Group Decision Support for e-Mail Service Optimization through Information Technology Infrastructure Library Framework

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Abstract—**The e-mail service takes significant part at the corporate collaboration due to its natural benefits like: unification, traceability and the ease of use. To ensure that such a fundamental service is functioning and being maintained right, proper methods for measuring its efficiency and reliability are in place. In this paper we propose a group decision support that allows the IT Management staff to choose proper asset of key performance indicators (KPIs) for measuring the operational performance of the service in a specific organization. A comprehensive set of KPI indicators is proposed for quality assessment of e-mail service. The optimization of the service is done within ITIL framework.**

Index Terms—**e-mail service, group decision making, ITIL (Information Technology Infrastructure Library), KPI (Key Performance Indicators)**

I. Introduction

THE e-mail service is one of the business critical functions in most of the enterprises. It is being defined as principal communication channel in most of them. This is caused both by productivity and legal reasons.

The Service Level Agreement is one of the key subjects in the Service Design volume of ITIL (Information Technology Infrastructure Library) - [1]. It is an asset of processes that aims to describe the deliverables that should be achieved in order to have the service available on the expected level. The Key Performance Indicators (KPI) are parameters that quantitatively describe the SLA (Service Level Agreement). For example, when we talk for e-mail service following KPI (Key Performance Indicators) [2] may be defined: 99% of all the e-mail messages to be delivered for less than a minute within the organization; the e-mail servers to be reachable for at least 97,5% of the time; all the priority 1 service requests to be resolved within 90 minutes; etc.

For the scope of this research we are going to cover the KPIs that fall under the Service Operations volume of ITIL - [2]-[4]. Our scenario includes the cases where the e-mail service is already integrated and running in normal operations mode. Key performance indicators can be also used in case of measuring the efficiency of integration of the service or from financial perspective in order to assess the financial efficiency.

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II. Problem Formulation and Overview

The usage of ITIL framework for improving and optimizing the level of the email service have been proved as successful approach [2], [5], [6]. This framework does not give the exact rules itself, it also does not specify the exact measurable for success. Therefore, development and application of appropriate methods is actual task – [7]-[14].

In the case study [15] it has been studied how the service is being recognized before and after the ITIL framework implementation based on a simple KPIs defined in [16] and in that way it is shown the benefits and difficulties from implementing ITIL.

How the customer satisfaction is being evaluated is described in [17]. They construct IT service level evaluation system, based on ITIL. On Fig. 1 it can be seen that the KPI has key effect over the customer's perceptions of the quality of the IT Service. The quality of the ITIL service is dependent both by the customer perceptions and the KPIs form the ITIL based service evaluation framework.
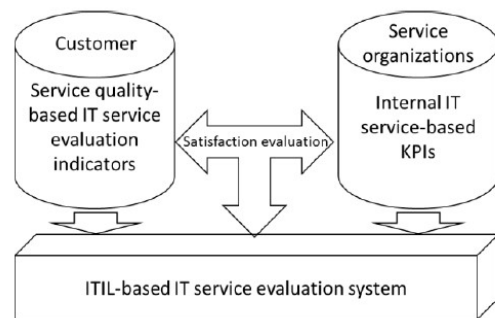

Fig. 1 Satisfaction evaluation for the IT Service - [17]

The proper choosing of the proper KPIs met the following two challenges:

• Usage of the proper asset of KPIs – as there are collaterals suggesting very large lists of KPIs that can describe the properties of the service, it is responsible task to choose the ones that can represent the customer's expectations and priorities. It is a common issue to choose irrelevant KPI metrics that furtherly to be monitored. In that scenario the companies suffer from low customer satisfaction but positive and optimistic values (for example service uptime for more of the expected 98% of the month). This results in losing company resources to get better in tasks that do not add sig-

