

# Analysis SIM Card Provisioning Process at Telecommunication Operator using Balance Scorecard

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**Abstract** — SIM card provisioning is a process to activate SIM card network and services before it is use by customers. This research is about to analyze the management of provisioning process and the performance improvement between the manual process and the automation process in a business unit at a telecommunication operator which is SIM card activation in provisioning unit/department. The important element to measure the management process in an organization is the performance evaluation of business process inside the organization itself. Although measuring and managing performance constitutes a difficult task in any kind of organization, but the clearly defined of business process, goals and stakeholders can guide to a better company policy. And to measure of performance evaluation system also can enable stakeholders to assess their decision for company improvement in the future. This study contributes to the literature of business process in provisioning and balanced scorecard of an organization.

**Keywords**— *SIM Card, Provisioning Process, Activation Process, Business Process Management, Balance Scorecard*

## I. INTRODUCTION

The rapid development of telecommunication technology has deep impact to services and applications delivered by telecom operator. The development of smart phones, tablets or notebook, is a trigger to the increasing of customer number for Telecom Operator Company. Telecommunication industry has presented new possibilities to exploit technologies, products and process to support strategies for increasing their revenue. Telecom operator as part of the telecommunication industry also takes this opportunity by increasing the number of customers and increasing income from the usage of their variety service products, -for using mobile telecommunication services or broadband services by the customers.

Almost 95% Indonesian mobile subscribers use Pre-paid card for their mobile telecommunication services. And with the increasing of number population, especially in Indonesia which now listed as the fourth rank of most populated country in the world. The people behavior itself now a day has more than one mobile devices/gadget (most people now for instance has more than one smart phone or also has tablet) and the behavior to spend more time accessing internet via mobile in

their gadget, leads telecommunication operator has to fulfill the demand of the prepaid SIM card in the market.

To fulfill the demand of SIM card numbers for the customers, SIM cards has to be provisioned before it distributes to customers, - which called provisioning process. Because a process can play a crucial role in business process performance, so the new ways of using good process in provisioning is the reason why SIM Card process is so important to be analyzed.

This paper therefore proposes the use of balanced scorecard (BSC) strategy to develop a framework to be used to enhance the business process improvement perspective of an organization. The study is informed by a case study of a business unit of SIM card provisioning at telecommunication operator in Indonesia. The paper contributes to the literature of mitigation of improvement of organizations business process. Also the developed financial framework is expected to be used to improve their service delivery. Such effective usage will lead to business excellence as to attract and retain stakeholders.

### A. Research Questions

From the results of exposure in background above, can be drawn issues of the following main research question namely:

- How to make improvement in a business process of SIM card activation with the large number of new SIM card requests (with MSISDN inside)?

### B. Constraints and Scope of Work

- The scope of this thesis research is related to the business process of Pre Paid SIM Card provisioning in GSM Telecommunication Operator in Indonesia.
- For evaluation and data analysis methodology in this research is using Balanced Scorecard.
- The Balance Scorecard focus in the part of the internal business improvement quadrant.

How to measure improvement is not only about the way activities are performed, but it can also provide additional insights whenever performance information is projected into useful information for the company, management or for

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Identify applicable sponsor/s here.

enhancement of the process itself. And therefore the research study is done.

## II. RELATED WORK

Former research about business process modeling was research by Tianyang Dong, Hongming Cai and Boyi Xu, "A Business Process Modeling Approach Based on Semantic Event-driven Process Chains"<sup>[8]</sup>, in 2010 using BPEL mapping.

Then in 2011 a research by Ljubica KAZI, et al about "Balance Scorecard (BSC) Framework in Software Project Monitoring"<sup>[7]</sup>, explain about BSC can be as concept as performance measurement system in the field of IT.

And a recent study in 2013 from Kudo, M.; et al from IBM Researcher, about "Business Process Analysis and Real-world Application Scenarios"<sup>[6]</sup>, explain about business process analyst architecture with the three effective scenarios which are business process improvement, system usability improvement and organization improvement.

Base on related work of the previous researches and other reading materials, that leads the author to have research in business process improvement in one of business unit in a telecommunication company which is provisioning process in SIM card activation. And this research study suggested hypotheses to test the influence of automation system as parameters to the business process improvement perspective of an organization. These hypotheses are;

- With the automation process in provisioning process should optimize the business process.
- Automation process can handle a large number request of Pre Paid SIM card provisioning from Regional User (Sales) team than with the manual process.

