

ANALYSIS OF EXTERNAL BUSINESS ENVIRONMENT'S IMPACT TO TELECOMMUNICATION COMPANY PERFORMANCE SYSTEM USING ANALYTIC NETWORK PROCESS (ANP)

(A STUDY CASECASE STUDY OF CORPORATE PERFORMANCE ON A TELECOMMUNICATION'S PROVIDER IN WEST JAVA INDONESIA)

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Abstract

This paper discussed the application of Analytic Network Process (ANP) to enrich design performance measurement system with Balanced Score Card (BSC). Balanced Score Card, the most popular performance measurement system, was found by Prof Robert S Kaplan and David Norton and. Uusesing four perspectives: Financial Perspectives, Customer Perspectives, Internal Business Process, Learn & Growth Perspectives. BSC defined linkage among four perspectives. However, some cases required correlation or linkage among sub-measurements within perspectives itself. During daily operation, some elements of other shareholders such as: community, government may affect internal business process which eventually impact to financial performance as company goal. In the telecommunication industry, some KPI within internal business process may affected by external factor such as community, government, security. For instance, some KPI related with cell availability, radio performances are also influenced by fiber optic (backbone) cut, community issue e.g.: blocking access, stolen or vandalism, flood. ANP provide method to evaluate inner dependency and non-hierarchical structure of element. Using ANP may enrich BSC to consider inner dependency within own perspectives and consider external factor as well.

Keywords: Balanced Score Card (BSC), Analytic Network Process (ANP), Telecommunication Industry

1. Introduction

Balanced Score Card (BSC) is most popular performance measurement system in the world. It was developed by Robert S Kaplan and David P Norton from Harvard Business School (Kaplan & Norton, 1996). BSC provides four perspectives: Financial Perspectives, Customer Perspectives, Internal Business Process and Learn & Growth Perspectives as a frame work to translate vision mission of an organization into strategy and provide performance measurement in order to get high growth and achieving its goals.

BSC translate performance measurement system framework into three steps: defining objective strategy, defining KPI indicators and strategy maps. Strategy objectives define step wise of organization to run its dairy business to achieve its goals. Key performance Indicators (KPI) is actual and measurable performance representing objective strategy which will be achieved. The Strategy maps show causal relation of objective strategy.

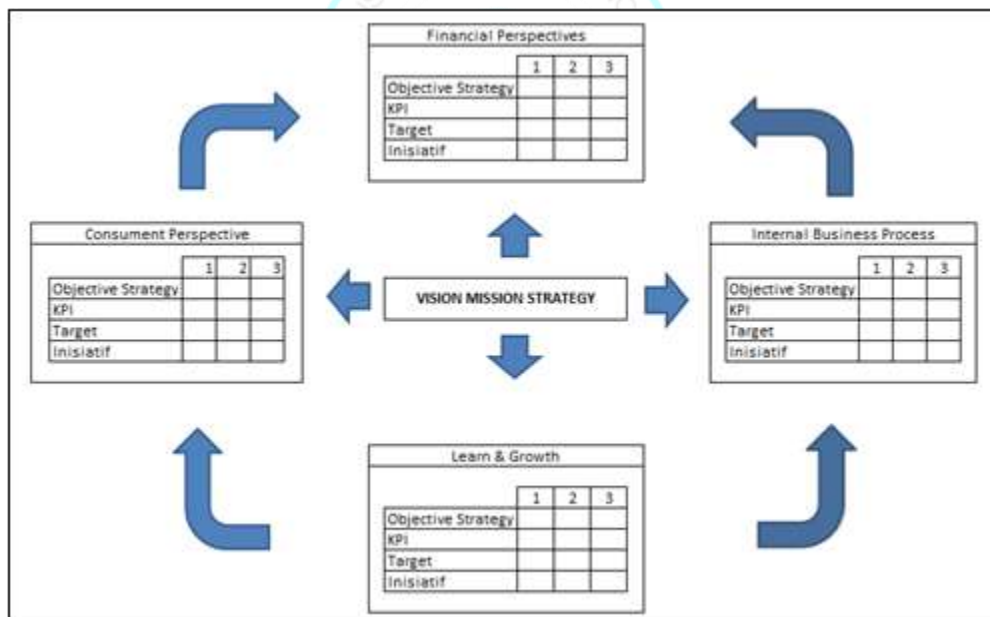


Figure 1: Balance Scored Card translating strategy into frame work (Kaplan & Norton, 1996)

