Implementation of the ITIL-Based Service Level Management Process to Improve an Organization's Efficiency: A Case Study

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***Abstract*—IT organizations' needs to reduce costs and maximize the efficiency and effectiveness of IT services have become essential factors for success. Processes, functions, and services require continual improvement in order to generate positive business results and high levels of customer satisfaction. This article presents the results of a process improvement case study carried out in the Information System Management (ISM) unit of the Finnish Tax Administration. The researchers focused on improving the ISM unit's service level management (SLM) process to increase employee and customer satisfaction. The research problem of this study is this: how to implement the Information Technology Infrastructure Library (ITIL) based SLM process to improve organization's efficiency? The main contributions of this paper are: 1) defining how to implement the ITIL-based SLM practices by using the Keys to IT Service Management Excellence Technique (KISMET) model to increase organization's efficiency, and 2) providing the lessons learned from improving SLM practices.**

Keywords*—IT service management; ITIL; continual service improvement; service level management; service level agreement

I. INTRODUCTION

The Information Technology Infrastructure Library (ITIL) is a set of good practices for directing and managing IT services. The ITIL gives a detailed description of IT service management (ITSM) processes with comprehensive checklists, activities, roles, and responsibilities, which can be tailored to any IT organization [1]. ITIL version 3 approaches ITSM from the IT service lifecycle point of view. The IT service lifecycle consists of five phases: Service Strategy [2], Service Design [3], Service Transition [4], Service Operation [5], and Continual Service Improvement [1]. This study focuses on the Service Design and Continual Service Improvement (CSI) lifecycle phases, where the business perspective plays an important role. Continually improving services is vital for every IT organization because there is strong competition in business today and the IT services need to be continually aligned with the customer's needs. According to ITIL [1], CSI reviews, analyzes, and makes recommendations on improvement opportunities in each IT service lifecycle phase and ensures that these opportunities are identified and managed throughout the service lifecycle.

An ITIL-based service desk provides a single point of contact between IT organization and users on a day-to-day basis. This also means that a service desk is responsible for handling support tickets, which are managed via the IT service management (ITSM) system. The type of a support ticket can be an incident or a service request. An incident is an unplanned interruption to an IT service or reduction in the quality of an IT service [5]. In practice, an incident can be e.g., a software error, which prevents normal use of software, a malfunction in the printer, or a crashed database server. A service request is a formal request from a user for something to be provided (for example, a request for information or advice to reset a password, or to install a workstation for a new user) [5]. The service desk treats every support ticket as a separate entity (one logged support ticket to the ITSM system should cover one incident or service request). However, while handling same types of incidents, the service desk can create a link between these incident tickets by using an ITSM system. This practice enhances the efficiency of incident management.

Service level management (SLM) is a process of Service Design lifecycle phase in ITIL v3 [3]. The purpose of the SLM process is negotiating and documenting SLM agreements with appropriate stakeholders, and then monitoring and producing reports to follow these agreements [3]. According to ITIL, SLM agreements can be classified into three groups: service level agreements (SLA), operational level agreements (OLA), and underpinning contracts (UC) [3]. A SLA is made between an IT organization and a customer. An OLA is an agreement between two parts of the same organization and an UC is a contract between an IT organization and a third party.

Every SLM agreement contains rules. These rules define how an IT organization handles different types of support tickets. Usually a support ticket affects one or more configuration items (CI). A CI is any component or other service asset that needs to be managed in order to deliver an IT service. For example, a CI can be a service, hardware, software, a building, people or a formal documentation. Looking at SLM from ITSM system perspective, CIs are mandatory because they can be used to create links between SLM agreements, CIs and support tickets. For example, this practice makes it possible to create SLM agreement, which includes rules that only focus on incidents of the Service Alpha (an CI).

In practice, a rule in the SLM agreement is a combination of following attributes:

- **Configuration items (or an item):** which CIs (usually services) are affected by the rule?