## III. DATA AND THEORY

### A. Balanced Scorecard

The Balanced Scorecard (BSC) is an analytical framework used for strategic planning and management within an organization. It ensures congruency between business activities and the organization's objectives, vision and strategic goals.

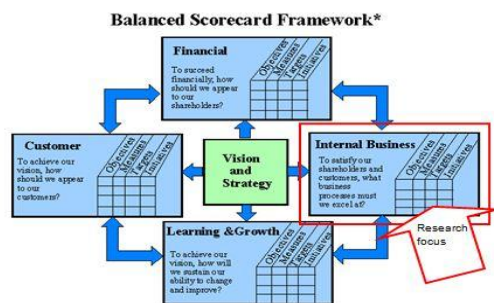


Fig. 1. Balanced Scorecard Framework

\*Adapted from Kaplan & Northon 1996

BSC has four quadrants that help in realizing organization's perspective in financial, internal business process, customer, learning and growth. And organizations will be putting in place instruments for checking and balances to improve its performance.

### B. Business Process Management

Business Process Management (BPM) is the discipline that combines knowledge from information technology and knowledge from management sciences and applies it into operational business processes to get continuously process improvement to get more effectiveness and efficiency in business perspective.

The BPM life cycle can be drawn as figure bellow;

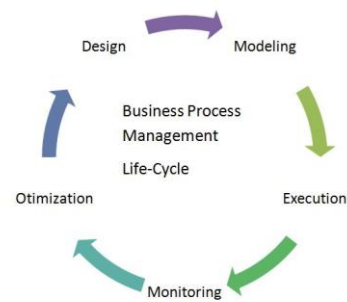


Fig. 2. BPM life cycle

\*Adapted from [http://en.wikipedia.org/wiki/Business\\_process\\_management](http://en.wikipedia.org/wiki/Business_process_management)

Business process can be illustrated with flowchart, activity diagram and sequence diagram. And in this paper, the author uses some of the diagrams to illustrate the process.

Flowchart is a type of diagram that represents an algorithm or process in designing and documenting complex processes or programs. The diagram usually illustrates the solution of problem. Flowchart is easier to understand by non programmer.

A sequence diagram is a diagram that shows objects interaction in time sequence of how the processes operate with one another and in what order also construct of a message sequence chart.

Activity diagrams are graphical representations of workflows activities and actions for choice, iteration and concurrency.

BPM technology is now considered as solutions to deliver real-time of a actionable information. Information can be collected in a variety of ways and can be made using real-time dashboards. It also can be implemented in a software packages in to a "modeling" that also a simulation. It is an approach that bridges organizational and technological in a package.

### C. SIM Card Activation in Provisioning Process

In telecommunication, provisioning is the process of preparing and equipping a network to allow it to provide (new) services to its users. It is a process to activate SIM card network and services before it is use by customers.

In provisioning some process has to complete due to the activation process such as authentication in Network Element (NE), IN/Online Charging System (OCS) and other system related to the operator. There are two categories in activating SIM card, from new numbers usually called “activation process” and from recycled numbers usually called “deletion process”.

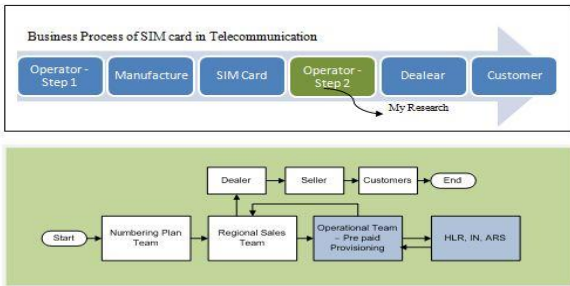


Fig. 3. Business Process SIM Card in Telecommunication

IV. METHODOLOGY

This research is directed to the analysis of the performance of a company Business Process in handling the provisioning process of pre paid SIM Card activation in telecommunication operator using a variety of perspectives in the Balance Scorecard (BSC) method with inserting Business Process Management as the step to define the internal business process part.

