sigma-Techniques-for-IT-Management/

Hsieh, C., Lin, B. & Manduca, B, (2007). Information technology and Six Sigma implementation. *Journal of Computer Information Systems,* 47(4), 1-10.

Kukuljan, K. & Kukuljan, V. (2008). The Usage of the Six Sigma Method for the Improvement of Support for ICT Services. *Information and Intelligent Systems Conference*, Available from: http://www.ceciis.foi.hr/app/index.php/ceciis/2008/paper/view/59/33

Morgan, M. & Ho, L. (2009). *Six Sigma for IT Service Management,* Available from: http://www.sixsigmazone.com/assets/Article_-_Six_Sigma_for_IT_Management.pdf

OGC (Office of Government Commerce). (2007). *The Official Introduction to the ITIL Service Lifecycle*, The Stationery Office, London.

Pollard, C. & Cater-Steel, A. (2009). Justification, Strategies, and Critical Success Factors in Successful ITIL Implementations in US and Australian Companies: An Examplantory Study. *Information Systems Management,* 26(2), 164-175, DOI: 10.1080/10580530902797540

Probst, J. & Case, G. (2009). *Integrating Six Sigma and ITIL for Continual Service Improvement - White Paper,* Available from: http://www.best-management-practice.com/gempdf/SixSigma_ITIL_CSI_WP_July09.pdf

Taylor, S., Case, G. & Spalding, G. (2007). *ITIL Version 3 Continual Service Improvement*, The Stationery Office, London.

Winniford, M., Conger, S. & Erickson-Harris, L. (2009). Confusion in the Ranks: IT Service Management Practice and Terminology. *Information Systems Management,* 26(2), 153-163, DOI: 10.1080/10580530902797532

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Upravljanje storitev IT: usklajevanje dobre prakse z metodo kakovosti

Upravljanje storitev informacijske tehnologije postaja vse bolj zahtevna naloga. V podporo upravljanju so se razvili različni standardi in metodologije. ITIL (krajše za IT Infrastructure Library) je najpogosteje uporabljen pristop t.i. dobre prakse za učinkovito upravljanje storitev IT. ITIL se osredotoča predvsem na vprašanje, kaj storiti, da zagotovimo učinkovite storitve IT, ne pojasni pa kako to doseči. To pomanjkljivost je mogoče odpraviti z dopolnitvijo okvira tudi z drugimi kakovostnimi pristopi upravljanja storitev. V tem kontekstu se omenja več metodologij, vključno uporaba Six Sigme (6s). Statistični narava metodologije Six Sigma omogoča analiziranje obsežne količine podatkov, zbranih s področja IT. Šele na osnovi meritev lahko nato določimo splošno zdravje storitev IT in izvedemo potrebne ukrepe za izboljšavo. Namen prispevka je podrobno analizirati oba pristopa. Vzpostavili bomo skupno vez med njima in s tem tudi možnost dopolnitve ITIL s Six Sigmo, ter posledično določili temelje za uvedbo potrebnih merljivih sprememb.

Ključne besede: Upravljanje storitev IT, ITIL, metodologija Six Sigma, DMAIC, nenehno izboljševanje