TABLE I.
GROUP DECISION MAKING MODEL FOR KPIs

	Service availability KPI			Service request management KPI				Incident management KPIs						Change management			Capacity SLA	
	Uptime percentage of the service	Count of complete unplanned service outages	Count of service degradation events	Average time for completing the service requests	Percentage of service requests completed within the agreed SLA	Percentage of service requests completed within one shot	Percentage of complaints	Average time for starting work on case	Average time for resolution	Percentage of incidents resolved within the SLA timeframes	Percentage of incidents completed within one shot	Percentage of incidents with proper initial assessment	Percentage of complaints	Percentage of successful changes	Number of failed changes	Number of unauthorized changes	Consumed disc storage per user	Supported users per FTE
Will support the service uptime																		
IT Director	10	10	7	3	4	4	6	4	7	9	8	6	8	8	7	10	8	10
SLA Manager	7	9	9	5	4	4	3	7	4	6	4	4	8	6	8	9	6	8
Incident Manager	9	6	7	4	5	5	6	6	3	10	6	8	4	7	9	9	2	4
Problem Manager	10	6	7	2	3	1	3	7	8	9	8	8	6	8	8	8	4	6
Change manager	9	9	6	2	3	2	4	8	4	8	6	7	5	10	8	7	6	4
Will support the end user satisfaction																		
IT Director	8	8	9	8	7	9	10	7	7	6	10	7	9	7	7	3	3	1
SLA Manager	10	6	5	8	5	7	8	3	6	5	7	4	8	4	5	1	2	3
Incident Manager	8	7	6	9	7	8	9	5	8	7	8	5	10	6	6	2	1	3
Problem Manager	8	9	6	7	6	9	8	4	4	6	5	2	7	5	4	1	3	2
Change manager	9	6	6	7	5	5	8	3	5	5	7	3	7	7	7	4	4	1
Will support the end user productivity																		
IT Director	10	9	8	7	4	2	4	8	8	5	3	5	5	5	5	2	7	3
SLA Manager	8	9	8	6	4	2	5	7	6	7	5	4	4	3	3	3	2	2
Incident Manager	9	6	6	5	6	2	3	4	9	9	3	5	6	4	3	1	1	2
Problem Manager	8	8	6	3	3	3	3	4	6	4	3	2	7	7	7	3	3	3
Change manager	9	9	5	4	6	3	1	5	7	6	1	1	3	5	4	6	2	5

nificant value to the overall quality of the service, while other important activities are being neglected.

• Setting up the right values for the chosen KPIs – the most often problem here is that after choosing the KPIs that are going to be monitored, they are not assigned with proper values. This leads to committing with objectives that cannot be met by the service supplier. Also, there is a dependency that determining higher value of a service requires higher effort, materials and funding. Because of that reason choosing the right values has economic dependency as well.

III. KEY PERFORMANCE INDICATORS DESIGN

The design of KPIs is not a single time activity. There are specific occasions when KPIs need to be implemented, applied, followed up and updated. The IT service lifecycle describes the stages where is an interaction with the KPIs.

The basic approaches that are currently being used by the companies are [18]:

• Usage of the proper asset of KPIs – most of the companies rely on a standard asset of KPIs included in their offering plans. These assets are different for the different companies and correspond to their strengths and maturity. This puts demand to the service so it to be relevant only for particular types of business needs. When non-standard requests come to the implementer/developer, custom KPIs needs to be created to measure the bespoke service.

• Setting up the right values over the chosen KPIs – the goal is to determine thresholds for the different KPIs. They need to correspond to the understanding for acceptable quality of service by both customer and supplier. When obtaining these thresholds, a detailed assessment is being made on the available support resource as well as the supported envi-

ronment. There is also a good practice to include additional warning threshold which to flag that high attention is needed for the indicator in order to continue functioning as expected.

Talking about email service there are a couple of groups with KPIs that can be defined. Depending of the business needs only a couple of the KPI can be chosen and also specific ones to can be added. In some of the companies it is extremely important to have high level of data privacy (banking, military) and in another ones the service reliability and the uptime are the most important (logistics, sales), so in the different business areas there are different business requirement for the email service. That leads to the different usage of KPIs for successfully measuring of the level of the support service.

It is important to be noticed that there are also different groups of KPIs for the different chapters of ITIL - [19].