To get expected result in this research for evaluation and data analysis, the author uses flowchart diagram for activities taken in this research study as describes in the figure below;

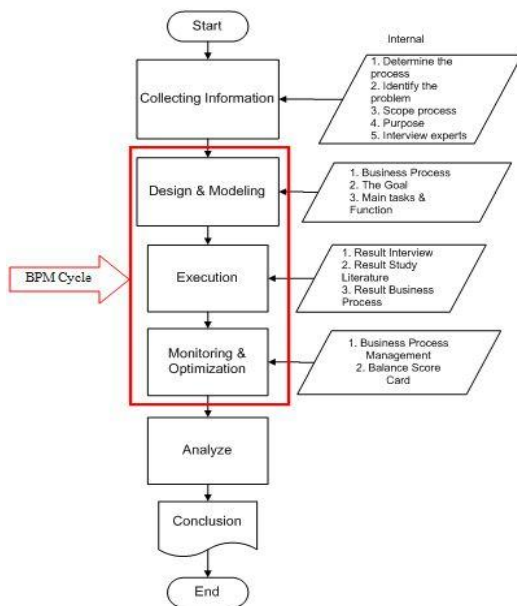


Fig. 4. Research Methodology Flowchart

V. RESULT AND ANALYSIS

Research results obtained from the implementation of steps taken to validate the method are;

A. Step 1 - Data/ Information collection

The results of determine the process, scope, problem, purpose and also the identification of vision in step and procedure at provisioning process, summarize below;

1) Element in Provisioning Process System:

- Database; for handling card’s life cycle. (A)
- Mass Provisioning process (B)
- The HLRs store detail of every SIM card issued by the mobile phone operator. Each SIM has a unique identifier called an IMSI which is primary key to each HLR record. (C)
- OCS/IN is Online Charging System (D)
- SPR is Subscription Profile Repository; a caching database, which also represent all data in HLR. (E)
- ARS is Automatic Route Selection/Selector; a data base system that handles system of Customer Relation Manager, that related to MSISDN and IMSI mapping. (F)

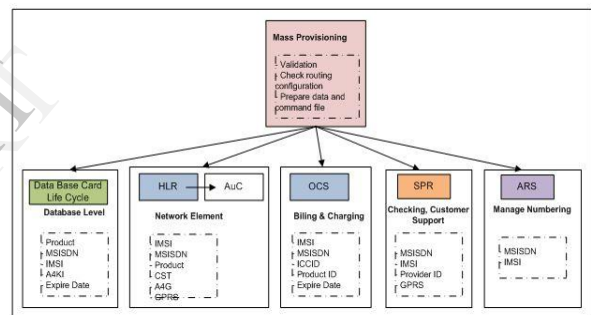


Fig. 5. Element in provisioning

2) The main functional element that important in provisioning process to be passed in cards activation such as:

- Product ID
- IMSI
- ICCID
- Provider ID
- A4KI
- Expire Date
- CST
- A4G
- GPRS

3) In the provisioning process of SIM card activation also has to include process like:

- Validation
- Check routing configuration
- Prepare data and command

B. Step 2- Design and Modeling

After identification of Scope and System Requirements the next step is to visualize the process in a diagram as the design and model of the business process flow requirement (-based on Step 1 point 1);

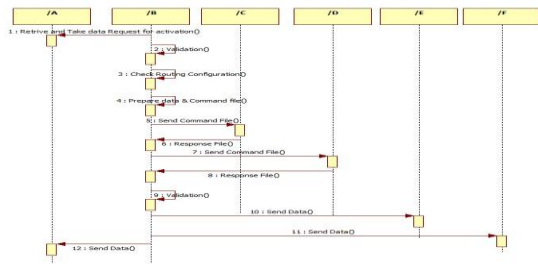


Fig. 6. Provisioning Process-Activation in Sequence Diagram

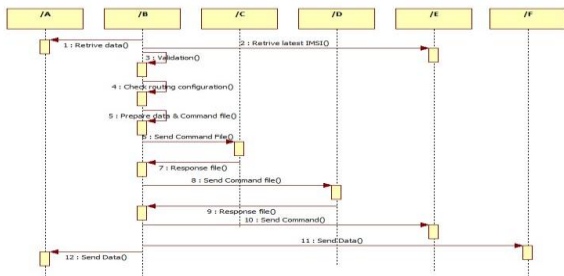


Fig. 7. Provisioning Process-Auto Deletion in Sequence Diagram

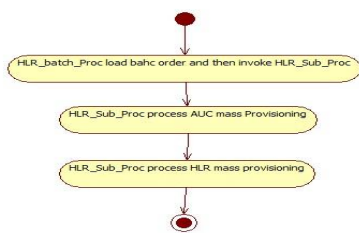


Fig. 8. HLR Batch Process in Provisioning in Global in Activity Diagram

C. Step 3 – Execution

Based on the requirements of the user story, it determines that the technology to be used is web service application as the improvement of the business process in SIM card provisioning.

