

# System Dynamic Modelling to Evaluate e-Business System

Moses L. Singgih, Handito A. Saroso and Erwin Widodo

Department of Industrial Engineering  
Institut Teknologi Sepuluh Nopember Surabaya  
e-mail: moses@ie.its.ac.id

## ABSTRACT

*Internet and information technology has great impact in recent years. It can assist business system to run effectively and efficiently. A business system which applies internet as part of its business system is recognized as e-Business System. PT. Semen Gresik ( Persero ) Tbk as one of the multinational scale company has applied e-Business system as their supporting system. e-Business system applied in this company is e-Commerce. Until now, e-Business model applied in the firm has a role as of supporting activity which is not directly influence business value chain. This research will analyse the e-Business Model and measure its performance using e-Commerce Scorecard. The model will also develop in System Dynamic model to gather the best strategy in increasing its performance. System Dynamic approach is used in this research because of its flexibility and effectiveness in capturing variables within observed system*

**Keywords :** *e-Business System, e-Business Model, System Dynamic, e-Commerce Scorecard.*

## 1. INTRODUCTION

### 1.1 Case Study

The competition among firms nowadays become so tight. To become competitive, they need IT support. One of superiority that can be applied in order to cope these competition is applied business system using internet or well known as e-Business system. By means of e-Business, firm able to reduce its operation cost up to 20%. It also provides more profit about 25 % of its common. In addition, firm also able to gain other intangible benefits such as : easy information acces, increase in image brand, etc.

PT. Semen Gresik ( Persero ) Tbk as one of the international scale company has been applied e-Business system as their supporting system, e-Business system applied in this company is e-Commerce. With this system implementation, the company have a lot of benefits such as Commerce cost reduction. Moreover it can increase employee satisfaction becuse it drive them to work more effective and efficient so they feel contented to their job. However, implementation of this system also have some barriers. To be appropriately implemented, these barriers must be minimized. Beside that, an appropriate e-Business strategy is also crucial factor in order to e-Business system applied could run as planned.

Until now, e-Commerce model applied in the firm has a role as of supporting activity which is not directly influence business value chain. Online commerce model that adopted by PT. Semen Gresik only exist in 60-70% of East Java distributor whereas their distributor exist not only in East Java but also in whole Java, Sumatera and Kalimantan. While online payment can be accessed by four distributor merely. Indeed, e-Business can be more than supporting activity in the firm which directed influence business value chain. Beside that, performance of e-Commerce system of PT. Semen Gresik have never been measured. They always assumpt if their e-Commerce system is success based on subjective appraisal.

In this research, e-Commerce objectives of PT.Semen Gresik are defined. Then, Business Model for e-Commerce in the firm is re-developed in form of framework model. Next step, performance of e-Commerce Business Model is measured using e-Commerce Scorecard. The worst KPI are improved using system dynamic modelling. Using this approach all variables that influence system modelling of e-Business are identified. Based on these variables, it can be seen any alteration that might occur while new business model proposed. Studying this phenomenom also give an understanding about what appropriate strategy can derived

in order to increase the performance of the e-Business model

**1.2 Research Question**

The problem will be done in this research is “**How to analyse e-Business model, measure its performance, and determine the best strategy in increasing its performance using system dynamic model**”

**1.3 Research Purpose**

The purpose of the research are develop e-Business Model and anlyse its weakness, measuring the performance of the e-Business model, determine the best strategy in increasing its performance using system dynamic model

**1.4 Research Boundaries**

Boundaries applied in this research are the research only can be done up to policies and decision stages, within this research, e-Commerce is defined as subset of electronic business. While assumption applied in this research are there is no change in the e-Commerce system structure during the research period.

**2 E-BUSINESS MODEL**

Business model is a summary of how a company will generate revenue identifying its product offering, value added services, revenue sources and target cutomer. The business model gives sense to the various business processes by describing why

certain processes are designed the way they are. In the electronic, business model has become more complex. New market environment, new technological environment and new relationship management has to be included in the business model then the business model become an e-Business model that defined as a conceptualization and formalization into elements, vocabulary, and semantics of the essential subjects.

e-Business model that used in this research are compiled from four pillars named Product Innovation, Customer Relationship, Infrastructure Management, and Financial.

