# Measuring and Improving IT Service Support Processes: A Case Study

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**Abstract.** With the rapid development of Information Technologies for many organizations and the increasing importance of IT, the focus of IT management has shifted from device-oriented management to service-oriented management. This paper describes the approach and results of measurement and improvement of IT service support processes in Bank of China and Nokia Co. The research applied best practices of Organizational Process Performance Process Area defined in CMMI to IT service support processes, and the following steps were adopted: defining the process models, designing their metrics from goals, data collection, processes evaluation, and the identification and elimination of bottlenecks. Two research questions concerned with the research approach are raised and explored in this paper.



## 1 Introduction

Over the past few years, Information Technology has become one of the most important roles in an increasing number of companies [1] Accordingly, IT performance directly affects the business performance. On the other hand, the emergence of new technologies and the increasing complexities of systems make it even harder for companies to achieve IT service management goals effectively and efficiently. Therefore, one of the key points to achieve business goals successfully is to ensure IT performance and quality.

To improve IT performance and quality, it is of utmost importance to enhance the maturity of IT service support processes. Due to the increasing role of IT service management in the enterprise, several standards and best practices – ITIL [2], [3] ISO20000 [4] and CMMI [5] for service -- provide guidelines for IT service management and are adopted in IT organizations all over the world. IT service support processes include the incident management process, problem management process, configuration management process, change management process and release management process. The efficiency and quality of IT service support processes directly influences the user's perception of service and the business efficiency and qualities. Thus, efforts are needed to identify and eliminate the bottlenecks to improve the process performance.

Though the quantitative analysis of IT service support processes is seldom discussed in ITIL, useful academic researches related to IT service support processes have been reported in the literature [6], [7], [8]. In addition, other research attempts have been made to measure and improve software processes [9], [10]. However, there

Zhou K. and Shen B..
Measuring and Improving IT Service Support Processes: A Case Study.
DOI: 10.5220/0003568100280035
In *Proceeding of the 1st International Workshop on Evidential Assessment of Software Technologies* (EAST-2011), pages 28-35
ISBN: 978-989-8425-58-4

is still a lack of a general method for IT service support processes measurement and improvement. Furthermore, the lack of empirical studies in this field is evident and must be addressed.

Organizational Process Performance (OPP) process area, which is defined in CMMI, builds process performance baseline (PPB) to determine if the process quality and performance objectives have been achieved. Based on PPB, process performance model (PPM) is established to predict process quality and performance, but the concrete steps to build PPM are not specified in CMMI.

Under this background, we conducted research on two organizations - Bank of China and Nokia Co. This case study is continued from our previous work where we proposed a BPDM-based IT service support process metamodel [11]. This research utilizes the best practices of Organizational Process Performance (OPP) Process Area defined in CMMI [12] to measure and improve performance and qualities of IT service support processes.

In this work, we focus on the measurement and improvement of IT service support processes in two case organizations. The remaining of the paper is structured as follows: Section 2 describes the research methods of this study. Section 3 presents the research results to answer research questions. In section 4, we summarize our results and point out some limitations in this study.



## 2 Research Method

This case study is part of work of the research project SOMSMP (Software Operation and Maintenance Service Management Process) from Shanghai Jiaotong University, China, funded by the Key Laboratory of High Confidence Software Technologies of the Ministry of Education of China. This project is a systemic research of software operation and maintenance service management processes, and this paper makes a preliminary study of IT service support process measurement and improvement.

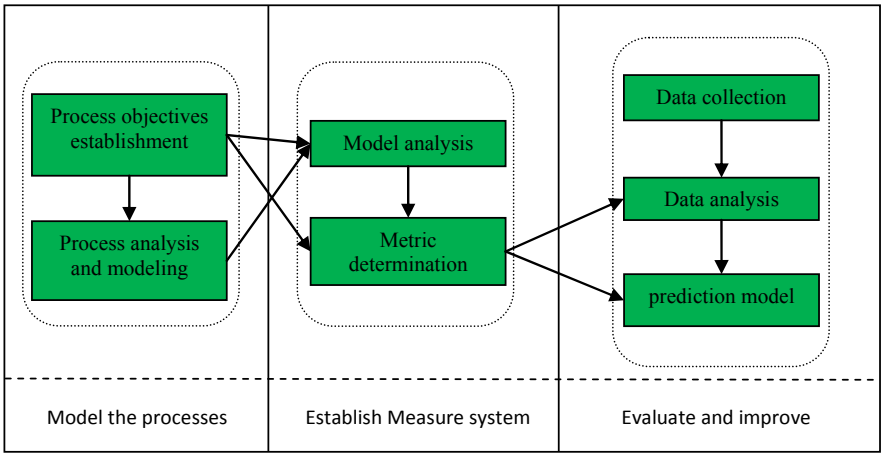


**Fig. 1.** Framework of the OPP-based approach to measure and improve IT service support processes.

We choose two research questions related to the IT service support processes measurement and improvement:

**Q1:** How is an IT service support process described and how are metrics defined?

**Q2:** How are the processes evaluated and bottlenecks identified effectively?

OPP [12] is one of the Key Process Areas in CMMI for Development (CMMI-DEV), which is developed for the improvement of software development processes. According to the research questions, we propose a method to measure and improve the IT service support processes based on OPP. The framework of this method is shown in Fig.1. Firstly, we establish the process objective for each process, since different IT service support processes have different objectives. According to the objectives established, we then analyze and model the current processes in the organization, using an IT service support process BPDM-extension meta-model. Based on the process model, we design and determine metrics to measure process performance and qualities. Next, we collect data from the case organizations for each IT service support process, and evaluate process performance and qualities according to the metrics defined previously. Finally, a prediction model will be used to predict the performance and qualities of the processes, but this step is not the focus of this paper and will be explored in the future.