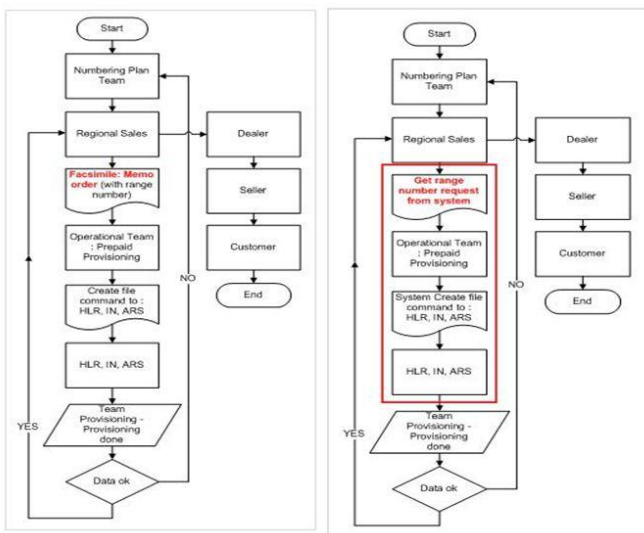


Fig. 9. Provisioning Process in SIM Card Activation - Flow before Automation & Flow with Automation process

And in this research author uses Bizagi simulation as the software to simulate the provisioning process. The result of the simulation can be seen in the figure below.

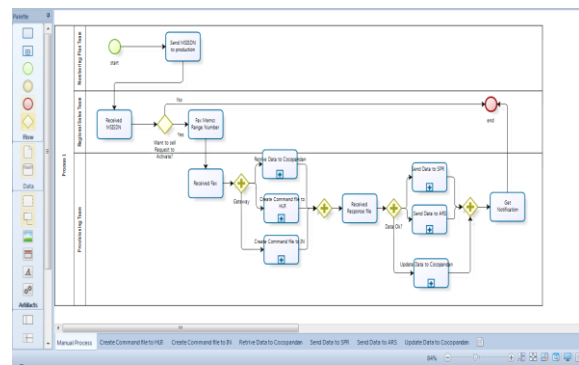


Fig. 10. Process using Bizagi simulation

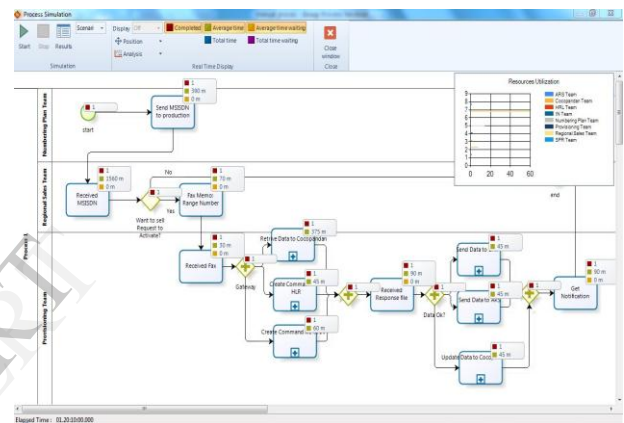


Fig. 11. Process using Bizagi simulation (2) – Result

D. Step 4 - Monitoring & Optimization

Provisioning process of SIM card activation in manual; the flow was still use facsimile to request for activation of SIM Card before it sell to the dealer and the amount of data is not so much (around hundred thousand). Usually the Regional Sales send facsimile of Nota Dinas to Mass Provisioning team (see Figure 3 and Figure 9, for the process flow).