In term of translating the relation, in which Balance Score Card may only provides strategy maps which is shows the linkage among its perspectives in hierarchical manner. In some cases, there is dependence among factors/measurement within same perspectives itself. But

However, in other cases, during daily operation of telecommunication industry in Indonesia, some external factor which was not considered in Balance Score Card may affect to internal business process such as community issue, Fiber Optic (backbone) cut, stolen/vandalism issue, community issue: blocking access and eventually will affect the business result performances (financial and non financial output). The Analytical Network Process (ANP) provides method to consider inner dependence and outer dependence and also deals with non-linear structure without concern of what comes first and what comes next in a hierarchy.

2. The Case (Using Balance Score Card as Performance Measurement System on Telecom Provider X)

PT X is one of the telecom providers in Indonesia. It has a vision to be top telecom provider in Indonesia. Their Company missions are: (1) Be company which provides affordable and good quality service to customer; (2) Being most efficient telecom company in the country; (3) Have growth in profitability on all units. Then translate it to strategy: (1) Cost efficiency; (2) Increase profitability in each unit business; (3) Maintain good quality service; (4) Affordable price to customer; (5) Increase subscriber; (6) Increase customer satisfaction.

In terms of providing affordable and good quality of service to customer, meanwhile increase profitability in each unit business, High management decide to cutting cost and keep the company as efficient as possible. All unit business particularly Operation Unit shall demonstrating high reliability with low cost of network.

This strategy also means keep efficient on CAPEX and OPEX to maintain profitability in each unit by increasing utilization on existing network as best as can. Company resources are kept efficient and used it on right place.

