

LOGISTICS COST MODELING
IN STRATEGIC BENCHMARKING PROJECT

CASE: CEL Consulting & Cement Group A

LAHTI UNIVERSITY OF APPLIED
SCIENCES
Degree programme in International Business
Thesis
Autumn 2010
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Lahti University of Applied Sciences
Degree programme in

NGUYEN, VU : Logistics cost modeling in strategic
 benchmarking project
 Case: CEL Consulting & Cement Group A

Bachelor's Thesis in International Business 59 pages, 0 pages of appendices

Autumn 2010

ABSTRACT

This thesis deals with logistics cost modeling for a benchmarking project as consulting service from CEL Consulting for Cement Group A. The project aims at providing flows and cost comparison of bagged cement of all cement players to relevant markets in Indonesia. The results of the project yielded strategic elements for Cement Group A in planning their penetration strategy with new investments.

Due to the specific needs, Cement Group A requested a flexible costing approach taking into account market factors reflecting Indonesian logistics conditions. Such requirement, however, needs a tailor-made approach for cost modeling. Consequently, the cost model conducted for that objective became an essential key element of the project, besides other general activities and studies. The thesis emphasizes the conducting process of the cost model and discusses relevant issues.

The method used in this thesis is inductive reasoning within a holistic case study. Field survey as a primary technique combines qualitative and quantitative data collection and analysis procedures. It is worth noticing that a contextual framework is designed as modeling approach facilitating the cost modeling building process.

The central feature of this thesis is the architecture of the cost model represented by the excel-based model with road, sea and rail modules, which includes different costing processes, components and key drivers. The thesis is arranged similarly to modeling steps: starting with pre-configuration to determine that transport and warehousing are key activities for costing in this benchmarking project; then moving to the configuration phase where the model's modules are filled up with relevant costing; and finally ending up with main outputs as model applications. Transport and warehousing are taken for costing as they represent the major costs of total logistics cost concept. Mapping the flows and calculating relevant cost using activity-based method is the basic costing procedure.

CEL has practically implemented the model to deliver results for the project. Full upgrading to software has been drawn as recommendations for improvement.

Keywords: CEL Consulting, cement, benchmarking, field survey, logistics cost, cost modeling, total cost concept, activities-based costing, Indonesia.

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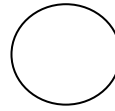
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ABBREVIATIONS

CAPEX : Capital expenditure or investment cost

Cus. : Customer



DWT : Deadweight tonnage

GS : Grinding Station



IP : Integrated Plant



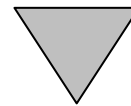
Ter. : Terminal



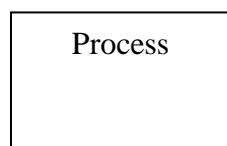
OPEX : Operating expenditures or operating cost

RFQ : Request for Quotation

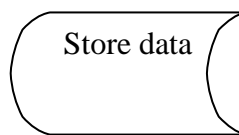
WH : Warehouse



SHAPES IN PROCESS MAPPING



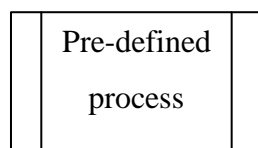
Process



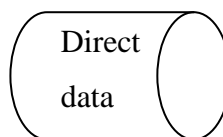
Store data



Decision



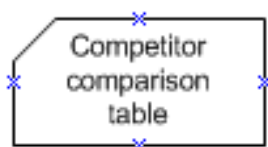
Pre-defined
process



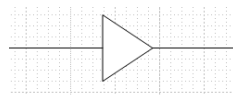
Direct
data

Output

Component



Competitor
comparison
table



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1 INTRODUCTION

This first chapter supplies the readers with some aspects of how the topic has been chosen together with clarifying the research questions the author aims to answer throughout the thesis. In conjunction, scopes, limitations, and thesis structure are also discussed.

1.1 Background

The first decade of 21st century has witnessed a universal process of globalization that has brought the world economy together. Thomas Friedman has said in his book “The World is Flat” that today globalization is “further, faster, cheaper and deeper” (Globalization 101 Forum 2010). Whilst mentioning about movement and physical dimension, it is notable that one element is about money. Truly, the new era of business around the world is striving for better ways to satisfy its demanding customers by outstanding quality and great service while being price-competitive and remaining profitable.

