International Journal of Engineering & Technology, 7 (4.31) (2018) 80-86

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Applying ITIL Framework to Analyze Problem Management Key Performance Indicator (KPI): a Case Study of Malay Owner Company (Mesiniaga Berhad)

Mudiana Mokhsin[1]*, Amer Shakir Zainol[2], Siti Nordianah Haihom[3], Mohd Husni Mohd Som[4], Abdul Jalil Abdul Rahim[5]

[1,5]Faculty of Computer & Mathematical Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
[1,2,4]Institute of Malay Thoughts and Leadership (IMPAK), Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
[2]Faculty of Art & Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
[3]Johor Matriculation College, Jalan Payamas, 84900 Tangkak, Ledang, Johor Darul Takzim
**Corresponding author E-mail: mudiana@tmsk.uitm.edu.my*

Abstract

Problem Management (PM) is one of the components in the Information Technology Infrastructure Library (ITIL) Service Support area. The primary focus of Problem Management is to identify causes of service issues and commission corrective work to prevent recurrences. To address this practice and make it more effective, the project tends to identify the specific Key Performance Indicator (KPI) for Problem Management process in a Malay owner company named as Mesiniaga Berhad. The identification of Problem Management KPI is based on the previous research which is using ITIL as a framework. The interview session has been conducted in Mesiniaga with Problem Manager working at that company with more than 10 years' experience in Problem Management process. The method of interview is using qualitative approach which is using the design question with the lists of KPI. The expert will select or decide which KPI are related with the current report in Mesiniaga. The result showed that 6 KPIs are related and come out with analysis on how the outcome of KPI behavior matched with the Incident report in Mesiniaga. To enhance on how the identification of KPI, instead of using manual to capture the Problem Management KPI, the automation of selected KPI from Incident to Problem Management can be implement in the systems. Most technologies are intelligent enough for data analytic to decide which suitable KPI of Problem Management follow the current business and client environment.

Keywords: *ITIL framework, problem management, key performance indicator, service support process.*

1. Introduction

Efficiency, productivity, security and cost effective are the main factors why most organization nowadays are implementing the of Information Technology application in running their business. Looking at this scenario, the organizations and enterprises need to have their own IT division or unit in monitoring and handling IT-related matters. In this study, one Malay owner company known as Mesiniaga Berhad had been chosen as a case study for this research discussion. The establishment of Mesiniaga Berhad was in response to Malaysia's New Economic Policy (NEP) to increase Bumiputera participation in the technology industry. In line with that, this organization had their IT Divisions or unit to monitor and handle the IT-related problem. Information Technology (IT) divisions are the most complex parts of associations. Apart from that a framework known as Information Technology Infrastructure Library (ITIL) is viewed as the most generally utilized IT structure in most organizations. Hochstein, Zarnekow, & Brenner (2005) support the ITIL reference model which is often being overlooked. Other than that, the benefits are merely assumed, and misunderstandings spread. Thus, several researchers had found that there is a need for IT Service Management to have a better process and framework which following the ITIL as a standard of practices. However, study by Lahtela & Kaukola (2010) discussed on how the measurement of the IT service support processes can be improved. In this study, an ITIL-based IT service management measurement system (ITSM-MS) and its implementation are presented. The ITSM-MS can be used to measure the performance of IT service support processes. The ITSM-MS was developed in cooperation between MaISSI (Managing IT Services and Service Implementation) research project and an IT service company in Finland (Tang & Todo, 2013). Neničková (2011) stated that find and analyze the most critical success factors (CSFs) for implementation of ITIL (Information Technology Infrastructure Library) was the best practices into the managing and delivering ICT services in large companies. The fulfilment of these factors is crucial not only for successful implementation of ITIL into practice, but also for its effective and efficient maintenance in case of ICT services delivery. There are several perspectives which serve to divide CSFs into several groups with preparation of secondary of several groups. The criteria for group creation are prepared from the scientific perspectives and supported by secondary research practice. Nenickova (2011) mentioned that key internal business processes related to the CSFs which are the way of definition of main metrics and Key Performance Indicators (KPIs) related to CSFs. The research methodology used by (Neničková, 2011) consists of two chosen approaches. The first approach is to provide a secondary research when academic and business journals and magazines have been used. The information

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

related to CSFs setting up has been searched and after that the method of induction has been used to define CSFs and to split them into the separate groups. The case studies from scientific journals have been also used to support the general conclusion creation as an induction.