Product Innovation cover all aspect of what firm offer its customer. It is not comprise only its products and services but also the manner of how it differ from its competitors. Product innovation element consist of three sub element that are value proposition of the firm offers to specific target customer segment and capabilities of the firm to deliver the value. It is based on Infrastructure Management which provide resources for it.

PT. Semen Gresik e-Commerce system enabling customer to gather much information about their order, make online order, and payment also using internet. With function named account management online, the customer is able to gain information about aging, invoice, and balance guarantee. Also with this function, customers can handle their account online and receive their statement electronically. Table 1 below are summarize of value proposition in PT.Semen Gresik.

**Table 1. Value Propostion of PT.Semen Gresik**

	Online Account Management	Order & Payment Online	Order Tracking
Description	Customer can handle their account online and receive their statements electronically. At every moment they have an up to date overview of their account history	Customer can make an order and pay their order electronically. It gives customer new convenient way in buying and paying order, less time, less cost	Customer can monitor about their order status. It give customer more trust in order fulfillment.
Reason	Customer can conveniently manage their account from their PC	Customer can save time and cost. But the most important is customer can increase the turnover of their money	Increasing customer trust and loyalty by involving them in monitoring business process related with their needs.
Life Cycle	Value Creation	Value Consumption	Value Creation
Value Level	Innovation	Me-Too	Excellence
Price Level	Free	Free	Free

Figure below are summary of the business model PT.Semen Gresik (Persero), Tbk

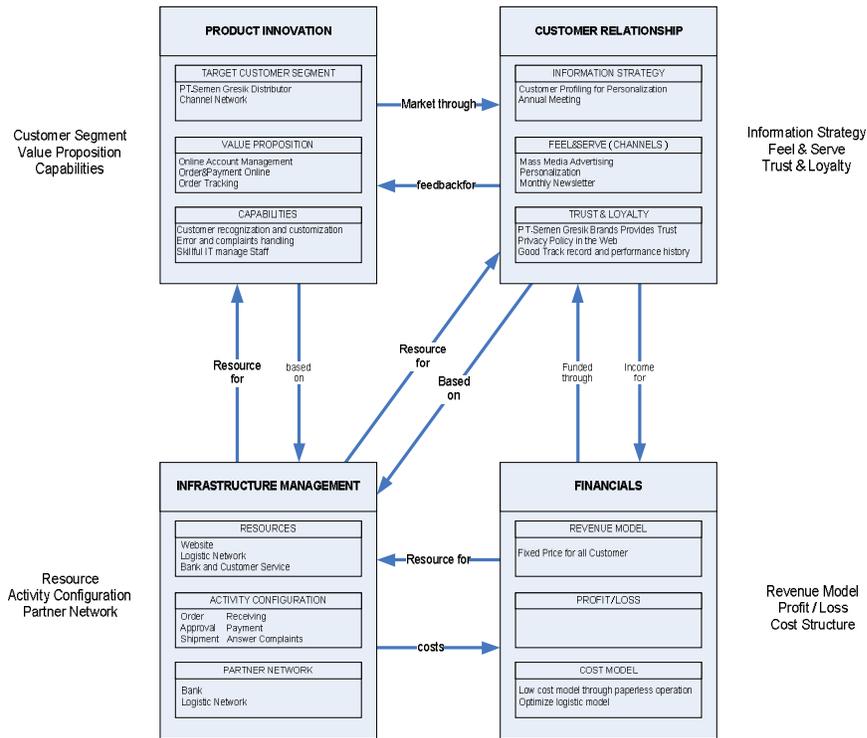


Figure 1. e-Business Model PT.Semen Gresik

Information output of the business model then being used to indicate relevant measures in the e-Commerce Scorecard. According to the e-business model mentioned above there are any measure that must be done to gather information which are need to be improved : Information Strategy, Partner Network, Resources and Assets, Capabilities and Trust&Loyalty. All of this measure together with additional measure must be inputted in the objectives or key performance indicator in the scorecard. The translation of each measure to objectives explained in the next section.