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- **Type of the support ticket:** which support tickets are affected by the rule?
- **Reaction and resolution times:** what kind of reaction and resolution times would be best for the selected CIs (these times might vary depending on the type of the support ticket)?
- **The priority of the support ticket:** how will the priority of the support ticket affect the calculation of reaction and resolution times?
- **The states of the support ticket:** which states will affect the calculation of reaction and resolution times?
- **Notification settings:** which people will be notified, when are the notifications sent, and what is the content of the notification?

In this context, the reaction time means the time in which work should start on a support ticket after the ITSM system has registered the ticket and the resolution time means the time in which a support ticket needs to be solved.

Well designed SLAs, OLAs, and UCs help to improve and maintain organization's efficiency. According to ITIL v3, efficiency is a measure of whether the right amount of resource has been used to deliver a process, service or activity. An efficient process achieves its objectives with the minimum amount of time, money, people or other resources [3]. In this paper, the researchers use the description of ITIL v3 for the term "efficiency".

The efficient handling of support tickets has become one of the essential tasks for IT organizations in the last few years. In practice, separate SLM agreements for different services enables that support tickets can be handled efficiently based on types and priorities of the tickets. This means that appropriate amount of resources (e.g., time, money, and right persons) can be allocated to handle tickets, which makes support ticket handling process efficient and has direct impact to organization's overall efficiency. It also seems that in the future there will be an increased number of support tickets, which customers will expect to be solved quickly and effectively. For these reasons many organizations have started defining and designing SLAs, OLAs, and UCs.

CSI has a strong interface with the SLM process. CSI reviews and analyzes SLA, OLA, and UC reports and if those reports indicate any deviations (e.g., the resolution times for support tickets being exceeded) CSI starts appropriate improvement actions. These actions should follow the ISO/IEC 20 000 standard [6]. ISO/IEC 20 000 is an international standard for ITSM. ISO/IEC 20 000 requires the results of the process monitoring to be recorded and reviewed to identify causes, nonconformities, and opportunities for improvement. The CSI model has been discussed in our previous paper [7].

A. Related work

There have been few studies which have analyzed the SLM process from the IT perspective. Jäntti and Suhonen [8] performed a research study about how to implement SLA using an ITSM tool. In their paper, Kajko-Mattsson, Ahnlund, and Lundberg [9] suggested a SLA model and evaluated it within four support organizations in Sweden. Wegman et al. [10] illustrated how methods based on the System Enterprise Architecture Methodology (SEAM) can be used to define SLA by modelling the service. Hsueh's [11] research described how an IT organization working in the aerospace industry applied an adaptive approach to ensure that service delivery meets business requirements in the face of changes in requirements. An adaptive SLM approach was used in their study to deliver a just-in-time quality service. Correia's and Abreu's [12] research work concentrated on defining and observing compliance with SLA. The main contribution of this research work was a model-based approach to SLA specification and compliance verification for IT services. Barroero's, Motta's, and Durante's [13] paper focuses on defining sustainable ways to create and manage service levels in call centres.

The purpose of this article is not to analyze successful factors of the study. There are many existing studies that have dealt with the success factors of ITSM such as the study made by Tan, Cater-Steel, and Toleman [14]. Their study focused on presenting successful factors in an Australian ITSM project. The study explained challenges and breakthroughs, confirmed a set of factors and contributed to the project's success, and offered learning opportunities to organizations.

B. Our Contribution

The main contributions of this paper are:

1) Defining how to implement the ITIL-based SLM practices by using the KISMET model to increase organization's efficiency.
2) Providing the lessons learned from improving SLM practices.

The results of this study can be used by persons such as service owners, service managers, process owners, process managers, and consultants, who are responsible for any phases of the IT service lifecycle. These results can be used to support CSI work based on the ITIL framework and the ISO/IEC 20 000 standard.

The rest of the paper is organized as follows. The research problem and methods are described in Section 2, and the work and results of implementing the SLM are covered in Section 3. The analysis of the findings, together with the lessons learned, is covered in Section 4. The conclusion and future work in Section 5 summarizes the case.

