CAPACITY REPORT AUTOMATION FOR CAPACITY PLANNING

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"To my people who kept me going despite the circumstances..."

This is for all of you

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ABSTRACT

Technology has been incorporated into many organisations for their day to day operations. Automation has become the main efficiency and cost saving initiative at this point of time. This study attempted to automate the Capacity Reporting process for DTE Sdn Bhd and produce a prototype of the automated report. The preliminary study found that employees were manually processing data using Excel, which took up a lot of time and was error prone. The prototype was designed to download data directly from multiple sources and then created as a report in the reporting platform. The prototype was developed by combining Waterfall and Prototyping Software Development Life Cycle methodologies. The prototype was then validated by comparing the data with the manual process. The automated process had less than 1% discrepancy and reduced the time taken to produce a report by more than half. The Capacity Reporting team reported that overall efficiency and accuracy improved after the implementation of the automated report.

ABSTRAK

Banyak organisasi telah menggabungkan penggunaan teknologi dalam operasi seharian mereka. Pada masa kini, automasi telah menjadi inisiatif utama untuk kecekapan dan pengurangan kos. Kajian ini telah cuba mengautomasi proses *Capacity Reporting* untuk DTE Sdn. Bhd. dan membina satu prototaip laporan automasi tersebut. Kajian awal mendapati pekerja memproses data secara manual menggunakan Excel, yang memakan masa dan cenderung untuk kesilapan. Prototaip telah direka bentuk untuk memuat turun data secara terus daripada pelbagai sumber dan seterusnya diolah sebagai laporan. Prototaip ini telah dibina melalui penggabungan metodologi Waterfall dan Prototyping. Seterusnya, prototaip ini disahkan dengan melakukan perbandingan data dengan proses manual. Proses automasi ini mengandungi kurang daripada 1% percanggahan dan telah menggurangkan masa untuk menjana laporan sebanyak lebih daripada separuh masa asal. Ahli Capacity Reporting telah melaporkan bahawa secara keseluruhan, kecekapan dan ketepatan telah bertambah baik setelah pelaksanaan laporan automasi.

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IT	-	Information Technology
ITIL	-	IT Infrastructure Library
BPM	-	Business Process Management
BPA	-	Business Process Automation
CAPA	-	Capacity Planning

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Information systems are increasingly present in all activities of our daily lives and in the most diverse areas of knowledge, from health, education and communication to finance, security and entertainment. Given the widespread use of information systems, performance of services provided have been object application designers and the scientific community (Galindo *et al*., 2010).

A business process is a complete, dynamically coordinated set of activities or logically related tasks that must be performed to deliver value to customers or to fulfil other strategic goals (Guha & Kettinger, 1993; Strnadl, 2006). In other words, a business process is a collection of linked tasks which find their end in the delivery of a service or product to a client. The process must involve clearly defined inputs and a single output. These inputs are made up of all the factors which contribute (either directly or indirectly) to the added value of a service or product. These factors can be categorized into management processes, operational processes and supporting processes (Trkman, 2010).

Management processes govern the operation of an organization's system of operation. Operational processes constitute the core business. Supporting processes such as human resources and accounting are put in place to support the core processes. (Trkman, 2010).

Depending on the organization, industry and nature of work, business processes are often broken up into different categories. Categories include operational processes that deal with the core business and value chain. These processes deliver value to the customer by helping to produce a product or service. Operational processes represent essential business activities that accomplish business objectives, such as generating revenue. Supporting processes on the other hand, back core processes and functions within an organization. Examples of supporting or management processes include accounting, Human Resource (HR) management and workplace safety. One key differentiator between operational and support processes is that support processes do not provide value to customers directly. Lastly are the management processes that measure, monitor and control activities related to business procedures and systems. Examples of management processes include internal communications, governance, strategic planning, budgeting, and infrastructure or capacity management. Like supporting processes, management processes do not provide value directly to the customers (Margaret Rouse, 2016).

Business process automation is being increasingly used by many companies to improve the efficiency of both internal processes to satisfy customers and employees. Business processes need to be executed with a high and predictable quality. In particular, it is crucial for organizations to meet the process design, automation, and management technologies are being increasingly used in both traditional and newly-formed, Interned-based enterprises in order to improve the quality and efficiency of their administrative and production processes, to manage ecommerce transactions, and to rapidly and reliably deliver services to businesses and individual customers. (Grigori, Casati, Dayal, & Shan, 2001).

To attract and retain customers as well as business partners, organizations need to provide their services such as executing processes with a high, consistent, and predictable quality. From a process automation perspective, this has several implications, for example Service Level Agreements (SLAs) agreed with the customers and to foresee as early as possible the risk of missing SLAs, in order to set the right expectations and to allow for corrective actions. (Grigori *et al*., 2001).

Capacity Reporting is an essential component in the bigger Capacity Planning module of an organization. Capacity Reports basically are information on the utilization of an IT services providers' resources. This report will be used to trigger remediation action and to plan and manage the resources based on ever changing requirements and environment.

