

Strategies for Incident Assignment and Escalation Based on BDIM

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Abstract. For IT support organizations, incident management plays an important role in the whole IT management. The improvement of the incident management can improve customer satisfaction and increase business profits. Traditional incident management applies inefficient strategies on the process of incident assignment and escalation. In this work, new strategies for incident assignment and escalation are developed based Business Driven IT Management. Experimental result shows these strategies improve the business performance in incident management.

Keywords: incident management, strategy design, BDIM

1. Introduction

Incident management is a key process in IT Service Management. Through it, the IT support organization manages to restore normal service operations as quickly as possible with minimum effect on business [1].

In traditional incident management, the service desk assigns incidents to support groups on level 2 by adding tickets to the tail of incident queue on level 2. When the support group cannot solve the incident, it need to be escalated to a higher support level by putting to the tail of another incident queue. This procedure has many disadvantages. First, incident with high priority has to wait behind some ones with low priority which may lead to SLO violations. Second, when an intractable incident is reported, it will be escalated level by level vainly and solved by the proper support group finally. All of these will reduce the efficiency of incident management. In this work, strategies using BDIM(Business Driven IT Management) will be applied on the process of incident assignment and escalation to solve problems mentioned above.

This paper is structured as follows. Section 2 describes metrics to measure incident management performance. Section 3 introduces strategies for incident assignment and escalation based on BDIM. Section 4 provides an experiment to verify the performance improvement of incident management by applying the strategies. Section 5 gives conclusive remarks.

2. Performance of Incident Management

2.1. Incident Management Process

Fig. 1 shows the incident management process. When an incident is reported, the service desk will create a ticket and classify it. If it is a service request, then the service request procedure will be executed, or it will be assigned a priority by assessing importance, severity and urgency [2]. If the service desk cannot solve it after diagnosis, it will be assigned to a higher support level. If the trouble is solved, the service desk will close the incident. All operations mentioned above should be traced by the incident management monitor.

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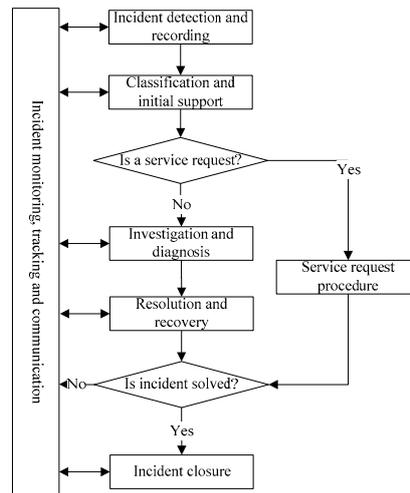


Fig. 1: Incident management process.

2.2. Business Metrics of Incident Management

As defined in ITIL (Information Technology Infrastructure Library) [1], “BDIM is an application of a set of models, practices, techniques and tools to map and to quantitatively evaluate interdependencies between business performance and IT solutions – and using the quantified evaluation - to improve the IT solutions’ quality of service and related business results”. Traditional IT management focuses on the IT indicators such as response time, throughout, etc. BDIM deals with decision and processes by considering the business object such as financial profits, cost and user satisfaction. It attempts to establish a bridge between these two aspects [2].

Table 1 provides an example of business metrics. Business objects are associated with weights according to the business perspectives and perspectives are also associated with user-defined weights.

Table 1: Example of business metrics.

Business Perspectives	Weight	KPI Target	Target Weight	Final Weight
Customer	0.3	SLA violations less than 10	1.0	0.3
Financial	0.7	Cost of implementing new strategies no more than 2,000\$ per month	0.4	0.28
		Total cost of SLA penalties no more than 1,000\$ per month	0.6	0.42

3. Strategies for Incident Assignment and Escalation

3.1. Strategies for Incident Assignment

As mentioned above, support groups are divided into several levels. When an incident is assigned to a specific support group, the operators will investigate and diagnose the disrupted service and try to provide a resolution. In most cases, they need to forward it to a higher support level which means the incident needs to be escalated. Incident escalation may happen anytime and at any support level. The efficiency of incident escalation is evaluated by the average time taken and the portion of solved incidents to total number of incidents reassigned [5]. There are two primary aspects should be considered in evaluating the performance of incident escalation strategy: incident escalation rule and incident escalation trigger.

3.2. Strategies for Incident Escalation

As mentioned above, support groups are divided into several levels. When an incident is assigned to a specific support group, the operators will investigate and diagnose the disrupted service and try to provide a resolution. In most cases, they need to forward it to a higher support level which means the incident needs to be escalated. Incident escalation may happen anytime and at any support level. The efficiency of incident escalation is evaluated by the average time taken and the portion of solved incidents to total number of incidents reassigned [7]. There are two primary aspects should be considered in evaluating the performance

of incident escalation strategy: incident escalation rule and incident escalation trigger.