II. Research Methods

The research problem of this study is how to implement the ITIL-based SLM process to improve the organization's efficiency. The researchers used a case study research and action research methods with a single case organization to find answers to the research problem. The research problem was divided into the following research questions:

- RQ1: What is the current state of the SLM in the case organization (this research question is discussed in the Section III. B. and C.)?
- RQ2: What kind of things should be taken into consideration when designing SLAs and OLAs (Section III. D. provides readers with an overview of design guidelines)?

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- RQ3: Which issues should be examined while analyzing whether SLAs and OLAs can be configured to the ITSM system (in Section III. E., researchers explore the ITSM system perspective of creating SLAs and OLAs)?
- RQ4: What types of benefits do SLM practices provide from the perspective of continual service improvement (the improvement cycle is visible in the whole article and relationships between CSI and SLM are discussed in the Section III. G.)?

These four research questions highlight the importance of CSI, while enhancing and deploying ITSM and SLM. This study was a qualitative research, which was built using the case study research and action research methods. According to Yin [15], a case study is "a research strategy, which focuses on understanding the dynamics present with single settings". During a case study, the researcher is an outsider who observes and analyses an environment and makes notes by combining different data collection methods [15]. According to Baskerville [16], the action research method produces highly relevant research results, because it is grounded in practical action, and it solves immediate problem situations. These selected methods support the situation where the researchers work together on a research project and their objective is to identify and solve problems in the IT organization's environment.

The Keys to IT Service Management Excellence Technique (KISMET) model supports action research methods, which focus on improving ITSM practices. For this reason, the researchers used the KISMET model as a tool to achieve the goals of this action research study. The KISMET model is also used in e.g., Jäntti's and Suhonen's research paper [8]. Additionally, the researchers used ITIL [1], ISO/IEC 20 000 [6], and COBIT [17] as the theoretical frameworks of this study.

A. The Case Organization

The case subject of this study was the Information System Management (ISM) unit, which is part of the IT unit of the Finnish Tax Administration. In 2012, the Finnish Tax Administration had around 5300 full-time employees from which approximately 60 work in the ISM unit. The ISM unit provided IT services (e.g., creating and maintaining user privileges, implementing changes to the software and hardware, and supporting the incidents and service requests) to these employees. The ISM unit is a representative case of a government agency with a desire to improve and enhance its IT services using ITIL-based practices.

The most of the ISM unit's employees perform service desk and customer support activities either part time or full time. The ISM unit's service desk follows ITIL-based incident management and service request management processes. In practice, this means that the number of service desk employees do not affect the support tickets handling principles, but it has influence on designing SLM agreements (defining reaction and resolution times for different types of support tickets).

B. Data Collection and Exploitation Methods

The data which was used in this research was collected by using the ITIL-based seven-step improvement process [1]. The ITIL-based seven-step improvement process consists of the following steps: 1) identify the strategy for improvement; 2) define what you will measure; 3) gather the data; 4) process the data; 5) analyse the information and data; 6) present and use the information, and 7) implement improvements.

The steps from 1 to 3 were conducted by the Finnish Tax Administration IT unit. During these steps the IT unit identified the strategy, defined metrics, and gathered the data for improving their ITSM. In Step 4, the researchers used three core perspectives of ITSM (people, process, and technology) to categorize the data that had been gathered (via a customer satisfaction survey and feedback related to resolved tickets). In Step 5, the researchers used the categorized data to identify challenges and opportunities for improving the services and processes related to ISM's practice. In Step 6, the researchers presented the ideas for improvements to the managers of the ISM unit and they made a decision to improve the SLM process. In the Step 7, the researchers implemented the improvements that had been decided by the ISM unit's on the basis of the researchers' recommendation in Step 6. This paper concentrates on the results of the Step 7, during which the researchers started the implementation of the SLM process.

The procedures of the Keys to IT Service Management Excellence Technique (KISMET) model where used to manage the SLM implementation activities. The following data collection methods and data sources were used during the research:

- **Documents and archival records:** ITSM documents, service descriptions, customer satisfaction survey, feedback data, meeting memos, and other internal records.
- **Participatory observation:** meetings and discussions with the service manager, customer manager, ITSM system specialists, and team managers from different service areas. SLM workshops held in autumn 2012.
- **Physical artifacts:** access to the intranet and to the ITSM system.