1.2 Background of Problem

Business Process Automation (BPA) is an essential part of any organization that wants to move on to the next level. Lack of business process automation can cause many problems and can become a disadvantage to an organization (Brick, 2016).

First, visibility will be lacking. With business process automation, visibility of process status is achieved. An item's location in a workflow is clearly seen. That can be particularly useful for capacity planning and deadline management. Visibility on the overall process will be very useful to track progress and plan needs or unexpected circumstances. Secondly, without a proper business process, there is less accountability. By automating business processes, managers can see who's responsible for what and where processes are getting stuck. This in turn helps to keep the quality in check as well (Brick, 2016).

Thirdly, BPA also helps document management to be more organized. When combined with a document management system, BPA reduces the time employees spend filing and retrieving documents. Documents are easier to track and so customers enjoy better service. And finally, business process automation helps to improve efficiency of the organization, by helping the employees do more, help processes move ahead faster, and alerts and task reminders can be generated automatically. On a management level, team leaders can get a macro-view of the process, allowing them to be more proactive about addressing and correcting potential bottlenecks. That high-level visibility means teams can reduce the time spent in update and review meetings.

It can be surmised that the lack of all the above characteristics will be a major problem to the organization in a non-automated business process. Therefore, an urgent need to define and implement an automated business process is obvious (Robert Winter, Winter;, Klesse, & St.Gallen, 2004).

Organization DTE Sdn Bhd that was studied is a storage and hosting provider for multiple clients. Their biggest client uses more than 5000 servers. Capacity and availability planning teams work to ensure all these servers' usage is optimized, and more importantly there is no unplanned downtime. Monitoring agents are installed in all these servers, and the agents send out data regarding the servers. All these data are stored on a central database, and used to manage and plan capacity and availability of these servers. There is a target of 99.9% of capacity each month, or else there is a penalty to be borne by the organization.

The Capacity Reporting process aims to provide information about the usage and optimization of all the assets of DTE Sdn Bhd, to support the client's 99.9 percent target. Capacity in this context means how much a server is currently utilized, and the whole capacity planning process aims to optimize the usage of all the servers. As such the reporting is needed to help monitor the capacity of servers

constantly and allow remediation to be done proactively, to conform to the Service License Agreement (SLA) of the customer, and avoid any penalty.

All raw data from monitoring agents are collected and kept in a central location. Internal reporting tool processes this data and then sends it out for capacity planning. There is a series of more data processing done through Microsoft Excel, where the servers list is filtered based on complex set of criteria, and finally the capacity percentage is calculated using an Excel macro. The calculation is done every month, and sent out to the customer. If the capacity is below 99.9 percent, there is a penalty to be paid by organization. Capacity is measured by CPU and RAM usage data. Figure 1.1 shows the architecture of current Capacity Reporting.

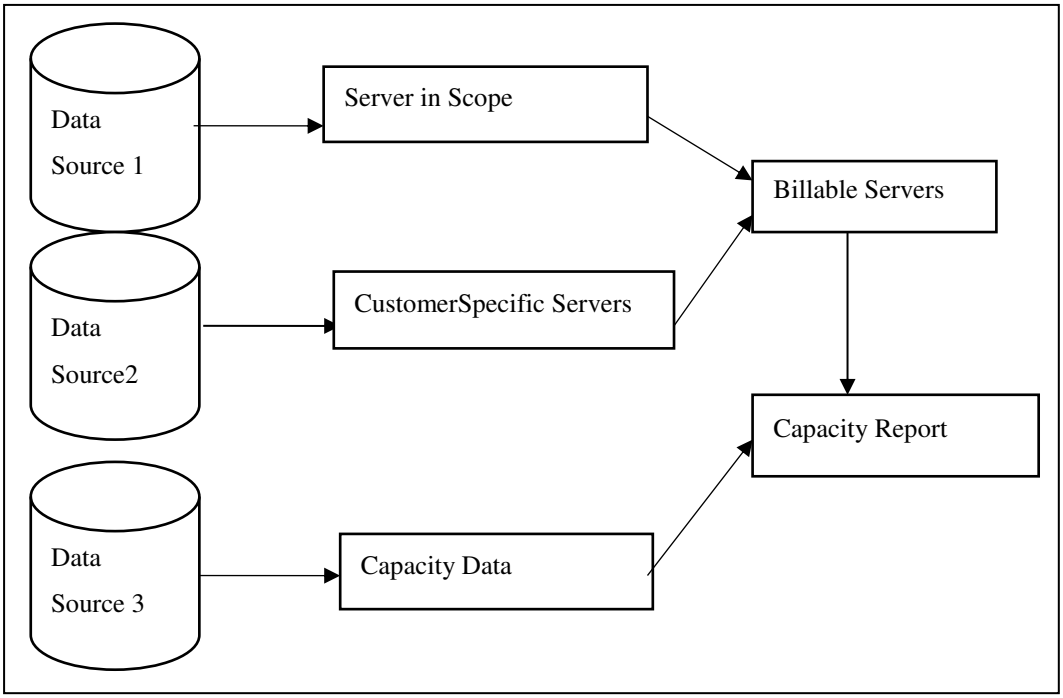

Figure 1.1 Current Architecture of Capacity Reporting

Based on the architecture in Figure 1.1, below are the steps that the reporting team must do for their monthly reporting.