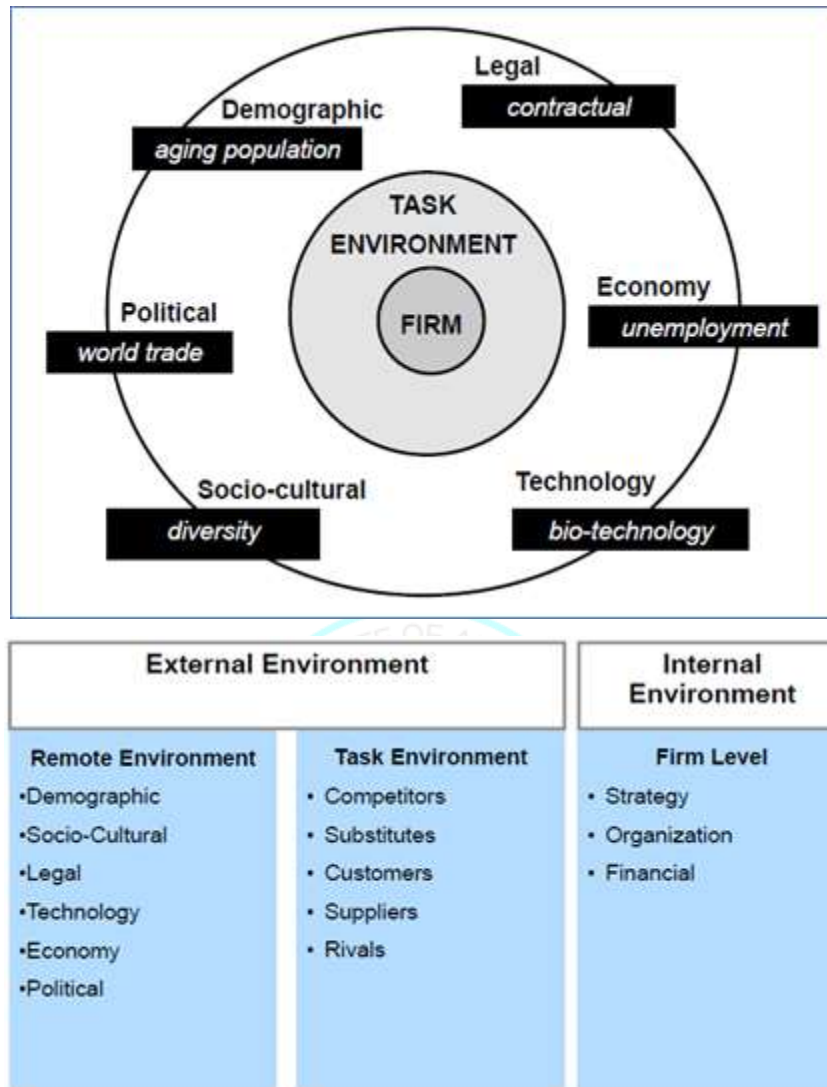


Figure 2 Business Environment Analysis

In a developing country, external environment factors are more dynamic. According to Focus Group Discussion (FGD), some external factors have significant impact on daily operation business e.g.: Socio-cultural factor such as: communal cultural, racial NGO (local organization) may blocking business by sabotage and blocking operation engineer on field; Political factor such as: low of law enforcement lead to more vandalism while lack in infrastructure may impact to flood and blocking access during rainy season, less coordination inter-department of Dinas Pekerjaan Umum (Civil Construction Board) and Departement Komunikasi dan Informatika

(Board of ICT) may lead to miss data of ICT infrastructure on the field which may lead to backbone (FO) cut ; Legal factors also could lead to community issue.

<i>OBJECTIVE STREATEGY</i>		<i>KEY PERFORMANCE INDICATOR</i>
FINANCIAL PERSPECTIVES		
F1	Profitability & Cost Efficiency	EBITDA
CONSUMENT PERSPECTIVES		
C1	Increase Subscriber	Market Share Data
		Customer Acquisition
C2	Profitability	Reload Activity
C3	Customer Satisfaction	Retailer Satisfaction
INTERNAL BUSINESS PROCESS		
I1	Maintain Good Quality of Service & Profitability	Cell Availability
		Radio Performance
		Core Performance
		Capacity
LEARN & GROWTH		
L1	Maintain Good Quality of Service	Technical Skill
		Team Work
		Motivation
L2	Cost Efficiency	Information System Capability

Figure 3 Objective Strategy to Key Performance Indicator Translation

The Focus Group Discussion suggested to considering external business factors to evaluate internal business process. In fact, this paper also investigating weighting factor of external factor in term of their impact to Internal Business process and eventually to Financial Perspectives. Since the Balance Score Card did not provide method to analysis inner dependence and non-hierarchical structure therefore we are use Analytic Network Process (ANP). Commonly, the Telecom Company did not take external business environment into account during performance measurement evaluation assuming that there is no such correlation between external factors to

Internal Business Process BSC. In fact, it does and it is quite significant impact into financial performances to PT X.

According to that condition we would like to do the research and present the result through this paper, in which comprise of the linkage of the external and internal perspective and how big is the relationships among them.

3. The Method: The Analytic Network Process (ANP)

Analytic Network Process (ANP) was further development of Analytical Hierarchy Process (AHP). The Analytic Network Process offer solution to deal with inner dependence and outer dependence which normally cannot solve by Analytic Hierarchy Process.

Analytic Network Process provides comprehensive multi-criteria decision making tools which allows for the consideration of interdependencies within and among levels of attributes built on the widely used AHP also. kKnown as “systems-with-feedback”.

According to Saaty (1980), The Basic idea of Analytic Network Process compromises of:

1. The Analytic Network Process is built on Analytical Hierarchy Process.
2. The Analytic Network Process goes beyond and further development of Analytical Hierarchy Process by allowing for dependence.
3. The Analytic Network Process deals with dependence within set of element (inner dependence) and among different set of elements (outer dependence).
4. The Analytic Network Process allows any decision problems without concern for hierarchy of what coming first and what next.
5. The Analytic Network Process is non-linear structure that deals with sources, cycles and sinks. A hierarchy is linier with a goal in the top level and the alternatives in the bottom levels.
6. The Analytic Network Process priorities not just elements but also groups of clusters of elements as were often necessary in the real world.

7. The Analytic Network Process utilizes control element (control hierarchy) to deal with different criteria. It could offer analysis over BOCR (benefits, opportunities, cost, and risk). Thus it is similar with how is human brain does in combining different sense data into account to inhere a decision.

The overall goal of using Analytic Network Process on this paper is to assist the researcher on with calculating relation between external business environment to internal business process which eventually affecting to financial perspectives as the main company goals. The steps including:

1. Develop network hierarchy showing the relationship (inner and outer dependence) among elements/perspectives of performance measurement system.
2. Compare pairs of factors that dependence each other.
3. Calculate the relative-importance weight vector of factors according to the Analytical Hierarchy Process.
4. Develop super-matrices composed from the relative-importance weight obtained from pair wise comparisons and normalize the super-matrices such that every column sum is equal to one.
5. Built the super-matrix from the normalized super-matrix in order to obtain stable set of weight.