C. Data Analysis

This study performed by using within-case analysis for a single organization. According to Eisenhardt [18], the within-case method typically involves detailed case study write-ups for each site and becoming familiar with the case as a stand-alone entity. The pattern matching technique [15] was used to find patterns from the empirical data. The researchers used this technique to analyze and categorize the customer survey results and feedback according to different patterns, such as people, process, and technology.

The triangulation used in this study allowed the researchers to be more confident about their results. Denzin [19] extended the idea of triangulation beyond its conventional association with research methods and designs. During the study the researchers used three forms of triangulation [19]: 1) data triangulation, which includes collecting data through several sampling strategies; 2) investigator triangulation, which refers to the use of more than one researcher in the field to gather and interpret data, and 3) methodological triangulation, which refers to the use of more than one method for gathering data.

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The process improvement events were organized into chronological order by the phases of the KISMET model. The research work was validated in weekly meetings with the ISM unit's representatives.

III. Implementation of the ITIL-based service level management process to improve organization's efficiency

The implementation of the ISM unit's SLM process was performed using the KISMET model. The model consists of the following phases: A) create a process improvement infrastructure; B) perform a process assessment; C) plan process improvement actions; D) improve / implement the process on the basis of the IT service management practices; E) deploy and introduce the process; F) evaluate the improvement of the process, and G) design continual process / service improvement actions.

A. Create a process improvement infrastructure

The "create a process improvement infrastructure" phase includes the following steps: motivate the business decision makers to ITSM, define business goals for ITSM process improvement, select an improvement target, and identify the stakeholders that participate in the process improvement.

The kickoff meeting of the SLM implementation study between the research team and the ISM unit was held in August 2012. The participants agreed that the main goal for the study was to improve and unify the ISM unit's working processes by implementing ITIL-based SLM. To achieve this goal, the research team needed to 1) evaluate the current state of the SLM in the ISM unit; 2) define SLA and OLA for the ISM unit, and 3) investigate how to configure SLAs and OLAs into the ISM unit's ITSM system.

B. Perform a process assessment

The "perform a process assessment" phase includes the following steps: perform a process assessment for a selected ITSM process, document the challenges and difficulties in the current state of the process, identify the key concepts regarding the process, study how tools support the process, and benchmark the process with ITIL best practices and ISO/IEC 20 000 requirements.

The process assessment was executed by analyzing the results (the ISM unit's internal customer satisfaction survey and feedback related to incidents and service requests that had been solved) and searching for issues and problems related to SLM. The analysis of SLM revealed following main challenges and bottlenecks: 1) there was neither knowledge nor a systematic way to perform SLM inside the ISM unit (insufficient amount of people know how to create SLAs and OLAs); 2) a common agreement between the ISM unit and customers stipulating that every incident and service request should be solved within an hour, and 3) the ISM unit needs appropriate metrics and reporting tools that could be used to improve and unify the ISM unit's working processes.

The following comments were captured from the ISM unit's customer satisfaction survey and feedback regarding SLM:

- "The delay is too long. We need help with incidents related to workstations immediately, not after a few days."
- "I don't know how long it will take till I actually get help or a solution."
- "We have been uncertain about a state or an estimated resolution time of an incident or a service request."

During the process assessment phase the researchers discovered the following strengths concerning the ISM unit's SLM. The ISM unit was interested in SLM, and both the management and personnel were strongly motivated to increase customer satisfaction and were ready to improve their ITSM system.

C. Plan process improvement action

The "plan process improvement actions" phase includes the following steps: analyze the challenges that have been identified, plan improvement actions, and validate the challenges and improvement actions.

This phase focused on defining the process improvement actions based on the challenges and bottlenecks that have been identified. For each challenge that was identified, improvement actions and the business benefit were documented.

Challenge: there is neither knowledge nor a systematic way to perform SLM inside the ISM unit (insufficient amount of people know how to create SLAs and OLAs). **Improvement actions:** the ISM unit needs to increase its knowledge of SLM methods and practices, configure their ITSM system to support SLM, and train and instruct employees to use the ITSM system efficiently. **Business benefit:** the ISM unit can define clear and measurable objectives for the SLM process. Additionally, efficient SLM can help the ISM unit to establish clear responsibilities between the ISM unit and a customer.