- Incident escalation rule

Traditional incident escalation assigns the incident to the next higher support level even if it is obvious that the incident will need deeper technical knowledge and the next higher support group is unable to resolve the incident within agreed time. This problem can be solved by applying the incident escalation rule.

The incident escalation rule defines conditions which lead to the escalation to a specific level. In Table 2, L0 represents the service desk and there are three other support levels. It indicates that the rules for escalation usually based on the severity of incident and resolution deadline. When an incident needs to be escalated, the service desk checks the incident state and assigns it to the level according to the pre-determined rule.

Table 2: Incident Escalation Rule

Priority	Resolution Deadline			
	Within 24 hours	Within 12 hours	Within 10 hours	Within 5 hours
Severity	L0	L2	L2	L3
High	L0	L1	L2	L3
Medium	L0	L1	L1	L2
Low	L0	L1	L1	L2

- Incident escalation trigger

The method to trigger an incident escalation is also essential for incident management. If the incident isn't escalated in time, the incident resolution time will be extended which may lower user satisfaction and make a negative impact on business. In addition, the premature incident escalation will reduce the resource utilization.

We can establish the incident escalation trigger based on the escalation rule. Suppose each support group G_i owns an incident queue Q_i with high priority first. Let t_{id} be the deadline of incident resolution and t_{iw} be the time of incident waiting in the queue. The rate of financial loss due to service disruption is s_i and the SLA penalty rate due to the delay of the incident resolution is c_i . Then the priority p_i is defined as

$$p_i = \begin{cases} s_i \cdot t_{iw} & t_{iw} \leq t_{id} \\ s_i \cdot t_{id} + (s_i + c_i) \cdot (t_{iw} - t_{id}) & t_{iw} > t_{id} \end{cases} \quad (4)$$

The incident queue Q_i of support group G_i on level N works as follows

- Accept incidents from level $N-1$ (For the service desk, incidents come from customers' report): The operator takes incident ticket from the head of Q_i . According to the definition of the priority, the incident at the head of Q_i will greatly impact on the business and shall be processed first.
- Check incident ticket: The operator of G_i reviews the escalated incident in order to understand the problem.
- Find out whether they can solve the incident, if they can solve it, go to step e. If not, go to step d.
- Follow incident escalation procedures: Escalate the incident according to the incident escalation rule.
- Follow incident resolution procedures: Change the incident state and close the incident.

Besides, when the support group is busy, the incident which stays at the tail of the priority queue may need processed immediately. In order to prevent this case, the incident management monitor process will check the incidents which are positioned at the tail of each support group's queue and find those urgent incidents and then escalate them. The check procedure will be executed periodically.

4. Experimental Result

4.1. Experimental Scenario

Our experiment simulates an IT support organization which consists of a service desk(L0) and 3 other support levels(L1~3).

Table 3 defines three SLOs. The first SLO is the average resolution time of incidents shall be no more than 10 hours. If it is violated, the organization will be charged a penalty of 1,500 \$. The second SLO states that the percent of unsolved incidents shall be no more than 10%, or 2,000 \$ will be charged. The third SLO is the total of incidents out of the resolution deadline shall be no more than 10, or a penalty of 1,000 \$ will be charged.

Table 3: Characterization of Service Level Objects

Condition	Penalty
The average resolution time of incidents greater than 10 hours	1,500\$
The percent of unsolved incidents greater than 10%	2,000\$
The total of incidents out of the resolution deadline greater than 10	1,000\$

The business objects, perspectives and importance weights of this IT support organization is provide in Table 1 and the incident escalation rule is given in Table 2.

4.2. Experimental Result

Separately, we apply the traditional and the new incident management process to the organization for 30 days and the performance statistics is showed in Table 4. In the tradition process, both of the average time of incident resolution and the total number of incidents out of the resolution deadline violate the SLOs. These violations cost the organization 2,500\$ and the alignment with the given business objects is 58%. Under the same conditions, the new strategies of incident assignment and escalation only costs a penalty of 1,500\$ for a violation of the SLO about the average resolution time. In addition, it cost 500\$ to implement these strategies. The alignment with the business object is maximized.

Table 4: Performance statistics of two incident management

KPI	Traditional Process	New Process
Total of incidents arrived	200	200
Total of incidents closed	188	189
Average time of incident resolution	11hours, 5min and 15seconds	10hours, 22min and 18seconds
Average time of incident waiting	10hours, 12min and 26seconds	9hours, 50min and 6seconds
Total number of incidents out of the resolution deadline	11	5
Average number of incident assignment	1.5	1.4
Total number of incident escalation	106	92
Average time of incident escalation	20hours, 13min and 3seconds	10hours, 41min and 5seconds
SLO violations	2	1
SLO penalties	2,500 \$	1,500 \$
Total cost	2,500 \$	500 \$
Business alignment	58%	2,000 \$
		100%

5. Conclusion

This paper introduces strategies for incident assignment and escalation by using BDIM concepts that maps the IT solutions with the business objects. Experiment verified the effective of incident management using these strategies.

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