We propose to use for quality evaluation of e-mail service a number of 18 KPIs divided into the following groups (they are detailed in the header of Table I): *Service availability; Service request management; Incident management; Change management; Capacity SLA*.

IV. GROUP DECISION MAKING IN KPIs SELECTION

The evaluation and selection of corresponding KPIs is the next step of integrating IT service. We apply Group Decision Making approach for this purpose.

The process is summarized in two steps:

I. The group of experts creates a list with all the key performance indicators that may be included in the SLA for the customer.

TABLE II.
TOP 5 SCORED KPI; LEVEL OF AGREEMENT AND DISAGREEMENT

| | Relative strength of disagreement | | | | Disagreement Heat Map | | | | Agreement Heat Map | | | | Top 5 scored | | |
	Weight	Score (uptime)	Score (satisfaction)	Score (productivity)	Weight	Score (uptime)	Score (satisfaction)	Score (productivity)	Weight	Score (uptime)	Score (satisfaction)	Score (productivity)	Score (uptime)	Score (satisfaction)	Score (productivity)
• Uptime percentage of the service					0.7	0.5	0.8	0.7	0.6	0.7	0.6	0.6	394	351	360
• Count of complete unplanned service outages					0.9	1.7	1.2	1.2	0.5	0.4	0.5	0.5	314	292	324
• Count of service degradation events					0.9	1.0	1.4	1.2	0.5	0.5	0.4	0.5	287	257	263
• Average time for completing the service requests					0.8	1.2	0.7	1.4	0.6	0.5	0.6	0.4	107	258	170
• Percentage of service requests completed within the agree					0.8	0.7	0.9	1.2	0.6	0.6	0.5	0.5	126	199	150
• Percentage of service requests completed within one shot					0.8	1.5	1.5	0.5	0.6	0.4	0.4	0.7	108	253	78
• Percentage of complaints					0.8	1.4	0.8	1.3	0.6	0.4	0.6	0.4	147	286	109
• Average time for starting work on case					1.0	1.4	1.5	1.6	0.5	0.4	0.4	0.4	261	183	225
• Average time for resolution					1.0	1.9	1.4	1.2	0.5	0.3	0.4	0.5	210	250	300
• Percentage of incidents resolved within the SLA timeframes					1.0	1.4	0.7	1.7	0.5	0.4	0.6	0.4	350	241	283
• Percentage of incidents completed within one shot					1.0	1.5	1.6	1.5	0.5	0.4	0.4	0.4	264	305	137
• Percentage of incidents with proper initial assessment					1.0	1.5	1.7	1.4	0.5	0.4	0.4	0.4	276	174	126
• Percentage of complaints					1.0	1.6	1.2	1.4	0.5	0.4	0.5	0.4	248	340	208
• Percentage of successful changes					1.5	1.3	1.2	1.3	0.4	0.4	0.5	0.4	296	220	177
• Number of failed changes					1.5	0.6	1.2	1.5	0.4	0.6	0.5	0.4	294	221	161
• Number of unauthorized changes					1.5	1.0	1.2	1.7	0.4	0.5	0.5	0.4	315	89	121
• Consumed disc storage per user					1.5	2.0	1.0	2.1	0.4	0.3	0.5	0.3	202	102	114
• Supported users per FTE					1.5	2.3	0.9	1.1	0.4	0.3	0.5	0.5	236	69	118

(Column sub-headers for each group: "Will support the service uptime", "Will support the end user satisfaction", "Will support the end user productivity")

II. The group of experts evaluates the feasibility of the collected KPIs one by one.

We demonstrate the proposed approach on the following real-life problem. There is a need to improve the quality of the IT service in a large national university with ~24 000 students. A number of five experts have been engaged to solve the problem according to the selected KPIs. The experts are part of the university IT department and they have the following roles according to ITIL: IT Director; SLA Manager; Incident Manager; Problem Manager; Change Manager. Additional clarification has been made that the university email service is provided only to the teachers and the personnel and not to the students.