Supporting businesses in optimizing its current operation and providing advice for new investment, CEL consulting is a young and dynamic management-consulting firm providing its services across South East Asia. The company highlights its expertise on the field of operation and supply chain. Towards the emerging markets of South East Asia, it has proved to be a reliable partner for emerging leaders to develop their businesses further.

CEL’s client is a multinational cement manufacturer which has planned new investments to expand their business operations to conquer the Indonesian market. The working team includes CEL consultants and the client’s business development department to carry on a “Strategic Logistics Cost Benchmark and Development Study” within many provinces across the market of Indonesia.

With a strong relationship with the client, CEL has done a similar project previously for another cement producer in a different market by different approach.

The cost model, which was developed for the previous project has been outdated by the scope and nature of the new project. It is requested to build up an upgrading model subject to the new requirements. This thesis is performed to serve that purpose and is carried out along with the project. The author in practice has been working as the project analyst cum team leader, in which cost modeling is one of his main duties.

1.2 Case companies and project facts

1.2.1 Cement Group A

Cement Group A is one of the leading groups in building materials with top-ranking position in cement, the industry in the scope of the thesis. The Group has a well-balanced geographical portfolio with its worldwide presence in all continents. With “pursuing growth in cement in emerging markets” being one of its two strategic priorities, The Group has established a solid position in emerging markets by combining acquisition and organic growth. (Cement Group A, Publication material, 2010.)

According to the Group forecast, the world cement market nowadays stands at two billion tons, and its demand is growing at 5% to 7% per annual. The construction materials market is boosted by population growth, booming infrastructure needs and the vibrant economies of emerging countries. Emerging markets account for some 80% of the world’s cement consumption.

To continue to fully capture this growth, the Group is also developing new capacity level. Between 2010 and 2011, 21 million tons of new capacity will be commissioned, including 14 million tons in 2010 alone. (Cement Group A, Publication material, 2010). Indonesia is one of the markets where the Group wants to strengthen its position by new investments, new cement plant with its penetration strategy.

The investment has been consulted by a number of business partners and consulting groups with a variety of different professional experiences. In the site selec-

tion and evaluation process, teams of independent consulting groups on geological assessment, land and license acquiring, market research and logistics assessment have been assigned to cooperate with the Cement Group A business development department. (A.F 2010)

1.2.2 CEL Consulting

CEL Consulting has opened its offices in Vietnam in 2005 and in Hong Kong-2007. With over 25 international and local consultants, analysts and experts, the company supplies services in Surveying, Analysis, Design, Simulation and Implementation. It is well known in supporting industrial investment in emerging SEA economies: Vietnam, Indonesia, Philippines, Cambodia and Laos. The industries the consulting firm has offered its expertise range from light processing industries, express logistics, retailing to heavy and bulk industries. (CEL Consulting company. 2010a.)