Two large scale case organizations, Bank of China and Nokia Co., are selected. Both organizations adopt IT service management processes to manage their IT system, but it is in our opinion that there is much potential for improvements to be made to the maturity of their current IT service management processes.

The methods used to collect data include: Direct collection (DC, participation in support teams and first-hand experience with the daily operation of processes), Interview (IN, meetings and discussions with different roles), Questionnaire (QU, questionnaires sent to stakeholders), Access to tools databases (AT, exporting records from tools and consulting related documents) and Periodic summarization (PS, collection of periodic summarizations which report some indicators related to performance or qualities).

## 3 Research Results

This section presents our main research results of the case organizations involved in this study. We identify the strengths of the IT service support processes of the case organizations and present our exploration into the research questions in Section 2.

### 3.1 Strengths of the IT Service Support Processes

Though the IT service support processes in the case organizations are far from mature, both organizations possess strengths in certain processes to facilitate the exploration in this study. The first strength is that the roles and responsibilities of IT service support processes are clearly documented in the two case organizations. The second strength is that Service Level Agreement (SLA) in Nokia Co. is explicitly

defined in a document called Service Level Definitions, which provides another way to judge the performance. The third strength is that tools have been adopted in the organizations to support IT service management, recording detailed data that makes the analysis easier. The fourth is that the process managers produce periodic summarization of the performance of each process, which helps to understand and analyze performance data. Finally, the commitment shown by high level managers is a strong impetus to improve the process performance and qualities.

### 3.2 Exploration to the Research Questions

**Q1: Process Modeling and Metric Determination.** In many organizations, the objectives of IT service support processes are established by high level managers, which may neglect the operational realities of processes. To counter this, information was collected from all stakeholders to establish process objectives which were more suitable for the case organizations as a whole.

Two types of objectives were identified through interview and questionnaires to the stakeholders in the case organizations: one being the common objective, and the other being the process-specified objective. The objectives we summarized are compatible with ITIL concepts.



Based on the process objectives, we analyzed the IT service support processes in case organizations and ITIL standards, and then should describe the processes properly. Because of limited space, we take incident management process modeling as an example. Fig. 2 shows the process model of incident management in BoC using BPDM-extension meta-model. In the BPDM-extension meta-model, we extend BPDM to better reflect the characteristics of IT service support process from three aspects: activity, resource, and interaction. To generalize the model and to support the IT service support process model integration, exchange and reuse with other business processes, we adopt this metamodel. The model in Fig. 2 consists of activities of incident management process. The most important resource in incident management process is IR (Incident Record). There are two levels of support groups in the case organization: the first level being the service desk response for Service Request, and the second level being the incident support team responsible for Onsite Incident Solving. Columns indicate the roles in charge of the respective activities: the left column lists the activities under the purview of a service desk worker, and the right column includes the activities under the incident support team's charge.

To define accurate metrics, we first analyzed the models to differentiate trivial activities and key activities, the former describing activities which have a limited impact while the latter indicating activities with a significant effect on the performance and quality of the entire process respectively. We have highlighted the trivial and key activities of Fig. 2.

Trivial activities included: create IR, record service request information, record incident solution information, close; key activities included: classify and prioritize, service request branch, assign, accept, reassign branch, solve correctly branch.