Challenge: there is a common agreement between the ISM unit and customers that stipulates that incidents and service requests should be solved within an hour. **Improvement actions:** the ISM unit needs to design SLAs and OLAs, which define reaction and resolution times for different types of support tickets. **Business benefit:** all incidents and service requests can be classified on the basis of their priorities. This helps employees to decide the order in which incidents and service requests should be handled, which makes support ticket handling process efficient and has direct impact to ISM unit's overall efficiency.

Challenge: the ISM unit needs appropriate metrics and reporting tools that could be used to improve and unify the ISM unit's working processes. **Improvement actions:** the ISM unit should define metrics that best meet the organization's goals. These metrics would direct the ISM unit's activities to achieve set targets. **Business benefit:** a constant monitoring allows the ISM unit to ensure that incidents and service requests are processed and solved within the agreed reaction and resolution times. Additionally, reviewing reports of reaction and resolution times allows the ISM unit to recognize weak points in processes and identify opportunities for improvement.

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TABLE I. AN EXAMPLE OF SLA RULES CREATED BY SERVICE LEVEL AGREEMENT AND OPERATIONAL LEVEL AGREEMENT RULE DEFINITION MODEL

Configuration item (CI)	Type of support ticket	Priority	Reaction time	Notification of reaction time	Resolution time	Notification of resolution time	Notification targets
Software A	Incident	Low	15 min.	1 hour after	10 working days	2 working days before	Support ticket handler
		Normal	15 min.	1 hour after	3 working days	6 hours before	Support ticket handler
		High	15 min.	10 min. after	2 hours	4 hours after	Support ticket handler

D. Improve / implement the process on the basis of ITSM practices

The purpose of the "improve / implement the process on the basis of ITSM practices" phase is to define and document: a) process goals; b) the benefits that a process provides to customers and the IT organization's business; c) key concepts; d) roles and responsibilities; e) actions; f) metrics, and g) relationships to other ITSM processes.

The SLM workshops in the autumn of 2012 played a major role when the researchers and the ISM unit were designing SLAs and OLAs for incidents and service requests. Before the workshops were held, the research team created and sent a questionnaire to the workshop participants (e.g., the service manager, the customer manager, and ITSM specialists). Those attending were told to answer the questions from their own unit's perspective (e.g., give an estimation of how fast the unit's personnel could handle incidents and service requests). The questions below were included in the questionnaire:

1) Who is responsible for SLM (managing SLAs and OLAs)?
2) Which configuration items should have their own SLAs and OLAs during the first stage of the implementation of SLM?
3) Will the SLAs and OLAs for configuration items be targeted at incidents or will service requests also be taken into account?
4) What types of reaction times would be best for incidents / service requests which affect the selected configuration items (the reaction time means the time in which work should start on an incident or a service request after the ITSM system has registered the incident or the service request)?
5) What types of resolution times would be best for incidents / service requests which affect the selected configuration items (the resolution time means the time in which an incident or a service request needs to be solved)?
6) Will different priorities of service requests and incidents have an effect on reaction and resolution times? Is it necessary to define a set of reaction and resolution times for incidents and service requests on the basis of the priorities of incidents / service requests? (In this context, the priority is a category used to identify the relative importance of a support ticket. Priority is defined on the basis of the impact and urgency of the support ticket. In practice, a high priority support ticket need to solved faster than a low priority ticket.)
7) When should notification messages be sent (when the reaction or resolution time looks likely to be exceeded or has already been exceeded)? Will the priority of the incident or service request affect the sending of notifications?
8) Which person(s) or group(s) will be informed when the reaction or resolution time looks likely to be exceeded or has already been exceeded? Will the priority of an incident or service request have an effect on the sending of a notification to person(s) or group(s)?

As a result of the workshops the researcher and the ISM unit defined the SLA and OLA rules for incidents. These rules were created by using the SLA / OLA rule definition model. An example of SLA rules created by definition model is presented in Table 1.