### 3 E-BUSINESS MEASUREMENT

#### 3.1 Strategic Objectives Derivation

Before the performance measurement system developed, first strategic objectives of the e-Commerce system must be defined. This strategic objectives have been derived from the corporate vision and mission and it is also represent measurement in the business model. This strategic objectives also support the corporate strategic objectives and have linked with it. As result of the business model there are element

must be involved in the scorecard that are : **Information Strategy, Resource and Assets, Trust and Loyalty, Partner Network, and Capabilities.** The determination of the strategic objective is done by interview with related division and staff that understand the system it self. There are 3 division are interviewed named information system, sales, and corporate development.

#### 3.2 Strategic Mapping

From the objectives that have been developed, that relationship among objectives formed into causal relationship that communicate strategic objectives of the whole organization.

#### 3.3 Designing Key Performance Indicator (KPI)

After objectives of each perspectives have been identified, then indicators that able to measure reaching index for all objectives is choosen. This indicators will be Key Performance Indicator ( KPI ).

### 3.4 e-Commerce System Measurement

Weighting is done by fill closed questionnaire by Manager. This weighting process consist of 3 levels that are:

- Performance weighting of each perspectives into enterprise performance.
- Weighting each performance (objectives) into each perspectives.
- Weighting of each KPI into objectives

Grade of each indicator is determined by management with considering its strength and organization preparation to achieve target that have been determined.

As PT.Semen Gresik are one of the best corporate in Indonesia, its grade for indicator achievement can be said as high. Grade determination of each colour indicator by thr managment are as follow

- Green : With score 76-100
- Yellow : With score 51-75
- Red : With score 0-50

Scoring system and traffic light analysis for all KPI in the performance hierarchy of PT.Semen Gresik can be viewed in the next section.

**Table 2. Achievement Score**

Performance Criteria	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7	KPI 8	KPI 9	KPI 10	KPI 11	KPI 12	KPI 13	KPI 14	KPI 15	KPI 16	KPI 17	KPI 18			
Score	80	70	80	75	76	98	90	60	45	80	100	75	45	67	95	71	99	100			
Weight	0,015	0,009	0,009	0,013	0,01	0,116	0,116	0,031	0,093	0,042	0,042	0,042	0,099	0,032	0,02	0,026	0,01	0,009			
Value	1,2	0,21	0,24	0,975	0,756757	11,368	10,44	1,86	4,207143	3,36	4,2	3,15	4,455	2,133333	1,9	1,857143	0,99	0,9			
<b>Keterangan</b>																					
KPI 1	a.Availability for e-commerce Security Features									KPI 11	b.Time to Handle Complain										
KPI 2	b.Planning for e-Commerce security features									KPI 12	c.Percentage of Ontime delivery										
KPI 3	c.Perception of e-Commerce use									KPI 13	a.Percentage of online customer										
KPI 4	d.Amount and quality of information available in the site									KPI 14	a.Percentage of Highly satisfied customer using online system										
KPI 5	e.Quality of e-Commerce website									KPI 15	b.Number of incoming complain againts complain handling										
KPI 6	a. Income Growth									KPI 16	c. Assessment of customer needs										
KPI 7	b. Revenue Growth									KPI 17	a.Quality of strategic partnership performed										
KPI 8	a. Customer profitability									KPI 18	b. Integration e-Commerce across business units and function										
KPI 9	b. Revenue Gathered from e-Commerce Activity									KPI 19	c. Number of specific Channel										
KPI 10	a. Lead time order									KPI 20	a.Number of employee who has e-Commerce skills and knowledge										
Performance Criteria	KPI 19	KPI 20	KPI 21	KPI 22	KPI 23	KPI 24	KPI 25	KPI 26	KPI 27	KPI 28	KPI 29	KPI 30	KPI 31	KPI 32	KPI 33	KPI 34	KPI 35	KPI 36	KPI 37	Total	
Score	100	60	65	80	90	75	60	85	50	100	70	40	95	40	40	86	86	85	65	2778	
Weight	0,003	0,016	0,008	0,009	0,01	0,021	0,017	0,009	0,048	0,009	0,007	0,018	0,018	0,016	0,011	0,023	0,018	0,01	0,013	1	
Value	0,3	0,96	0,52	0,24	0,9	1,575	1,02	0,765	2,4	0,9	0,49	0,72	1,71	0,64	0,44	1,971429	1,552941	0,85	0,845	73,00175	
<b>Keterangan</b>																					
KPI 21	b.Quality of employee who has e-Commerce skills and knowledge										KPI 31	b.Percentage budget allocated for e-Commerce program									
KPI 22	c.Percentage of performance measures alligned and linked to e-Commerce activities										KPI 32	c.e-Commerce objectives clearly communicated									
KPI 23	d.Amount and quality of customer data acquired through e-Commerce activities										KPI 33	d. Percent of manager who are "e-Commerce literate"									
KPI 24	e.Time required to fill customer order through e-Commerce										KPI 34	a. Customer satisfaction rate									
KPI 25	a. Site traffic										KPI 35	b. Employee satisfaction rate									
KPI 26	b. Web downtime										KPI 36	c. Product and process quality									
KPI 27	a.Fund available for e-Commerce investment										KPI 37	d. Investment in training									
KPI 28	b. Skills assessment of employee																				
KPI 29	c.Quality assessment of current technology																				
KPI 30	a. Time dedicated to e-Commerce																				