ITIL as a global de-facto standard in IT service management (ITSM) is a set of guidelines towards the planning, provision and support of operational IT services. The cornerstone of ITIL is the concept of aligning IT operations with business objectives to improve service quality. Service Support is designed to ensure that the customer has access to appropriate services to support and enable his business processes. According to Moser & Bayer, (2005) service support are designed for configuration management and other support management issues including incident management, problem management, change management, and release management. Problem Management process is the process of diagnosing root causes of incidents to proactively eliminate and manage service disruption (Potgieter, Botha, & Lew, 2005). According to ITIL, problem management is an important aspect of service provision (Niessink & Vliet, 1998). The ITIL Problem Management process aims at minimizing the impact of failures ('incidents') and on correcting root causes of failure. This makes it part of both the upper-right and the lower-right arrows of the IT service lemniscate. Problem Management is worth the time and investment because if implemented and managed effectively, it can provide very high returns. In additional values, it can have a direct impact on service quality whereby it can provide much needed quick wins during the first phase of an ITIL implementation. However, the issue is that many organizations think that they have implemented Problem Management when they have done better at managing incidents. Most organizations do not fully execute or manage all aspects of this key support process, and consequently do not reap full benefits. This study also aims to understand what it really takes to go all the way with Problem Management in the organization. The following is a look at six of the biggest difficulties associated with implementing and managing an effective Problem Management process:

i. Issue 1: Not all key stakeholders fully understand that Problem Management is one coin with two sides.
ii. Issue 2: The Problem Control and Error Control aspects of Reactive Problem Management are not fully deployed.
iii. Issue 3: Problem Manager(s) not established.
iv. Issue 4: Very few organizations perform both Reactive and Proactive Problem Management.
v. Issue 5: Existing tools and technology do not support integrated processes.
vi. Issue 6: There is a poor link between the Incident and Problem Management processes.

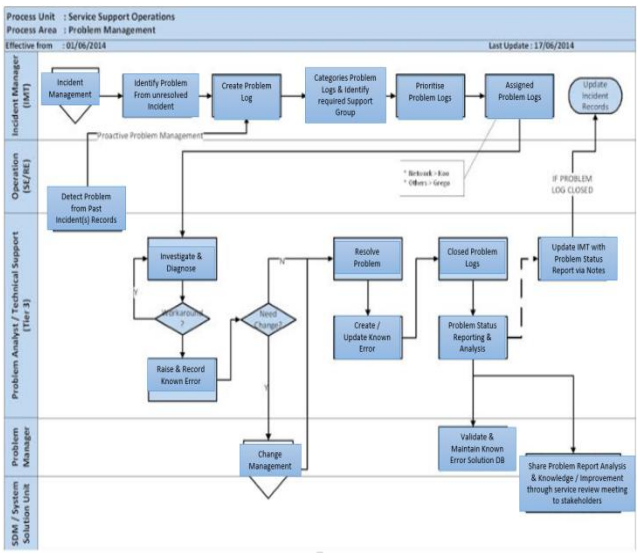

Fig. 1: Current Problem Management process in Mesiniaga Berhad.

Figure 1 shared the process of Problem Management which is thought of as a reactive process in that it is invoked after Incident Management process. The goal is to ensure that incidents do not recur in the future, or if they do, to minimize their impact. In Mesiniaga, specifically for Service Delivery Division, they are managing both processes with the coordination team as per below: The process is initiated by a help desk in which they will receive notification of a malfunction or a monitoring system generating an appropriate message. This help desk team is known as Incident Management Team (IMT). The information about this fault is given to the appropriate IT-experts known as the Incident Managers, who then initiate a short-term solution. In contrast to the Problem Management process carrying out a comprehensive investigation of the failure´s root cause, it will be avoided in the Incident Management process. This process concentrates on finding the fastest possible solution, a so-called workaround. Besides finding these workarounds, Incident Management is mainly a communication process. This means that for every fault documented through the Incident Management process the reporting or concerned entities (e.g. customer, service manager,) are kept up to date on the state of current operations. This communication for every fault is kept up even when many faults have a common reason that is being dealt with in the Problem Management process. The main problem is to identify the elements of problem performance for analysis purposes. Each one of these segments has a few procedures. The structure of each one of ITIL procedures incorporates definition, detail portrayal, Critical Success Factors (CSFs) and Key Performance Indicators (KPIs). Next, The Control Objectives for Information and related Technology (COBIT) will be used to review and construct IT structure with high ability in light of process estimation. This estimation-based structure comprises of four unique areas which are plan and sort out, procure and actualize, conveyance and support and screen and assesses spaces. Thinking about the quality and shortcomings of every standard and structure, a perfect and down to earth approach is to actualize ITIL based procedures through a compelling coordinated effort with COBIT based KPIs to quantify and upgrade each ITIL based procedures. Be that as it may, one of the basic ITIL procedures is Problem Management preparation. This procedure issues to distinguish defeat reasons for reported episodes and attempt to dispose of them. All KPIs connected to this procedure were at initially accumulated with some mechanical encounters and after that examined to deliver a few discoveries re-recorded through the Incident Management handle the reporting or concerned substances (e.g. client, benefit administrator,) are stayed up with the latest on the condition of current operations. This communication for every fault is kept up even when many faults have a common reason that is being dealt with in the Problem Management process.