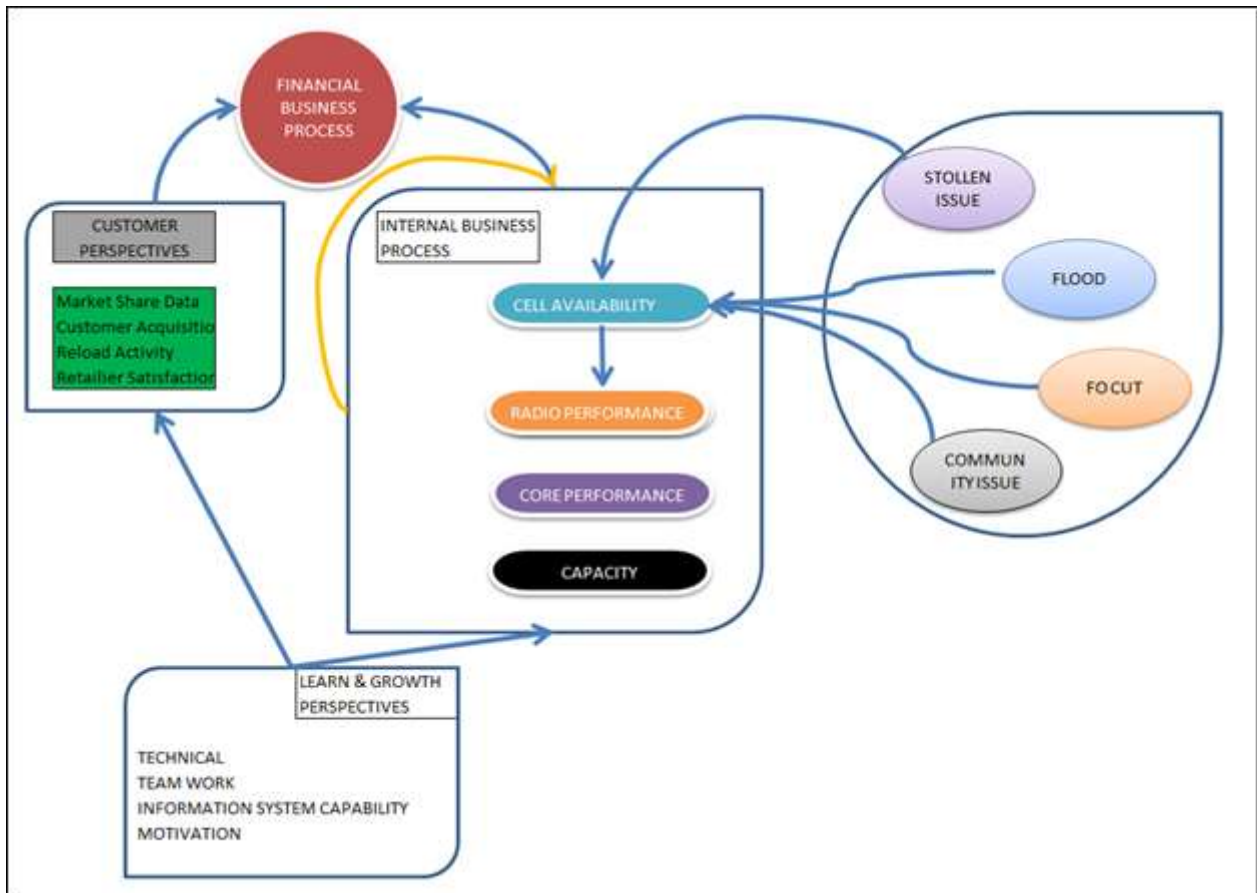


Figure 4 Hiernet of performance measurement system, BSC by considering external business environment as dependence factor to internal business process.

Figure 4 shows Hhiernet of external business environment, as the case study on one of Telecom Company in West Java, affected to Internal Business Process as one of element Balanced Score Card performance measurement system. Each level contains a number of elements and arrows indicate the direction of hierarchy between the levels. Another form of interdependency is the relationship of different elements within a level shown by looped arc that appears within Internal Business Process.