TABLE I. DATA TRANSACTION SUMMARY (MANUAL PROCESS) IN A YEAR

Period	Request		Period	Number		Total Transaction
	Activation	Deletion		Activation	Deletion	
Jan-09	4,703	0	Jan-09	134,159	0	134,159
Feb-09	4,753	732	Feb-09	148,555	127,245	275,800
Mar-09	4,046	194	Mar-09	111,938	34,290	146,228
Apr-09	3,713	5,844	Apr-09	121,682	1,151,260	1,272,942
May-09	4,117	1,494	May-09	155,918	297,400	453,318
Jun-09	2,871	70	Jun-09	111,148	13,140	124,288
Jul-09	2,809	81	Jul-09	113,398	17,600	130,998
Aug-09	2,317	148	Aug-09	102,009	29,600	131,609
Sep-09	2,031	166	Sep-09	66,494	32,820	99,314
Oct-09	2,156	0	Oct-09	83,669	0	83,669
Nov-09	494	0	Nov-09	16,393	0	16,393
Dec-09	890	0	Dec-09	38,923	0	38,923
<b>Total</b>	<b>34,900</b>	<b>8,729</b>		<b>1,204,286</b>	<b>1,703,355</b>	<b>2,907,641</b>

After the Provisioning process become automation (it also called Mass provisioning), the process now is using web services application which also an integrated system. The Mass Provisioning system is now integrate with other system such as HLR, OCS and others, and the number of the data transaction summary of SIM card activation now is increasing.

TABLE II. DATA TRANSACTION SUMMARY (AUTOMATION PROCESS) IN A YEAR

Period	Request		Period	Number		Total Transaction
	Activation	Deletion		Activation	Deletion	
Jan-13	1,759	37	Jan-13	10,581,770	8,709,577	19,291,347
Feb-13	1,781	28	Feb-13	12,260,795	9,853,482	22,114,277
Mar-13	1,998	32	Mar-13	14,152,679	12,597,978	26,750,657
Apr-13	3,048	30	Apr-13	17,651,228	10,254,398	27,905,626
May-13	2,592	33	May-13	16,569,912	11,065,407	27,635,319
Jun-13	2,742	30	Jun-13	13,413,485	8,548,996	21,962,481
Jul-13	3,719	31	Jul-13	17,649,617	8,145,134	25,794,751
Aug-13	2,482	32	Aug-13	11,942,470	9,172,122	21,114,592
Sep-13	3,611	30	Sep-13	17,439,252	7,322,551	24,761,803
Oct-13	3,081	32	Oct-13	15,001,938	8,610,815	23,612,753
Nov-13	3,427	31	Nov-13	16,916,825	8,116,669	25,033,494
Dec-13	3,609	32	Dec-13	16,917,374	6,798,461	23,715,835
<b>Total</b>	<b>33,849</b>	<b>378</b>		<b>180,497,345</b>	<b>109,195,590</b>	<b>289,692,935</b>

E. Step 5 - Analyze

1) Concepts of Provisioning Business Process with BSC

Aligning business process in Provisioning with BSC, by choosing Strategic Measures for the Four Perspective quadrants of BSC explain in a table matrix below;

TABLE III. MATRIX BSC, STRATEGIES & MEASUREMENT

BSC	Strategies	Measurement
Financial Perspective (F)	F1. Revenue growth and mix Cost reduction/ Productivity Improvement	FM1. Sales growth rate by segment FM2. Cost Reduction Rate FM3. Unit Cost (per unit, per transaction)
Customer Perspective (C)	C1. Increase orders from profitable customer	CM1. Market Share - Customer Profitability
Business Process Perspective (P)	P1. Improve quality of process P2. Improve delivery	PM1. Velocity /Cycle times PM4. Number of on time deliveries
Learning and Growth perspective (L)	L1. Improve employee productivity L2. Increase new product development	LM1. Number and cost saving from process improvements LM3. % sales from new products

2) Data Analysis

TABLE IV. AVERAGE TRANSACTION AND REQUEST IN MANUAL PROCESS

	Total Transaction	Total Request
Average per month	242,303.42	3,635.75
Average per minute in a month	504.80	7.57

\* Based on data operator

TABLE V. AVERAGE TRANSACTION AND REQUEST IN AUTOMATION PROCESS

	Total Transaction	Total Request
Average in a month	24,141,077.92	2,852.25
Average per minute in a month	50,293.91	5.94

\* Based on data operator

TABLE VI. COMPARISON THE NUMBER OF CUSTOMER

	Manual	Automation
Cust Postpaid (in Thousand)	2,035.00	2,149.00
Cust Prepaid (in Thousand)	97,609.00	122,997.00
Total Cust (in Thousand)	81,644.00	125,146.00
Market Share	49%	45%