2. Problem Statement

In most of the organization, handover to Problem Management shall happen after the incident is solved or the service is stabilized with a workaround (Zero Outage, 2016). Looking at this scenario Problem Management process is mandatory for all critical and high incidents. Problem management seeks to minimize the adverse impact of incidents and problems on the business that are caused by underlying errors within the IT Infrastructure, and to proactively prevent recurrence of incidents related to these errors (ITIL, 2011). Unfortunately, currently in Mesiniaga, there is no list of KPI in the Problem Management process. They used the problem management from customer request which is identifying from unresolved incident not from the KPI list provided by problem analyst. The process is not defining the objectives of problem management and what outcomes of problem management help us to achieve. The problem management team in Mesiniaga only measures the number of incidents and the overall business impact of incidents. These would certainly be valuable things to

know but does not show how well problem management has been working, because so many other factors could have contributed. In additional, based on the study done by (Tang & Todo, 2013), Problem Management in Mesiniaga is more focusing on the Root Cause Analysis (RCA), however this does not actually deliver any benefit since it is just a technique that they use in problem management.

3. Research Methodology

Qualitative approach is the best approach to find KPI implying that the data stems from the combination of rating, judgment, and expectation or standard (Phusavat, 2007). Qualitative data much more suited to clarify the way or how to fix the problems (Knizek et al., 2008). To get the expert feedback and effectively catch potential KPI includes multiple phases such incident matching, investigating, resolving and several other ITIL processes (Gummesson, 1994). To do KPI testing for Problem Management, a field study has been conducted where the expert group uses the real KPI of problem management in service support operation. When a real expert uses the real incident data to find which related KPI for implementation, the result will lead more realistic information (Hsu, 2011). The project was carried out in four phases which are Phase 1: Planning, Phase 2: Data Collection, Phase 3: Data Analysis and Phase 4: Documentation as discussed below:

i. Phase 1: Planning - The objective of phase 1 is to get an overview and understanding for identification of problems, aim, objectives, research questions, scope and significances. Main activity was identified through personal experience of Mesiniaga and combined with some literatures to disclose the true problem. After actual problem was identified with supported of related literatures; aim, objectives, research questions, scope and significances of this study was identified. Upon completion of this activity it will be resulting fixed and cleared purpose and scope of this study.
ii. Phase 2: Data Collection - Based on the outcome of the first phase, possible data collection methods were identified. The data collection method is based on the most literature KPIs of Problem Management Process in Organizations (Sharifi et al., 2009). KPI in Problem Management was identified in two stages; identification and implementation and using qualitative approach which come-out with the lists of KPI that suitable with the current process. From the introduction, the expert was interviewed to get their background information which must be related with the current job scope and the right person to involve with this study. The interview sessions were conducted using general information about the expert. At the identification stage, the expert was asked to choose and decide which KPI from the list which are suitable with the current process and possible to get the result based on the current report details. The expert was observed to read and understand clearly for every each of KPI priorities to decide which can meet the objective of Problem Management. At the implementation stage, the expert was provided with the Incident report from Mesiniaga to match with the selected KPIs especially on the category for each column must relevant with the objective of the selected KPI. The data collection process involved four activities including identifying KPI in Problem Management, establish the KPI using match-up data, preparing guide report and decide the KPI that will be used to get the analysis finding results. Figure 2 describes the process involved in the data collection phase.



Fig. 2: Data Collection Process

According to the figure 2, the process of data collection will be starting with first phase known as Problem Identification and Planning Phase which consists of two main activities as discussed below:

a. First main activity is identification of problems, aim, objectives, research questions, scope and significances.
b. Second activity is a thorough literature review which was performed to identify and to dig as much information on past researches that were related to this study. Literature review was also done to obtain as much information on background of current Problem Management process in Mesiniaga and its implementation. Besides, literature review ensures that this study is appropriately developed and relevant to present-day needs and focus.

Second phase in the data collection is designing and interview questions. There are three activities in designing an interview questionnaire as discussed below:

a. First activity is through identifying the appropriate instrument from ITIL framework and the information from the selected research paper, to come out with the most applicable KPIs of Problem Management Process in an organization (Sharifi et al., 2009).
b. Second activity is to design a question after data gathering from the interview and,
c. Third activity is to gather the sampling model with the relevant elements that match on the requirements.