Table 1: Super-Matrix Build Up and Comparison Matrix

PANEL A: SUPER MATRIX BUILD UP WITH ALL SUB-MATRICES

	Financial Perspectives	Customer Perspectives	Internal Business Process	Learning & Growth	Weight Factor
Financial Perspectives	1.00	8.00	6.00	0.00	0.70
Customer Perspectives	0.13	1.00	6.00	7.00	0.21
Internal Business Process	0.17	0.17	1.00	6.00	0.08
Learning & Growth	0.00	0.14	0.17	1.00	0.01

PANEL B: COMPARISON MATRIX INTERNAL BUSINESS PROCESS WITH RESPECT TO FINANCIAL RESULT

	Cell Availability	Radio Performance	Core Performance	Capacity	Weight Factor
Cell Availability	1.00	7.00	4.00	6.00	0.61
Radio Performance	0.14	1.00	2.00	4.00	0.17
Core Performance	0.25	0.50	1.00	7.00	0.16
Capacity	0.17	0.25	0.14	1.00	0.05

PANEL C: COMPARISON MATRIX CUSTOMER PERSPECTIVE WITH RESPECT TO FINANCIAL RESULT

	Market Share Data	Customer Acquisition	Reload Activity	Retailer Satisfaction	Weight Factor
Market Share Data	1.00	5.00	5.00	4.00	0.41
Customer Acquisition	0.20	1.00	7.00	6.00	0.42
Reload Activity	0.20	0.14	1.00	4.00	0.13
Retailer Satisfaction	0.25	0.17	0.25	1.00	0.04

PANEL D: COMPARISON MATRIX FOR LEARN & GROWTH WITH RESPECT TO INTERNAL BUSINESS PROCESS AND CUSTOMER PERSPECTIVE

	Technical Skill	Team Work	Motivation	Information System Capability	Weight Factor
Technical Skill	1.00	4.00	6.00	7.00	0.54
Team Work	0.25	1.00	6.00	8.00	0.33
Motivation	0.17	0.17	1.00	5.00	0.09
Information System Capability	0.14	0.13	0.20	1.00	0.04



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Table 2 Initial Super Matrix

		EBITDA	Cell Availability	Radio Performance	Core Performance	Capacity	Market Share Data	Customer Acquisition	Road Activity	Retailer Satisfaction	Technical Skill	Team Work	Motivation	Information System Capability	FO Cut	Stall on Issue	Community Issue	Flood Issue
FINANCIAL	EBITDA	1.00																
INTERNAL BUSINESS PROCESS	Cell Availability	0.61	1.00	0.60											0.50	0.50	0.60	0.50
	Radio Performance	0.17		1.00											0.50	0.40	0.40	0.40
	Core Performance	0.16		0.40	1.00										0.00	0.00	0.00	0.00
	Capacity	0.05		0.30		1.00									0.20	0.20	0.00	0.10
CUSTOMER PERCEPTIONS	Market Share Data	0.41					1.00											
	Customer Acquisition	0.42					0.40	1.00										
	Road Activity	0.13					0.20		1.00									
	Retailer Satisfaction	0.04					0.40	0.60		1.00								
LEARNING/HR. GROWTH	Technical Skill		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.00							
	Team Work		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33		1.00						
	Motivation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1.00					
	Information System Capability		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04				1.00				
EXTERNAL	FO Cut		0.24	0.15											1.00			
	Stall on Issue		0.30	0.12												1.00		
	Community Issue		0.50	0.33													1.00	
	Flood Issue		0.00	0.01														1.00