These experts rank each of the indicators with score between 1 and 10 as 1 means that the KPI will not be supportive at all and 10 means that such a KPI will strongly support measuring the organization's performance. Each KPI should be evaluated from 3 aspects – *if it is going to support the service uptime, the user satisfaction and the user productivity*. This will help the process managers to gain clear overview for which purposes the KPIs can be used during the service operations.

The evaluation is made on the base of the IT Environment of the university as follows: technical infrastructure overview; business goals and ongoing issues.

Technical infrastructure overview: The University contains six buildings in one campus, connected with high broadband WAN network in between. The provided e-mail service is available only for the teachers and the administrative personnel. There are 850 mailboxes created in total. The specific is that there is a very large number of external mail contacts stored in the active directory ~32 000. That is due to the reason that for each student a mail contact is created. These contacts are part of different public distribution lists that describe the different classes and learning groups. Technically the environment is hosted on premise in a dedicated server room. Microsoft Exchange 2010 servers with full redundancy deliver the service.

Business goals: It has been planned to upgrade its environment to Exchange 2013 in order to use the features of the latest version. The goal is to have 0% outages for the email service during the weekdays. Another goal is to implement the laboratories booking trough the Exchange calendar feature.

Ongoing issues: currently the personnel is complaining that the support desk is engaged with a big delay after the issue is reported – sometimes on the next business day. Another identified issue is the data loss for email items – a big number of the requested mailbox restores are not successful.

Based on the provided description the experts have put their ratings. Consolidated view of group decision making model can be seen on Table I. The columns correspond to the KPIs. The rows correspond to the DMs: DM1 = IT Director, DM2 = SLA Manager and so on. The values a(i,j) in the matrix are the scores of the Decision Maker (i) according to the KPI(j).

The above model is solved using the group decision support method according to [20]. It provides structured, transparent decision making within a group based on statistical methods. The approach employs a weighted decision matrix with authoritative attributes which leads to an individual decision outcome. The weighting coefficients are used to represent the depth of knowledge for the experts about the area of particular KPI. The solution process consists of three stages: I – Group factor identification; II – Individual scoring; III – Facilitator complies results. The output includes the following data: Disagreement and Agreement heat map; Points of contention; Optimistic/Pessimistic Disagreement;

Optimistic/Pessimistic support of the final score – see Table II.

It can be seen the top 5 scored KPI indicators for each of the three purposes of the feedback session: support for the service uptime; support the end-user satisfaction; support for the end-user productivity. Also, the levels of agreement and disagreement between the experts about the relevancy of particular KPI according to the heat maps are displayed. More intensive color is about high level of agreement (disagreement) between the experts and vice versa.

Further it can be seen that the service availability KPIs (the first three columns from Table I) have major importance for the 3 measured aspects. This is also aligned with high level of agreement between the experts. Also, the level of disagreement between the experts is relatively high for the top 5 chosen KPIs for measuring the end user productivity and satisfaction (Table II, last two columns). That can be explained with the different point of view on the IT service that the different experts have. Another interesting result is that the experts are confident and have high level of agreement for the KPIs that are scored low (see Table II, agreement heat map). That means that we can confidently confirm which KPIs are not relevant. Namely:

• Will support the service uptime: Percentage of service requests completed within the agreed SLA; Average time for completing the service requests; Average time for starting work on case;

• Will support the end user satisfaction: Number of unauthorized changes; Consumed disc storage per user; Supported users per FTE;

• Will support the end user productivity: Percentage of service requests completed within one shot; Supported users per FTE; Percentage of service requests completed within the agreed SLA.

V. Conclusion

We have proposed a methodology for selection of KPIs that to ensure improved client satisfaction. Also, a comprehensive catalogue with Key Performance Indicators for measuring the quality of an email services was presented. Thirdly, a methodology based on group decision making approach for evaluating KPIs relevance is applied. This methodology allows the management department in organizations to have structured approach for choosing proper KPIs for measuring the business goals. The methodology is demonstrated on a real-life example for enhancing the quality of e-mail service in a large organization.

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