Third phase in data collection process is conducting an interview session whereby the interview has been conducted in a two-way communication which involves questions and answering session, to select the related answer from the questions design lists. The interview session was done with one expert from Mesiniaga who had to handling the problem management process for almost 10 years of experience. The interview sessions were videotaped, voice recorded, and notes taken to help researcher to review and study the answers. Fourth phase is to decide result for the implementation. The result from the selected of KPI lists will go forward for the next implementation process. This activity was involved with comparing and analysing the current report provided by Mesiniaga.

iii. Phase 3: Data Analysis - Collection data from second phase were analyzed and interpreted at this stage. The voice recordings, and design questions were reviewed several times and the findings were also being discussed to finalize and present the results into documentation.
iv. Phase 4: Documentation - The documentation phase is to describe the project and to conclude the findings that have been analyzed and provide recommendation for future research project.

4. Result and Discussion

This section describes briefly on the findings of the KPI from the interview question which has been conducted with the expert prior to the implementation stage. The purposes of the identification interview questions for this project are to establish the suitable information of the expert and to explore the expert knowledge and experience about KPI in Problem Management. There were two experts who are the Problem Manager and Senior Manager. They were involved with the selected of the suitable KPI based on the experience handling the problem management. This study covers two categories of respondents that were from the management, IT Problem Manager and Senior Manager in Service Delivery Division. That was why quota technique was selected in determining the sample. Based on the feedback from the Senior Manager from Mesiniaga, there have a few lists of KPI suitable with Mesiniaga environment. Percentage of problems with a root cause identified, following Mesiniaga current process, it can be done to ensure every problem created solved. Percentage of problems resolved within the required time, this to ensure all

problems solved within stipulated time but currently problem not tied to any SLA in Mesiniaga. Average problem closure duration is very crucial because in the current process and escalation, it can be a base of KPI to monitor and tracking the duration of problem. Number of repeated incidents, this can be done to find a permanent solution from the analysis of every repetitive incident from the previous month, but the challenge is difficult to track as the number of incidents in Mesiniaga are very high and no enough data to track the correlation between each incident. Number of problem closed, to track the effectiveness of the problem management process. Top 5 categories of incidents reported for the period, this is very useful in Mesiniaga because it's useful for trending analysis.

However, there have a few lists of KPI that not meet or not suitable in Mesiniaga environment. There is percentage of customers given satisfaction surveys, this KPI not suitable in Mesiniaga because normally there are using different checklist and distribute to customer for the feedback under Customer Satisfaction Survey activity. Number of Problems resolved by Known Errors (KE), Request for Changes (RFC) or other Input Requests, this KPI is not suitable in Mesiniaga because not enough data to observe the trending. Average cost to solve a problem, percentage of overdue problems and ratio of number of incidents versus number of problems, this 3 KPI is not directly related with Problem Management in Mesiniaga process. Number of business disruptions caused by problems, this KPI is not suitable because not enough data to observe using the current system reporting. Problem queue rate, this KPI not selected because currently in Mesiniaga, there have no queue as the number of problems were not high. Percentage of problems with available workaround and Problem backlog, percentage of incidents not linked to problems and number of incidents for which the solution is user training, this four KPIs is rely on the functionality of Information Technology Service Management (ITSM) tools, the current Kbase is not mature enough to get reference on the workaround. As for the total number of incidents they are somewhat difficult to track the root cause of each incidents using the current system and existing process flow in Mesiniaga.

Table 1: Interview Question with the Senior Manager at the Service Delivery Division Mesiniaga Berhad (Sharifi, et.al, 2009)