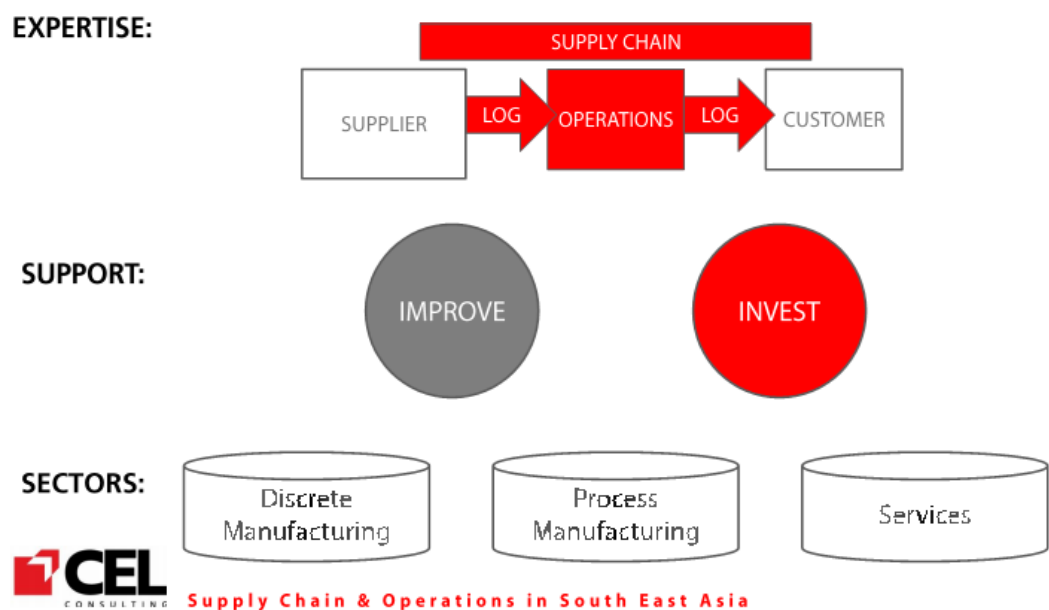


FIGURE 1. CEL Consulting scope of expertise, support and sector (CEL Consulting company. 2010a)

Basically, CEL services are summarized in two keywords: Improve and Invest. On one hand, the management-consulting firm offers optimization projects to

businesses who want to streamline the current operations. Besides, CEL also offers consulting service for new investments.

The director of cement group A has actually endorsed CEL services as “pro-active, structured yet flexible approach”. (M., J. 2010). In practice, the key competitive edge highlight CEL has offered its customers is a boutique tailor-made solution. By that way, they provide added value where consulting advice is offer flexibly according to customer changing requirements. The mentioned project is one of typical examples.

1.2.3 Strategic benchmark & development study project

The project has two objectives: benchmarking and development study. In order to penetrate a new market, in this case being a new province or region in Indonesia, the Cement Group A has to understand in great detail how the competitors have brought their products to the customers. The metric is defined as the best practice, meaning the best ways of doing such delivery. In assessment of competitors supply chain, survey team should distinguish the best way the players apply for long-term planning.

Furthermore, since Cement Group A also plans to invest in a new factory, the consulting project is also for assessing the logistics condition for the projection of the factory. Future logistics system and its costs with different scenario are provided in which the cost model plays essential roles.

The project has intensive schedule and requires heavy traveling for surveying and field assessment. Instant feedback and period reviews employed in regular basis with business development department of Cement Group A help to adjust the approach and schedule from time to time. The project team not only provides information internally but also supports other consulting teams with logistics analyses and advices. At the end, the project has successfully reached its target and is believed propelling factors that are of great help to the top management on making investment decisions. The investment level is approximate five hundred million dollars with 50 years planning.

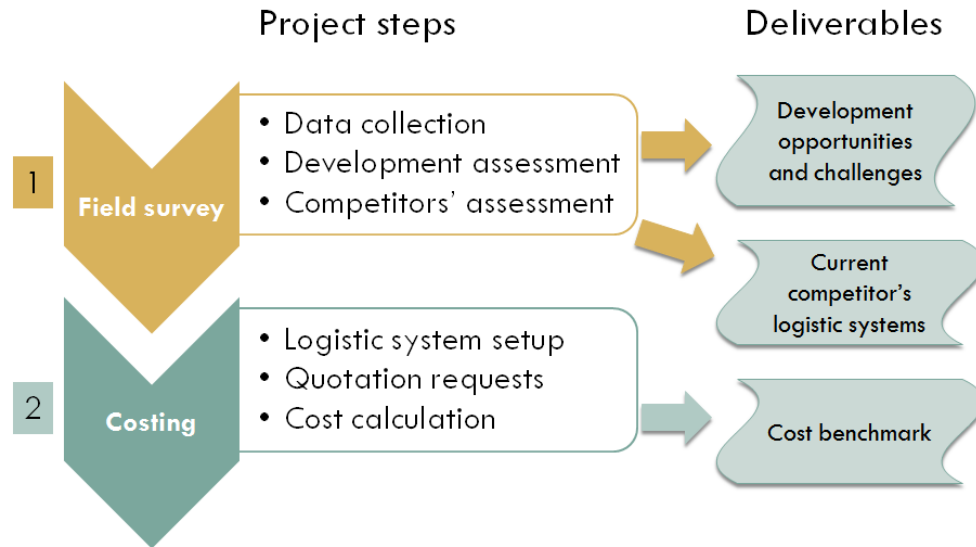


FIGURE 2. Strategic benchmark project deliverables scheme (CEL Consulting company. 2010b.)