## 4 System Dynamic Model

### 4.1 Variables Identification

Before entering system dynamic modeling, first we must identify variables that will have affect in the e-Commerce system.This variables have its own interdependency to each other and also have causal relationship. The variables used in the system dynamic model must derived from the e-Commerce scorecard that have been developed before. Not all of the variables in the scorecard are modeled in this system. Only variables that great influence to the objectives are involved in the model. The main variables modeled in the system is explained in the next section.

variables identification process is made by having an interview and survey with related authorities in PT.Semen Gresik. The final result to determine important factors is made by brainstorming process in a group. These main variables will be modeled in system dynamic: **Online Distributor, Staff, Investment, Profit, e-Commerce Quality, Amount of Information, Third Parties Logistic Performance, and Customer Satisfaction.**

Within the model only a small part of the elements of real enterprise is shown in detail. Therefore some assumption have to be made for the enterprise. With these assumptions complex circumstances of

reality are simplified. The substantial assumptions can be summarized as follows:

- The skills of staffs will be measured by points
- The actual standard productivity considers employee's time away job
- Each training takes 7 working day and reduces the staff working time
- All worker have to be trained in equal way
- The skill lost and information lost rate is constant
- All worker have nearly the same skills. So an average value can be used
- Skills points for promotion is based on assumption made by stakeholder
- The initial value of each variables are based on actual condition during the research made
- Non linear relationship made with assumption of the stakeholder
- Variable cost used in the model given as percentage of the sales

- The model only emphasize four main sub system compiling e-Commerce system PT.Semen Gresik
- Any further cost and revenue can be ignored for calculating profit
- The model only emphasize staff, revenue and cost model, customer, customer satisfaction

#### 4.2 Model Formulation

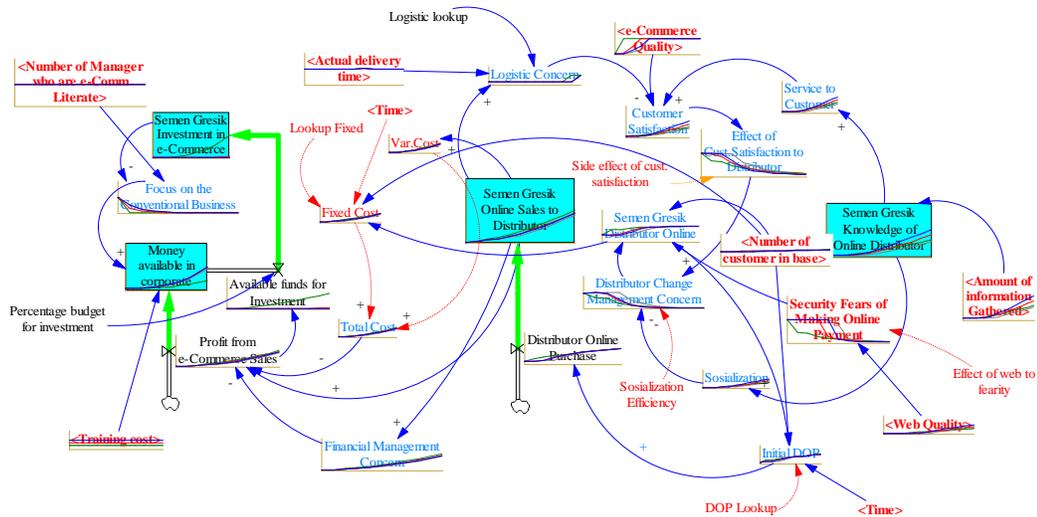
In order to easily understand the whole system, the system is divided into 5 part. The purpose of this division because each submodel in this part is being affected by different variables but still have connection among each other.