\* Based on data annual report operator

TABLE VII. QUALITIES THAT IS COMPARABLE IN A TABLE

Activation Process	Manual	Automation
Total Request in a year	43,629.00	2,852.25
Average Total Request in a month	3,635.75	2,852.25
Average Total Request per minute in a month	7.57	5.94
Total Success Transaction success in year	2,907,641.00	289,692,935.00
Average Total Success Number in a month	242,303.42	24,141,077.92
Average number of SIM to complete in 1 minute	504.80	50,293.91
Number of employee in business unit (people)	14	4
Average working time (hours)	11	8

TABLE VIII. ANALYSIS EFFICIENCY AND EFFECTIVENESS IN PROVISIONING PROCESS IN SIMULATION

	Manual	Automation	Effectivity %	Unit Price	Manual	Automation	Efficiency %
Learning and Growth perspective							
Employee/People	14	4 ↓	10	71.43	3,000,000	42,000,000	12,000,000
Working Time 8 hours	11	8 ↓	3	27.27	100,000	12,600,000	25,200,000

TABLE IX. ANALYSIS IMPROVEMENT IN PROVISIONING PROCESS IN SIMULATION

	Manual	Automation	Effectivity	%
Velocity /Cycle times, working time is 8 hours equal to 480 minutes (average)				
Average number success in request	242,303.41	24,141,077.91 ↑	23,898,774.50	9,863.16
Average number of SIM to complete process in 1 minute	6,057.58	603,526.94 ↑	597,469.36	9,863.17
Total Transaction	2,907,641.00	289,692,935.00 ↑	286,785,294.00	9,863.16

TABLE X. RESULT AND ANALYSIS

Measurement	Result	
	Manual process	Automation Process
Revenue growth and mix Cost reduction/ Productivity Improvement		
- Sales growth rate by segment	post paid A 2,035 Prepaid B 57,993 Prepaid C 21,616	post paid A 2,149 Prepaid B + C 122,997
Increase orders from profitable customer	Market Share : improve from 48% in 2008 to 49% in 2009 The number of customer 81.64 million	Market Share still 49% The number of customer increase to 125.146 million
Improve quality of process		
- Velocity /Cycle times If working time is 8 hours equal to 480 minutes	- Average request = 3635.75 - Average number success in request = 242,303.41 - Average number of SIM to complete process in 1 minutes = 6,057.58	- Average request = 2852.25 - Average number success in request = 24,141,077.91 - Average number of SIM to complete process in 1 minutes = 603,526.94 (100 times)
- Order field	- Figure 19, Total transaction in manual process = 2,907,641	- Figure 22, Total transaction per 2013 = 289,692,935
Improve employee productivity		
- Number of employee	14 employee (in department)	4 employee
- Working time	With overtime-work	No overtime
Increase product development	Increase sales 9 %	Increase sales in significant 17%

### 3) Result

- The implementation of process automation in the line process of SIM Card activation can improve the effectiveness of 71.43% compared to the manual process.
- The effectiveness implementation can be seen from the reduction in the number of employees that can reduce the financial cost of the department, in terms of the employee cost and the employee does not have to work overtime to meet the demand of SIM card activation.
- Quality improvement can be seen from the result of increasing number of data from successful activation per day in automation system compared to the manual system (Table I and Table II). In a month average transaction, it increases 99 times in number or 9963.16 %, from average 242303.42 in manual, to 24141077.92 in automation.

## VI. CONCLUSIONS AND RECOMMENDATION

The aim of this study is to analyze how the BSC can be adapted to a telecommunication company as a measurement in improvement process. It proof that, this research uses BSC to measure the improvement. But to get the result of measurement, the organization must explicitly state how it is going to accomplish its objectives by identifying the chain of cause-effect relationships which outline the way that strategic objectives are attained as well as how they intend to implement the strategy.

The diagrams, model, tables, matrix and simulation was used as a strategic control tool as a way to transmit strategic objectives through strategic measures and goals to the whole organization, in order to develop a way to check their implementation by means of a comparative evaluation of objectives with results. Also as a modeling approach based on the extension of process chains for modeling that describes web services and the interaction between service providers in application system.

For recommendation with this research is that the management in any organization is expected to support the program analysis in business process improvement, although initially there will be extra cost for consultant and the development of the system in the beginning of the project, but for the future step is expected to have improvement of business process itself, improvement of system usability and the improvement of organization beside it also can reduce business unit cost and improvement in efficiency and effectiveness for the company.

Further research could investigate whether this implementation produced the desired effects in the long run despite the identified defect or weakness in the system.

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