NO.	KPI	YES/ NO
1.	Percentage of customers given satisfaction surveys; The initial aim of any QMS is to satisfy customer of business services. This is the most important KPI and at the same time the hardest on in terms of selecting appropriate measurement tool. Comment: Not related to problem management	NO
2.	Number of Problems resolved by Known Errors (KE), Request for Changes (RFC) or other Input Requests: The incidents which have been received based on Known Errors or Request For Changes or other requests of other departments. Comment: Not enough data to observe the trending	NO
3.	Average cost to solve a problem: The Average costs to solve a problem calculated by time registration per work performed for problems and applying a cost factor to the work. Comment: Not directly related to problem management	NO
4.	Percentage of problems with a root cause identified: Percentage of problems with a root cause identified for the failure Comment: Very important to ensure every problem created solved	YES
5.	Percentage of problems resolved within the required time period or percentage of problems that missed target resolution time: An effective problem Management procedure should be able to meet SLA (Service Level Agreement) target time. Comment: To ensure all problem solved within stipulated time but currently problem not tied to any SLA	YES
6.	Percentage of overdue problems: The number of problems that are not closed or solved within the established time frame. Comment: Same as above	NO
7.	Ratio of number of incidents versus number of problems: Ratio of number of incidents versus number of problems grouped by services and in some cases by CI's. Comment: Not directly contributed to problem management improvement	NO
8.	Number of business disruptions caused by problems: The number of downtime of IT services due to caused problems Comment: No enough data to observe the trend	NO
9.	Average problem closure duration: This KPI reflects, the average time between the registration of problems and their closure. Comment: Very important to track the problem resolution duration	YES
10.	Problem queue rate: The number of problems closed, relative to the number of problems opened in a given time. Comment: so far, no queue as the number of problems were not high	NO
11.	Number of repeated incidents: This KPI Indicate the efficiency of problem management in incident analysis but it seems it is very difficult to measure this KPI especially in big enterprises. Comment: But difficult to track as the number of incidents are very high and no enough data to track the correlation between each incident	YES
12.	Percentage of problems with available workaround: Number of open problems for which a workaround is available relative to the total number of all open problem records Comment: the current Kbase is not mature enough to get reference on the workaround	NO
13.	Problem backlog: Number of open problems older than 30 days (or any other given time frame) relative to all open problems Comment: difficult to investigate on the older problems	NO
14.	Number of problem closed: The number of problem closed during given time. Comment: to track the effectiveness of the problem management process	YES
15.	Total number of incidents: The incidents caused by problems Comment: difficult to track the root cause of each incidents	NO
16.	Percentage of incidents not linked to problems: The incidents that have not yet been examined by problem management Comment: no enough data	NO
17.	Top 5 categories of incidents reported for the period: Based on a chart which shows the 5 highest percentages of categories of call received in the reporting period, trends can be observed, and possible problem areas identified for future analysis Comment: useful for trending analysis	YES
18.	Number of incidents for which the solution is user training: Sometimes incidents accurse because of user's lack of knowledge. So, a considerable number of incidents can be avoided by training the users of the systems. Comment: training tied to the contract	NO

Table 2: Interview Question with the Problem Manager at Mesiniaga Berhad (Sharifi, et.al, 2009)

NO.	KPI	YES/ NO
1.	Percentage of customers given satisfaction surveys; The initial aim of any QMS is to satisfy customer of business services. This is the most	NO

	important KPI and at the same time the hardest on in terms of selecting appropriate measurement tool.	
2.	Number of Problems resolved by Known Errors (KE), Request For Changes (RFC) or other Input Requests: The incidents which have been received based on Known Errors or Request For Changes or other requests of other departments.	NO
3.	Average cost to solve a problem: The Average costs to solve a problem calculated by time registration per work performed for problems and applying a cost factor to the work.	NO
4.	Percentage of problems with a root cause identified: Percentage of problems with a root cause identified for the failure.	NO
5.	Percentage of problems resolved within the required time period or percentage of problems that missed target resolution time: An effective problem Management procedure should be able to meet SLA (Service Level Agreement) target time.	YES
6.	Percentage of overdue problems: The number of problems that are not closed or solved within the established time frame.	YES
7.	Ratio of number of incidents versus number of problems: Ratio of number of incidents versus number of problems grouped by services and in some cases by CI's.	NO
8.	Number of business disruptions caused by problems: The number of downtime of IT services due to caused problems (High Severity).	YES
9.	Average problem closure duration: This KPI reflects, the average time between the registration of problems and their closure.	NO
10.	Problem queue rate: The number of problems closed, relative to the number of problems opened in a given time period.	NO
11.	Number of repeated incidents: This KPI Indicate the efficiency of problem management in incident analysis but it seems it is very difficult to measure this KPI especially in big enterprises.	YES
12.	Percentage of problems with available workaround: Number of open problems for which a workaround is available relative to the total number of all open problem records.	YES
13.	Problem backlog: Number of open problems older than 30 days (or any other given time frame) relative to all open problems.	YES
14.	Number of problem closed: The number of problem closed during given time.	NO
15.	Total number of incidents: The incidents caused by problems.	NO
16.	Percentage of incidents not linked to problems: The incidents that have not yet been examined by problem management.	NO
17.	Top 5 categories of incidents reported for the period: Based on a chart which shows the 5 highest percentages of categories of call received in the reporting period, trends can be observed, and possible problem areas identified for future analysis.	YES
18.	Number of incidents for which the solution is user training: Sometimes incidents accurse because of user's lack of knowledge. So, a considerable number of incidents can be avoided by training the users of the systems.	NO

Based on the result shown in the Table 1 and 2, there were 6 KPIs selected from the expert. The KPI were selected based on the incident category captured from the internal systems that currently used for IT Service Management tools for reporting incident purposes. Details of selected KPI are as below:

a. Percentage of problems resolved within the required time or percentage of problems that missed target resolution time: An effective problem Management procedure should be able to meet SLA (Service Level Agreement) target time.
b. Percentage of overdue problems: The number of problems that are not closed or solved within the established time frame.
c. Number of business disruptions caused by problems: The number of downtime of IT services due to caused problems (High Severity).
d. Number of repeated incidents: This KPI Indicate the efficiency of problem management in incident analysis but it seems it is very difficult to measure this KPI especially in big enterprises.
e. Percentage of problems with available workaround: Number of open problems for which a workaround is available relative to the total number of all open problem records.
f. Problem backlog: Number of open problems older than 30 days (or any other given time frame) relative to all open problems.