Table 3 Normalized Super-Matrix

		EBITDA	Cell Availability	Radio Performance	Core Performance	Capacity	Market Share Data	Customer Acquisition	Road Activity	Retailer Satisfaction	Technical Skill	Team Work	Motivation	Information System Capability	FO Cut	Stallion Issue	Community Issue	Flood Issue	
FINANCIAL PERCEPTIVES	EBITDA	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
INTERNAL BUSINESS PERFORMERS	Cell Availability	0.20	1	0.15	0.20	0.17	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.15	0.15	0.10	0.15	
	Radio Performance	0.20	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.15	0.10	0.10	0.10	
	Core Performance	0.20	0.20	0.10	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
	Capacity	0.20	0.20	0.20	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.15	0.20	0.20	
CUSTOMER PERCEPTIVES	Market Share Data	0.14	0.20	0.20	0.20	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
	Customer Acquisition	0.14	0.20	0.20	0.20	0.20	0.15	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
	Road Activity	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
LEARNING/ORGANIZATIONAL	Retailer Satisfaction	0.20	0.20	0.20	0.20	0.20	0.15	0.15	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
	Technical Skill	0.20	0.15	0.14	0.17	0.17	0.15	0.11	0.17	0.17	1	0.20	0.20	0.20	0.20	0.20	0.20	0.20	
	Team Work	0.20	0.11	0.10	0.17	0.14	0.11	0.15	0.17	0.17	0.20	1	0.20	0.20	0.20	0.20	0.20	0.20	
	Motivation	0.20	0.25	0.22	0.25	0.24	0.25	0.24	0.25	0.25	0.20	0.20	1	0.20	0.20	0.20	0.20	0.20	
EXTERNAL	Information System Capability	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1	0.20	0.20	0.20	0.20	
	FO Cut	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1	0.20	0.20	0.20	
	Stallion Issue	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1	0.20	0.20	
	Community Issue	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1	0.20	
EXTERNAL	Flood Issue	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1

Panel B, C, D in table 1 show matrix pair wise comparisons in each Balanced Score Card performance measurement system. Analytic Network Process conducts pair wise comparison in each level in respect to their relative importance towards their control criteria. For instance, Panel B shows comparison matrix of Internal Business Process in respect toward Financial Result.

The weighted priorities are shown on the last column of each panel. For example last column of Panel B, C, D. These weighted can be obtained through matrix multiplication and row-sum averaging calculation. While Panel A shows big picture of relative-importance and relationship between Balance Score Card performance measurement system. Together they will form up Super-Matrix as show on table 2.

Zero or blank data within the matrix shows that there is no correlation among the element within or among cluster/perspectives. The Analytic Network Process only deals with interdependency or relationship among elements.

The Super-Matrix allows for a resolution of the effects of interdependencies among the element of the system. The Super-Matrix is a partitioned matrix where each sub-matrix was obtained from a set of relationships between and within levels

The Table 2 shows the initial Super-Matrix. The relative-importance scaled was generated in pair wise comparison in table 1, Panel B, can be traced in the first column of Super-Matrix (EBITDA – Internal Business Process).

Final relative-importance weights for the external factors are obtained through convergence of the super-matrix. In order to get convergence, it required the matrix to be “column-stochastic”. For example, each of the column summation of the Super-Matrix must be one. To complete this task, each of the columns may either be normalized by dividing each weight in the column by the sum of that column, as shown here. Another method would be assign relative importance weight to level influencing the same controlling level.

4. The Result

Among external business environment, Community issue giving highest impact to internal business process about 7%, stolen issue giving about 3% impact while FO cut giving about 3% impact to Internal Business Process in respect to EBITDA.

Table 4 Weight External Environment Factor Impact to Internal Business Process in respect toward Financial Persepctives

EBITDA	Cell Availability	Radio Performance	Weight Factor Combination	Normalization of weight factor combination
FO Cut	0.14	0.29	0.02	0.19
Stollen Issue	0.20	0.19	0.03	0.22
Community Issue	0.64	0.51	0.07	0.58
Flood Issue	0.01	0.01	0.00	0.01



In total, the external business environment factor giving about 10% impact to Internal Business Process in BSC on Telecom Company, study case in West Java. This is means that the company could have 10% space to adjust up their profitability by solving this external issues and it is also meant that the external business environment in developing country (Indonesia) is giving 10% additional cost to telecommunication Industry.



References

- i. Saaty, T. L., 1994. How To Make a Decision: The Analytic Hierarchy Process. *Interfaces*, 24(6), pp. 19-43.
- ii. Saaty, T. L., 1996. *Decision Making with Dependence and Feedback: The Analytic Network Process*. Pittsburg, PA: RWS Publication.
- iii. Sandy, I. A., Alfian, Giovanni A. P. M., 2013. *Penerapan Metode Analytic Network Process (ANP) untuk pemilihan supplier bahan baku pada CV TX*. Seminar Nasional INEACO, ISSN: 2337-4349.
- iv. Szucs, G. & Sallai, G., 2010. *Joining Analytic Network Process and Bayesian Network model for Fault Spreading Problem*. Budapest University of Technology and Economics Hungary, <http://cdn.intechopen.com/pdfs-wm/11950.pdf> (Accessed December 10, 2015)