E. Deploy and introduce the process

The "deploy and introduce the process" phase includes the following steps: deploy an ITSM process with a pilot unit, create work instructions for how to perform the process in practice, encourage a positive attitude to ITSM among the staff, increase the awareness of ITSM in the organization through training, and organize ITSM workshops to clarify the ITSM process interfaces.

The researchers organized a workshop in September 2012 to investigate how to implement and configure SLAs and OLAs into the ITSM system. The researchers created and used the following questionnaire to evaluate the readiness of the ITSM system from the viewpoint of the implementation of SLAs and OLAs:

Creation of a new SLA / OLA

The SLM process is heavily dependent on the organization's ITSM system. In practice, a ITSM system has to contain a SLM module (a collection of SLM features), which need to be configurable. Otherwise SLAs and OLAs cannot work properly in the ITSM system and the organization will not be able to execute SLM practices efficiently (e.g., ensure that reaction an resolution times are used as planned). The following issues should be examined while analyzing ITSM system's principles related to the creation of new SLAs / OLAs:

- Does the ITSM system contain a proper method to create new SLAs and OLAs? Is it possible to use pre-created SLA and OLA templates?
- Is there a proper method to create a link between a SLA / OLA and a configuration item (CI)?

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When a new support ticket is registered into the ITSM system, the data of the ticket will be analyzed. If the ticket contains a CI that has an existing link to SLA / OLA, this SLA / OLA will become active and the ticket needs to be resolved according to the SLA / OLA rules.

- Is there a proper method to activate a completed SLA / OLA? Is it possible to set a date when the SLA / OLA will become active?

Rule definitions for SLAs and OLAs

Every SLA / OLA contains different types of SLA and OLA rules. Defining appropriate reaction and resolution times is an essential task while designing SLA and OLA rules. A well balanced reaction and resolution times directly affect organization's capabilities to manage support tickets effectively and to keep customers satisfied. In practice, a successful creation of SLAs and OLAs requires that the attribute values of SLA and OLA rules are accurate (these values were defined in Section III. D.). The following issues should be examined while analyzing whether SLA and OLA rules can be configured to the ITSM system:

- Is there a proper method to create new SLA and OLA rules?
- Is there a proper method to edit SLA / OLA rule settings? How are the reaction and resolution time values configured into the rule?
- Is there a proper method to configure how the priority of the support ticket affects the calculation of reaction and resolution times?
- Is there a proper method to create sets of different kind of states of support tickets, which are taken into account in SLA / OLA rules?

  In practice, some of the states will affect the calculation of reaction and resolution times. For example, a state "waiting for reply from the third party" should not affect calculation of a resolution time. These kinds of states should be well-known and documented.
- Is there a proper method to create and configure working hours and holiday sets which might affect reaction and resolution times?
- Is there a proper method to configure notification message settings related to reaction and resolution times? A notification message will be send automatically to the appropriate personnel at the agreed times (e.g., when the resolution time exceeds).
- Is there a proper method to edit the content of the notification message?

Generating SLA and OLA reports

An organization has to define appropriate metrics to be able to generate accurate and relevant SLA and OLA reports. This practice helps to improve support ticket escalation and work queue management. For example, metrics can be used to measure the percentage of incidents, which have been resolved according to reaction and resolution times. This information is useful when organization reviews the functionality, validity, and business alignment of SLAs / OLAs. The following issues should be examined while analyzing ITSM system's principles related to metrics and a SLA / OLA report generation:

- Is there a proper method to configure metrics that measure how well SLAs and OLAs are working in practice?
- Is there a proper method to generate SLA and OLA reports?

At the end of the workshop, the researchers were able to determine that the ISM unit's ITSM system allows its users to create appropriate SLA and OLA rules. Based on this knowledge, the ISM unit decided that it would create SLAs and OLAs for the incident type of support tickets.

F. Evaluate the improvement of the process

The "evaluate process improvement" phase involves collecting feedback regarding an improved process, tools, and training, conducting fine-tuning if necessary, and the deployment of the processes to other organizational units or services.