For the implementation stage, the expert has provided the list of incidents from one of Mesiniaga clients. The incident lists were recorded from the month January 2016 until December 2016. Below are the results of KPIs analysis based on the lists of incidents reported from one customer:

a. KPI 1: Percentage of problems with root cause identified: Percentage of problems with a root cause identified for the failure.

Subcategory	State	Branch	Priority
Router	Open	TM - ENTP HOSPITAL JITRA	1 - Critical
Router	Resolved		1 - Critical
Router	Resolved	TM - CPE 1PDRMNET PGA SEMENYIH	1 - Critical
Router	Resolved	TM - CPE 1PDRMNET PONDOK POLIS PUTRA PRIMA	1 - Critical
Switch	Resolved	TM - CPE NKRA PDRM BALAI POLIS PETALING	1 - Critical
Router	Resolved	TM - CPE PDRM PRS BALAI PUCHONG	1 - Critical
Router	Resolved	TM - CPE PDRM BALAI BANDAR TEKNOLOGI	1 - Critical
Barracuda	Resolved	TM - CPE 1PDRMNET IPD KUALA MUDA	1 - Critical
Router	Resolved	TM - CPE NKRA PDRM B.POLIS DAMANSARA UTAMA	1 - Critical
Switch	Resolved	TM - CPE PDRM BALAI POLIS DABONG	1 - Critical
Router	Resolved	TM - CPE PDRM IPD SENTUL	1 - Critical
Router	Resolved	TM - CPE PROTON EDAR 3S MELAKA	1 - Critical
Router	Resolved	TM - CPE ENTP HOSPITAL RANAU	1 - Critical
Router	Resolved	TM - CPE LTH KULAI	1 - Critical
Router	Resolved	TM - CPE PROTON EDAR IPME CASTING(CAS)	1 - Critical

Fig 3: List of resolved ticket with identified root cause.

b. KPI 2: Percentage of problems resolved within the required time or percentage of problems that missed target resolution time: An effective problem Management procedure should be able to meet SLA (Service Level Agreement) target time. To identify the SLA for each incident, the calculation is based the severity level or priority number of incidents categories.

Created	SLA Meet	Resolved
2016/01/02 02:43:19	Yes	2016/01/04 09:48:18
2016/01/04 12:58:15	Yes	2016/01/04 15:54:32
2016/01/05 16:31:14	Yes	2016/01/12 21:50:33
2016/01/05 17:56:24	No	2016/01/06 11:22:16
2016/01/06 09:14:04	No	2016/01/19 10:46:33
2016/01/06 10:47:46	Yes	2016/01/07 09:36:18
2016/01/06 12:42:05	Yes	2016/01/06 13:30:30
2016/01/06 17:31:13	Yes	2016/01/07 11:15:58
2016/01/08 14:47:06	Yes	2016/01/08 15:30:00
2016/01/08 16:11:56	Yes	2016/01/11 12:49:40
2016/01/08 23:31:49	Yes	2016/01/11 19:18:49
2016/01/10 21:45:22	Yes	2016/01/11 04:17:58
2016/01/11 11:11:48	Yes	2016/01/11 14:38:53
2016/01/11 12:26:56	Yes	2016/01/15 01:53:28
2016/01/12 14:32:30	Yes	2016/01/15 12:01:33

Fig 4: Ticket created date and resolved date.

c. KPI 3: Average problem closure duration: This KPI reflects, the average time between the registration of problems and their closure.

Subcategory	State	Branch	Created
Switch	Resolved	TM - CPE PDRM BALAI POLIS DABONG	2016/02/21 00:24:39
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/02/24 19:33:48
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/02/29 11:55:10
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/03/14 15:17:49
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/04 10:37:26
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/05 09:14:03
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/08 11:48:51
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/09 16:21:05
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/12 11:48:21
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/14 09:45:43
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/16 09:15:57
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/25 13:56:19
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/27 03:19:58
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/27 09:19:52
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/29 10:56:50

Fig 5: List of average problem closure duration.

d. KPI 4: Number of repeated incidents: This KPI Indicate the efficiency of problem management in incident analysis but it seems it is very difficult to measure this KPI especially in big enterprises.