#### 4.3 Policy Experiments to Improve Performance of e-Commerce System

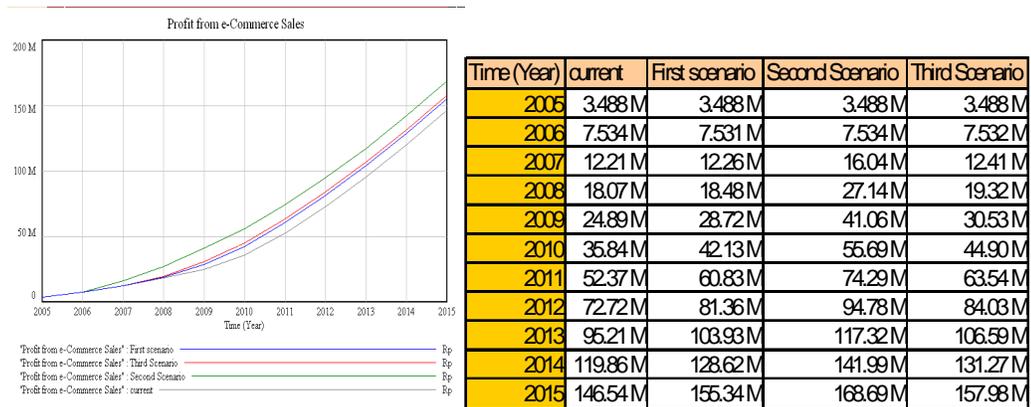
In the following, there are analysis of three simple scenarios or strategies relative to a base run situation, with focus on the dynamic system.

**Table 3. Policy Strategy**

Strategy	Relevant Variables
We want to maximize profit from e-Commerce activities within 10 years	Training effort relative to given staff and staff adjustment ( NOT increased to 10 and staff increase to 120)
We want to maximize profit from e-Commerce activities within 10 years	Increase percentage of investment ( Investment increase to 7% of Profit )
We want to maximize profit from e-Commerce activities within 10 years	Training effort relative to given staff and increase percentage of investment ( Investment increase to 5 %, NOT increased to 8 )



**Figure 2. Simulation Result**



**Figure 3. Profit from e-Commerce Sales graph & Policy Experiment Result**

A quick inspection in the graph and table listed above, indicate that the second scenario has the best value. For maximize the profit through e-Commerce activities the corporate have to increase their investment from 2% to 7% of their profit. But the percentage investment only has great impact until the fifth year. After the fifth year pass, the increase is not as high as before.

## 5 SUMMARY AND CONCLUSION

Combining three tools in any different level can be powerfull in defining, measuring, and improving e-Business system. In the research that have been done, show that each of this tools has a relationship and among each others. The business model tried to depicted to logic of the business model and its element. The business measurement system tried to determine which of the element are need significant improvement. The last, the system dynamic model tried to solve the problem and shows the relationship among each variables.

There are three simple strategies and transformed these into an analytical models based on simple assumption cause and effect relationships between various performance measures. A relatively simple strategy, the model already becomes relatively complicated as does its dynamic behaviour. As have been mentioned, combination between three tools are essential in modeling, measuring, and improving the e-Business model. The base

scenario shows that the company have any problem in gathering sales through their e-Commerce system. Else, they face problem in persuating their customer to use the online system. It is causes slow increase in their net income. According to the scenarios that have been set up, shows there are any significant improvement in the profit, online sales, and number of customer online. These three scenarios will be choosen which one posses greatest value. The best scenario are scenario to with action increasing investment from 2% become 7%.

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