1.3 Research questions

This thesis is targeted at answering the research questions surrounding the business context as defined above. There are three main research questions toward the topic, which are stated below respectively in the order of their importance:

1. How to conduct a logistics cost model in a strategic benchmark project?
 - Showing the approach and making process of the cost model.
2. What are the essential applications of the model in the benchmarking project?
 - Describing the central role of the costing model in the project.
3. What can be improved to make the model a better consulting tool for CEL Consulting?
 - Suggesting spaces for model improvement.

1.4 Scope and limitations

Due to the practical nature of the thesis, its scope is subject to the scope of the consulting project. At the same time, the cost model itself is a deliverable of the thesis. Limitations therefore occur in the level of details on model reporting.

According to the project scope, in spite of being the centre of the strategic benchmark project, the model itself is only one part among others. Other project activities such as field survey, Greenfield study or development study will not be discussed in depth.

Furthermore, as followed by the supply chain dimension, the costing scope of the model takes into account the supply chain from factory to province capital distribution centre only. Moreover, the product in question is limited as cement in bag, not in the form of bulk cement. The unit considered here is bag, therefore, it is not necessary to clarify what type of cement.

Finally, the thesis only discusses the design process of the cost model, i.e. the foundation and methodology in conducting it. Discussions in details in the formula and the excel file will not be mentioned. The manual on how to use the model does not fall into the scope either. On the other hand, project results such as cost benchmark, logistics condition overall understanding or any other matters in the scope of confidentiality of consultancy contract will not be discussed. However, some snapshots of cost model, some results, pictures and figures are displayed occasionally to illustrate the cost model. The cost model itself in excel file will not be provided.

The thesis structure part below presents discussion points in Figure 3.

1.5 Thesis structure

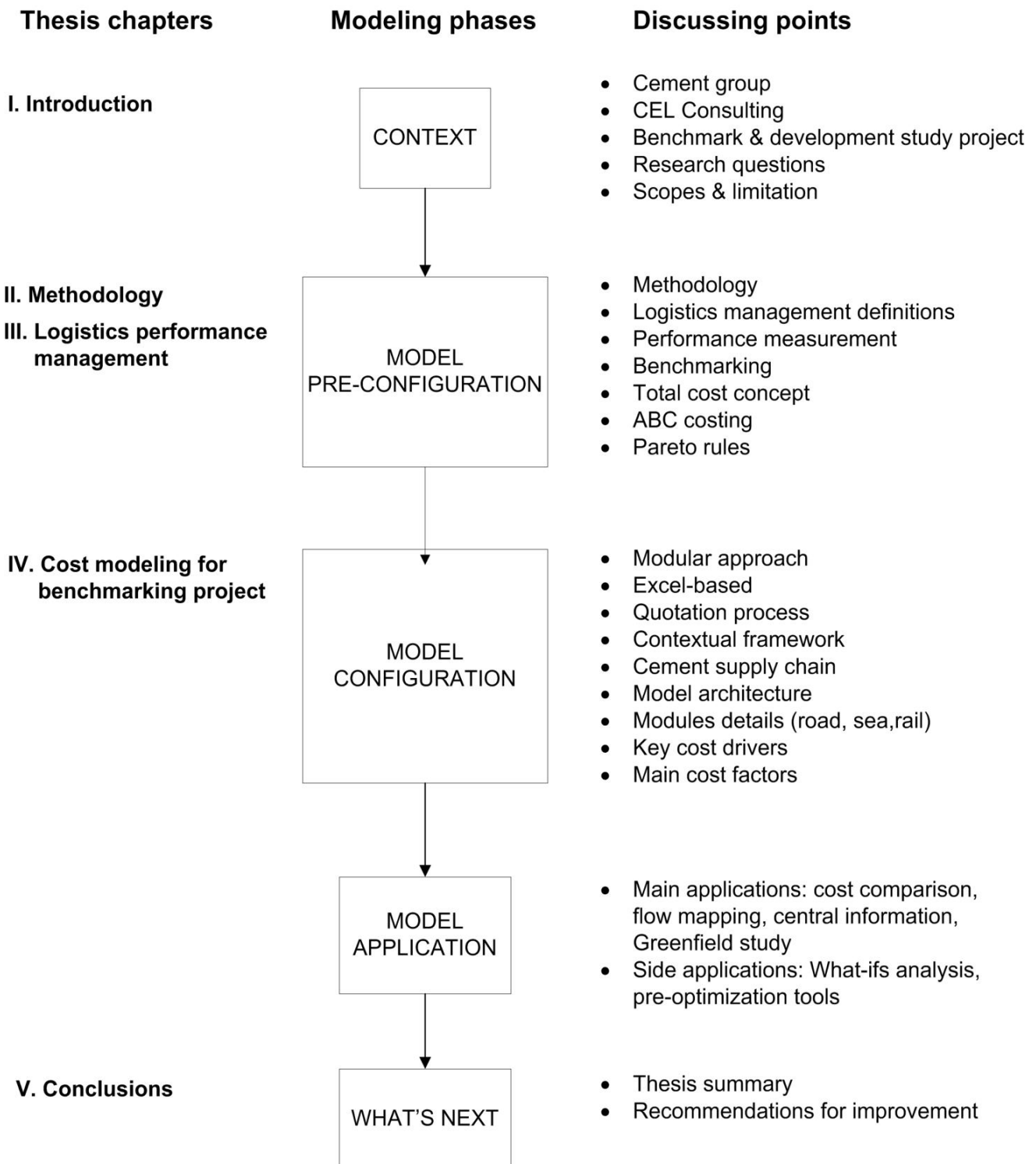
This thesis is divided into five chapters. It starts with Chapter 1 – Introduction, where the author discusses the context in which the thesis topic has been chosen. This chapter is also functioned to state the purposes of the thesis and define clearly scope & limitations of the topic derived from a practical project.