Subcategory	State	Branch	Created
Switch	Resolved	TM - CPE PDRM BALAI POLIS DABONG	2016/02/21 00:24:39
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/02/24 19:33:48
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/02/29 11:55:10
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/03/14 15:17:49
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/04 10:37:26
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/05 09:14:03
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/08 11:48:51
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/09 16:21:05
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/12 11:48:21
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/14 09:45:43
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/16 09:15:57
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/25 13:56:19
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/27 03:19:58
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/27 09:19:52
Router	Resolved	TM - CPE PDRM IPD SENTUL	2016/04/29 10:56:50

Fig 6: List of repeated incidents from the same branch and subcategory issues (router problem).

e. KPI 5: Number of problem closed: The number of problem closed during given time.

Created	SLA Meet	Resolved
2016/01/02 02:43:19	Yes	2016/01/04 09:48:18
2016/01/04 12:58:15	Yes	2016/01/04 15:54:32
2016/01/05 16:31:14	Yes	2016/01/12 21:50:33
2016/01/05 17:56:24	No	2016/01/06 11:22:16
2016/01/06 09:14:04	No	2016/01/19 10:46:33
2016/01/06 10:47:46	Yes	2016/01/07 09:36:18
2016/01/06 12:42:05	Yes	2016/01/06 13:30:30
2016/01/06 17:31:13	Yes	2016/01/07 11:15:58
2016/01/08 14:47:06	Yes	2016/01/08 15:30:00
2016/01/08 16:11:56	Yes	2016/01/11 12:49:40
2016/01/08 23:31:49	Yes	2016/01/11 19:18:49
2016/01/10 21:45:22	Yes	2016/01/11 04:17:58
2016/01/11 11:11:48	Yes	2016/01/11 14:38:53
2016/01/11 12:26:56	Yes	2016/01/15 01:53:28
2016/01/12 14:32:30	Yes	2016/01/15 12:01:33

Fig.7: List of number of problem closed.

f. KPI 6: Top 5 categories of incidents reported for the period: Based on a chart which shows the 5 highest percentages of categories of call received in the reporting period, trends can be observed, and possible problem areas identified for future analysis.

Subcategory	State	Branch	Priority
Router	Open	TM - ENTP HOSPITAL JITRA	1 - Critical
Router	Resolved		1 - Critical
Router	Resolved	TM - CPE 1PDRMNET PGA SEMENYIH	1 - Critical
Router	Resolved	TM - CPE 1PDRMNET PONDOK POLIS PUTRA PRIMA	1 - Critical
Switch	Resolved	TM - CPE NKRA PDRM BALAI POLIS PETALING	1 - Critical
Router	Resolved	TM - CPE PDRM PRS BALAI PUCHONG	1 - Critical
Router	Resolved	TM - CPE PDRM BALAI BANDAR TEKNOLOGI	1 - Critical
Barracuda	Resolved	TM - CPE 1PDRMNET IPD KUALA MUDA	1 - Critical
Router	Resolved	TM - CPE NKRA PDRM B.POLIS DAMANSARA UTAMA	1 - Critical
Switch	Resolved	TM - CPE PDRM BALAI POLIS DABONG	1 - Critical
Router	Resolved	TM - CPE PDRM IPD SENTUL	1 - Critical
Router	Resolved	TM - CPE PROTON EDAR 3S MELAKA	1 - Critical
Router	Resolved	TM - CPE ENTP HOSPITAL RANAU	1 - Critical
Router	Resolved	TM - CPE LTH KULAI	1 - Critical
Router	Resolved	TM - CPE PROTON EDAR IPME CASTING(CAS)	1 - Critical

Fig.8: List of categories of incidents reported.

This chapter discussed the finding and results from interview session and matching KPI of problem management among Problem Manager and Senior Manager which is the expert to find the suitable KPI for Problem Management in Mesiniaga following ITIL framework. Based on the findings, there are 6 KPIs of Problem Management have been selected; percentage of problems resolved within the required time or percentage of problems that missed target resolution time; percentage of overdue problems; number of business disruptions caused by problems; number of repeated incidents; percentage of problems with available workaround and, problem backlog. From the selected KPI, now Mesiniaga has experienced with the right way on how to move step forward regarding come-out with analysis of problem management practice. The expert also gave good opinion, recommendations to improve the KPI in Problem Management to make it more usable for the current process in the future.