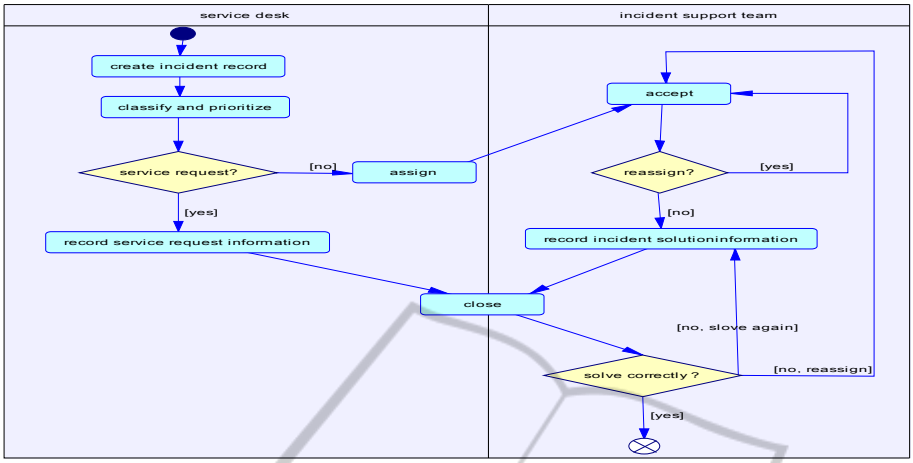


**Fig. 2.** Incident management process model.

**Table 1.** Metrics derived from key activities.

| Metrics | Meaning | Derivation activity |
|---|---|---|
| M0 | the ratio of correct preliminary classification of incidents | classify and prioritize |
| M1 | Mean solution time by priorities | classify and prioritize |
| M2 | the ratio of service request | service request branch |
| M3 | the ratio of solved incidents by one assignment | assign &accept &reassign branch |
| M4 | mean times of assignment/reassignment of incidents | assign &accept &reassign branch |
| M5 | the ratio of reopen closed incidents | solve correctly branch |

Our exploration focuses on key activities, since trivial activities are not important to measure the process performance. According to the key activities and the incident process objectives we summarized, we define metrics to elaborate the measure system. Table 1 lists the metrics we defined according to corresponding key activities to measure performance and qualities.

**Q2: Evaluation and Improvement.** We obtained process related data against the metrics defined previously. Resources [11] records of IT service support processes were collected from tool databases, including: Service Request Record, Incident Record, Problem Record, Request for Change(RFC), Configuration Item(CI). Furthermore, we also collected mail summaries and meeting reports which reported on data relevant to performance or qualities.

Using the previous example, incident management process in BoC, we demonstrate how to analyze data in our research. We retrieved 6962 Incident Records

and 13670 Service Request Records spanning January 1, 2010 to October 31, 2010 from the incident management database, and obtained parts of the mail summaries and some meeting reports since January 1, 2010. We discarded records which had obvious errors. Table 2 shows values of the key activity metrics of the incident management process in the case organization.

After getting values for the key activities metrics, we adopted two methods to determine whether the performance of corresponding key activities is good or not: Service Level Agreement (SLA) and Process Performance Baseline (PPB). We get PPB in the both case organizations from the summarizations of the processes performance for last two years. SLA, which is already documented, is a part of a service contract. Since some metrics are not defined in SLA or PPB, we combine the two methods to determine the qualities and performance of processes.

We compared the results in Table 2 to definitions in SLA and PPB, and we concluded that the qualities and performance of incident management process in BoC was desirable since all values of these metrics were in the range of SLA or PPB. However, metric M4, which indicates times of assignment/reassignment of incidents, in Nokia was not desirable because it did not meet the PPB standard value of 1.2. The excessive value in this metric implies that the capability of service desk or incident support team is not ideal.

Through the analysis of key activity metrics we could determine the bottlenecks of IT service support processes, because the metrics is related to particular activities. The abnormal values of metrics would make it easy to identify the presence of bottlenecks. The manager of processes should then take the abnormality into account and take actions to eliminate the bottlenecks thus improving the whole process performance and qualities.

We explored one reason why BoC outperforms NC when it comes to IT service support processes. After comparing the details of IT service processes and IT departments in these two organizations, a possible reason identified was that the IT service requirements in NC were more diverse and sophisticated than BoC.

**Table 2.** Values of key activity metrics of incident management process in case organizations.

| Metrics | Value in BoC | Value in Nokia |
|---|---|---|
| M0 | 93.90% | 88.50% |
| M1 | priority 1: 338.9 (min)<br>priority 2: 80.1 (min)<br>priority 3: 286.8 (min)<br>priority 4: 164.75 (min)<br>priority 5: 78.23 (min) | priority 1: 1313.9 (min)<br>priority 2: 932.3 (min)<br>priority 3: 464.3 (min)<br>priority 4: 203.5 (min) |
| M2 | 66.30% | 55.00% |
| M3 | 93.50% | 81.30% |
| M4 | 1.16 | 1.31 |
| M5 | 0.52% | 0.91% |

## 4 Discussion and Conclusions

This paper describes the results of a case study focusing on improving IT service support processes in two case organizations. In this study, we continued our previous work – a BPDM-based IT service support process metamodel – and adopted an OPP-based approach to measure and improve performance and qualities of IT service support processes. The results and procedure of the measurement and improvement of IT service support processes in case organizations and the exploration of the research questions are presented.

Measuring and improving IT service support processes was a more difficult task than previously expected, and some limitations are present in this case study. Some of metrics appeared neither in PPB nor in SLA. We compared the value of the key activity metrics to PPB or SLA, but we could not find the revelant data in both PPB and SLA for some metrics. Another limitation is the lack of high qulity data.

We regard this study as the first step towards a more comprehensive quantitative measurement and improvement approach. In the future, we will focus on the research of performance prediction model to propose a elegant model.



## Acknowledgements

This research is supported by the Opening Project of Shanghai Key Lab of Advanced Manufacturing Environment (No. KF200902), and the Opening Project of Key Laboratory of High Confidence Software Technologies (No. HCST201001).

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