i. Download list of servers in scope from Data Source 1.

ii. Download customer specific server list from Data Source 2.

iii. Combine the above data to get Billable servers list, which involves VLOOKUP and filtering as given in Appendix A.

iv. Download Capacity data from Data Source 3

v. Copy the list of billable servers and Capacity data into the Capacity Report template (Excel macro with complex formula to calculate capacity percentage).

vi. Manually exclude any known excludable server.

vii. Refresh pivot table to get latest capacity percentage.

1.3 Problem Statement

Process automation refers to the use of Information Technology to assist employees in the performance of a business process. Many routine tasks can be automated while others may still need human involvements. In general, tasks can be fully/semi-automated or manual. Business process automation improve the performance of business activities and enables enterprise-wide monitoring and coordination. Automated tasks can be executed faster, with less cost, and with a better result.

However, during the observation and interview of the Capacity Reporting team, it was found that many critical routine tasks where still done manually, mostly through Ms Excel. Manual filtering of the servers list through Excel was taking up at least 4 hours each time the report need to be generated. If any criteria or attribute of a server changes, then the whole process must be repeated. Manual processing also has a higher chance of human error. Therefore, there is a need to implement an automated report that can achieve the Capacity Report with less time and zero human error. The reporting process needs to ultimately support the Capacity Planning process to provide 99.9% server availability each month which is important to meet the Service Level Agreement (SLA) with the customer, and avoid a penalty of 250K

in case of noncompliance. The analysis of the Capacity Reporting team interview results is shown in Chapter 3.

The automated Capacity Report will help to improve the quality of the report in terms of time taken and error reduction, by loading the data from multiple sources, and then filter it based on the required criteria using a SQL Server Integration Services (SSIS) package. The automated process will take less time that a manual effort, and there is minimal human intervention that will inherently reduce chances of errors. Once the report is implemented, the Capacity Reporting team only need to run the report from the website, and then input it into the Excel macro which calculates the Capacity percentage.

The automated Capacity Report will benefit the whole organisation globally, and the Capacity Report is presented to the higher management to help track the up time of all the company's assets and highlight any need for replacement or upgrade of assets to better serve the customer. Apart from this, a more accurate Capacity Report will enable the management to trigger remediation of faulty or offline servers more proactively. By being able to extract the Capacity data more frequently and accurately, the Capacity Reporting team can present their findings to the Operations team to initiate remediation actions sooner, which will again help to reduce possibility of penalty.

1.4 Research Objective

i. To identify the requirements to produce an automated Capacity Report.
ii. To develop an automated Capacity Report.
iii. To validate the automated Capacity Report.

1.5 Research Questions

i. How to identify requirements of automated Capacity Report?
ii. How to develop an automated Capacity Report?
iii. How to validate automated Capacity Report?

1.6 Research Scope

This research automated the Capacity Reporting process, focusing on the monthly reporting process. Data for this purpose is derived from three major data sources, depicted as Data Source 1, Data Source 2 and Data Source 3 in Figure 1.1.

1.7 Research Significance

The interviews and discussion with the Capacity Reporting team found a few gaps that can be improved with an automated report. One of the most important part of the Capacity Reporting process is to define which servers that should be billed to the client (billable servers). But this is not easy to achieve, as there are three different sources of servers list in the whole process. And due to previous errors in registering or changing the servers' details, the information can sometimes not match within the three sources. And since three different teams own the data source, it is difficult to get them to synchronize among themselves as well. Due to this, the reporting team must compare and match the data from these 3 sources before even doing the Capacity Reporting.

Furthermore, changes to the servers' attributes due to any reason like decommissioning and change of owner will sometimes add or remove a server from this billable list. There is no automated update of these changed attributes across all data sources which will pose more inaccuracy in the reporting process and need to be sorted manually.

Since all the data for capacity is provided by the monitoring agents installed on the server, if a server stops reporting, that will not be considered a reason to be excluded from the billable servers list. The reporting team must follow up with the operations team and attempt to fix the problem somehow. Again, there is no automated process that can help to trigger if a server has stopped reporting, so that remediation can be done proactively.

Therefore, this study attempts to:

i. Increase accuracy of data from all data sources by loading them into a reporting database and automation of the filtering process based on the criteria.

ii. Help the capacity team save time on the reporting process by creating the reporting on the reporting tool.

1.8 Summary

This chapter provided an overview of the entire research project. The problem statement, significance of research, research objectives, research questions and the scope of the study were all described precisely. The automation of the Capacity Reporting process is the focus of this research.

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