5. Conclusion

The research was carried out to achieve two objectives which are to identify the KPI of Problem Management behavior in Mesiniaga based on ITIL framework. This objective was successfully achieved using the selected of lists with suitable KPI for Problem Management in Mesiniaga. Through the interview session and Problem Manager has decided the KPI based on the experience of Mesiniaga in managing incident from the services provided to the client. The second objective is to map the KPI of ITIL into Problem Management of Mesiniaga. By analyzing the incidents log provided by Mesiniaga, with using the selected KPI, the objective is achieved. The findings of the selected lists of this project show that there are three KPIs which are clearly follow the category for Mesiniaga Incident logs. There are also some recommendations towards the betterment of this research as follows:

a. To capture more details of Problem Management, the comprehensive access for internal Mesiniaga systems is must to ensure the current data and system that Mesiniaga use in operation is in line with ITIL framework.
b. The ITSM system has grown rapidly whereby there are many tools or software available in market. The comparison ITSM software can also be conducted to identify and to compare the Problem Management practice in Mesiniaga.
c. Instead of using manual capture of Problem Management KPI, the automation of selected KPI from Incident to Problem Management can be implemented in the systems. Most technology are intelligent enough for data analytic to decide which suitable KPI of Problem Management follow the current business and client environment.

Acknowledgement

The authors would like to acknowledge the Chancellery of Universiti Teknologi MARA (UiTM) for the financial support. The appreciation also goes to Faculty of Computer and Mathematical Sciences (FSKM) and Institute of Malay Thoughts and Leadership (IMPAK) of Universiti Teknologi MARA, Shah Alam, Selangor for giving a moral support in the production of this paper.

References

[1] Hochstein, A., Zarnekow, R., & Brenner, W. ITIL as common practice reference model for IT service management: Formal assessment and implications for practice, (2005). Paper presented at the 2005 IEEE International Conference on e-Technology, e-Commerce and e-Service.
[2] Lahtela, M & Kaukola, J. Implementing an ITIL-Based IT Service Management Measurement System. Paper presented at the Digital Society, (2010). ICDS '10. Fourth International Conference on.
[3] Tang, X., & Todo, Y. A Study of Service Desk Setup in Implementing IT Service Management in Enterprises Technology and Investment, 4(3), 190, (2013).
[4] Neničková, H. Critical Success Factors For ITIL Best Practices Usage. Economics & Management, 16, (2011).
[5] Moser, C., & Bayer, F. IT Architecture Management: A Framework for IT-Services, (2005). Paper presented at the EMISA.
[6] Potgieter, B., Botha, J., & Lew, C. Evidence that use of the ITIL framework is effective, (2005). Paper presented at the 18th Annual conference of the national advisory committee on computing qualifications, Tauranga, New Zealand.
[7] Niessink, F., & Vliet, H. v. Towards mature IT services. Software Process: Improvement and Practice, 4(2), 55-71, (1998).
[8] Zeo Outage. Problem Management, (2016). Retrieved from https://www.zero-outage.com/processes/problem-management/#c363.
[9] Information Technology Infrastructure Library (ITIL). (2011)

[10] Phusavat, K. Roles of performance measurement in SMEs' management processes, (2007). International Journal of Management and Enterprise Development, 4(4), 441-458.
[11] Knizek, B. L., Hjelmeland, H., Skruibis, P., Fartacek, R., Fekete, S., Gailiene, D. & Rohrer, R. R. County council politicians' attitudes toward suicide and suicide prevention: A qualitative cross-cultural study, (2008).. Crisis, 29(3), 123-130.
[12] Gummesson, E. Service management: an evaluation and the future, (1994). International Journal of service Industry management, 5(1), 77-96.
[13] Hsu, M. The challenges of implementing the ITIL Problem Management process in IT support organizations, (2011).
[14] Sharifi, M., Ayat, M., Ibrahim, S., & Sahibuddin, S. The most applicable KPIs of problem management process in organizations, (2009). International Journal of Simulation: Systems, Science & Technology, 10(3), 77-83.
[15] Sharifi, M., Ayat, M., Sahibudin, S., & Ibrahim, S. An empirical study identifying high perceived value KPIs of incident management process in organizations, (2008). International Journal of Simulation: Systems, Science and Technology, 9(4), 16-24.
[16] Asic, M., Bajrami, E., & Tanovic, A. Improvement of the eTOM Operations phase through the comparison with ITIL best practices, (2012). Paper presented at the 20th Telecommunications Forum (TELFOR), 2012.
[17] Cater-Steel, A., & Pollard, C. Conflicting views on ITIL implementation: managed as a project–or business as usual, (2008). Paper presented at the Proceedings of 2008 International Conference on Information Resources Management (Conf-IRM), Niagara Falls, Canada.
[18] Pollock, W. K. Using key performance indicators (KPIs) to measure and track the success of your services operation: AFSMI S-Business, (2007).
[19] Wennerström, M. Process improvement for problem management: A case study of Basware, (2014).