After the workshop held in September, the ISM unit executed a one-month-long evaluation period. During that time the ISM unit ensured that SLAs and OLAs worked correctly in the ITSM system. This was done by: 1) creating test SLAs and OLAs; 2) testing reaction and resolution times by using different types of incidents (e.g., incidents with different priorities), and 3) checking whether notification messages got sent to the right persons at the right time.

The ISM unit was able to test the basic SLM features of the ITSM system and they confirmed that these features work correctly. However, the ISM unit also stated that one month is a too short time period to test and configure all SLM features thoroughly. The results of this evaluation period were analyzed in a workshop at the end of October 2012. Evaluate phase indicates that ISM unit has achieved the following results:

- ISM unit's managers have been able to increase their awareness related to SLM process and its purposes and practices compared the situation before research pilot (e.g., before the research only few ISM unit's managers had basic knowledge about SLM and after the research over 10 managers has now good understanding about SLM and they know how to design SLAs and OLAs).
- During the research workshops ISM unit's specialists learned how to create and configure SLAs and OLAs to the ITSM system (e.g., before the research, specialists did not have comprehensive knowledge about SLM features in the ITSM system).
- After the research, ISM unit is committed to create SLAs for the services they are providing and OLAs for different ISM unit's work groups (e.g., before the research, ISM unit used only one SLA, which covered all services).

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G. Design continual process / service improvement actions

The "design continual process / service improvement actions" phase includes the following steps: conduct process reviews frequently, identify and report process improvement ideas, and plan and implement improvement actions.

The ISM unit needs to identify critical success factors (CSF), key performance indicators (KPI), and metrics for SLM in the same way as in other ITSM processes. The CSFs, the KPIs, and metrics will determine whether there are gaps between the expected outcome and the real outcome. The metrics need to be monitored and the results of the measurements should be used to identify opportunities for improvement. Ideas for improvements that are identified should be logged in the CSI register for evaluation and possible implementation. A CSI register is a database or structured document used to record and manage improvement opportunities throughout their lifecycle [1].

The metrics direct the ISM unit's activities to achieve set targets. The ISM unit has had problems with implementing the metrics that were designed because of the lack of SLM best practices. After the research described in this paper, the ISM unit is now prepared to create reports, which will help it to see how well SLAs and OLAs are working (with the possibility of handling incidents within the given reaction and resolution times) and thus, continually improve its IT services. Complete understanding of how SLM works also requires the ISM unit to measure other processes that have interfaces with the SLM process. For this reason the following CSFs and KPIs were chosen by ISM unit for incident management [5][20]:

CSF: resolve an incident as quickly as possible to minimize the impacts on the business:

- KPI: reduce the mean time required to find a resolution or a workaround for an incident, broken down by priority.
- KPI: an increased percentage of incidents resolved within the agreed resolution times by priority.

CSF: maintain user satisfaction with IT services:

- KPI: average user survey score (total and by question category).
- KPI: percentage of satisfaction surveys answered versus total number of satisfaction surveys sent.

Communication, training and documentation are required to move a new or improved service, a tool or a service management process into production [1]. The ISM unit needs to review improvement activities to ensure that approved ideas for improvement are implemented and employees use these new practices in daily basis. The ISM unit should also organize training sessions for its employees to make sure that they understand SLM practices.

IT organizations should create reports where the implemented improvement actions are presented. These reports should be delivered to employees and customers. For example, improvement actions based on customer satisfaction surveys and feedback motivate employees and customers to give feedback in the future if their input has been taken into consideration while improving the service. A report, which shows improvement trends can be used as marketing tool to communicate that the organization is committed to continual improvement [1].

IV. Analysis

In this section, the researchers analyze the research findings in the form of the lessons learned. These lessons learned can be used as general guidelines while repeating the same experience. The source for each lesson is presented using the following abbreviations: DR = documents and archival records, PO = participatory observation, and PA = physical artifacts.

Lesson I: implement a systematic way to manage and operate SLM throughout the organization (PO). Non-existent or incoherent SLM creates different working methods and practices inside the organization and its units over a long period of time. With ITIL-based defined roles, responsibilities, processes, and metrics, the organization should be able to execute SLM in a systematic way, which improves and unifies the organization's working practices and increase organization's overall efficiency.

Lesson II: define reaction and resolution times for different types of support tickets according to the ticket's priority (PO, PA). If all support tickets are processed identically without their types and / or priorities being taken into consideration, the organization may encounter the following challenges: 1) employees who work at the service desk may have difficulties with handling support tickets at a sufficient speed, and 2) customers may also feel that they do not get solutions for their support tickets fast enough. Also, in case of high-priority support tickets, resolution time notifications should be sent after exceeding a resolution time because time limits are usually very strict and personnel do not have time to check their email messages when they are solving a ticket. In other words, these notifications should work primary as reminders to close tickets.

Lesson III: employees and customers might not have comprehensive knowledge about SLM or the benefits, which can be gained by using it (PO). If, after the successful implementation of SLAs and OLAs, a person who submits support tickets does not understand the meaning of SLAs or OLAs, he / she might not understand either why his / her low-priority support ticket takes longer to handle than high-priority tickets. For this reason, the organization needs to communicate with employees and customers about new and changed SLAs and OLAs and increase people's knowledge of SLM by organizing training sessions. These actions can be used to prevent resistance to change with regard to SLM practices.

Lesson IV: missing SLAs and OLAs might cause self-inflicted hurrying among the employees of the organization (PO). In this context, self-inflicted hurrying means that customers have unrealistic expectations about the resolution times of support tickets and employees want to handle support tickets as quickly as possible without prioritizing them first. SLAs and OLAs can be used to prevent self-inflicted hurrying among the employees of the organization because SLAs and OLAs create common rules, which both employees and customers should know and follow.

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Lesson V: define appropriate metrics for SLM (DR, PO, PA). The organization needs to define and configure appropriate process metrics to gather measurement data and monitor trends and performance against service targets at planned intervals. The measurement data should be used to identify the causes of nonconformities and opportunities for improvement.

Lesson VI: organize regular reviews to evaluate how the SLAs and OLAs have been followed and report the findings to interested parties (DR, PO). It is important to define requirements for SLM reporting after the deployment of SLAs or OLAs. The requirements should answer at least the next questions: Which persons will attend to report reviews? How often will report reviews be held? What kinds of actions will be taken if the reaction and resolution times are not working properly?

V. Conclusions and Future work

The research problem of this study was this: how to implement the ITIL-based SLM process to improve the organization's efficiency. The main contribution of this study was: 1) defining how to implement the ITIL-based SLM practices by using the KISMET model to increase organization's efficiency, and 2) provide the lessons learned from improving SLM practices. In this study, the researchers used the KISMET model to improve the IT service process. The improvement focused on the following things from the viewpoint of the ITSM: evaluate the current state of the SLM in the ISM unit, define SLA and OLA for the ISM unit, and investigate how to configure SLAs and OLAs into the ISM unit's ITSM system.

There are three important reasons why our research results are valuable: First, poorly planned SLAs may cause significant financial losses in the form of sanctions when SLA rules cannot be met. Second, there are only few academic studies that deal with interface between CSI and SLM. More studies are needed to fill this knowledge gap. Third, we provided practical implications for IT organizations to enable a systematic improvement of SLM practices by using the KISMET model.

The use of case study and action research methods has certain limitations. First, the research was performed with one organization, which means that the research work needs to be repeated in other organizations, so that the results can be generalized. However, the results of this study can be used to extend ITSM theory. Other case study researchers can use the KISMET model and SLM questionnaires to get similar results while repeating this study. Second, this research was executed within a short period of time. A longer research period would have provided a more detailed analysis of how SLAs and OLAs work in practice. Third, the researchers could have conducted more SLA and OLA validation meetings with employees to get a better understanding of whether the SLA and OLA rules that were defined correspond with the reality.

More studies are needed to examine SLM and its interfaces with other ITSM processes. Further research could also focus on exploring how to assess and measure ITSM process maturity by using the ISO / IEC 15504 framework [21]. It would be also interesting to research how impacts of service improvement actions could be evaluated in IT organizations.

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