The second chapter, Methodology, follows the 1st chapter in giving insights on how to structure the approach to the issue. In chapter 3, Logistics performance management, theoretical framework of this thesis is debriefed as literature reviews and architecture of a cost model is introduced at the end. The two chapters comprises the Pre-configuration step of the model.

Chapter 4, Cost modeling for benchmarking project, discusses the configuration of the model while introducing its main fuctions in the project. This part copes with the configuration and application of the model approach. Finally chapter 5 (Conclusion) supplies with an executive summary and suggests some available recommendations.

The thesis structure in parallel with modeling phases is stated in the figure below together with key discussion points in the thesis.

Topic: Cost modeling in logistics strategic benchmarking project



Research question: How to conduct a cost model in logistics strategic benchmarking and development study project?

FIGURE 3. Thesis structure

2 METHODOLOGY

It is essential to define and set-up good method for problem-solving. The part belows summarizes in brief the research approach, data collection method and modeling method.

2.1 Research Approach

Within the scope of the surveying project, the problems are not well defined at the beginning and its initial solutions are exploratory at the same time. In such context, Trochim (2010) recommends an inductive reasoning approach “where researcher can start with specific observations and measures, begin to detect patterns and regularities, formulate some tentative hypotheses that we can explore, and finally end up developing some general conclusions or theories”. Conducting the inductive way ensures the flexibility on the very new consulting environment of Indonesia whereas the cost model, which is the outcome of the research, is tested at the hand-over to the client.

Saunders, M. Lewis, P.& Thornhill, A. (2007, 379) states that there is no standard approach to the inductive reasoning, therefore, a mixed-method using a combination of qualitative and quantitative techniques and analysis procedures should be applied to maximize the findings in such an inductive approach.

Furthermore, the thesis should be designed as ad-hoc single case study as the research aims at solving a very specific real-life context problem which involves empirical investigation using many layers of evidence from field survey. (Saunders, Lewis & Thornhill 2009, 588.)

2.2 Data collection

The field survey dominating the thesis in supplying contextual patterns helps to perform the costing model. Contextual patterns indeed form up the method for modeling the cost. This method will be explained shortly in the next part.

Simply speaking, a field survey is the process of collecting and gathering information at the local level by conducting primary survey. In collecting data techniques for field survey, various tools are suggested including recorded and published data, field observation & measurement and interviewing (Wikispaces 2010).

Figure 4 below simply defines the modeling process. All tools mentioned above has been used widely in this thesis. Recorded data and published data especially reports in regional and national level, South East Asia and Indonesian respectively, are reviewed and highlighted the different information about Indonesia logistics condition, cement industry and related issues. Based on these input data, hypotheses are proposed and tested through field survey tools, dominated by observational and semi-structure interview. Quantitative testing using a process of quotation request is applied to help cross check the hypothesis with more market driven data. Quotation process is discussed later in the cost model part.

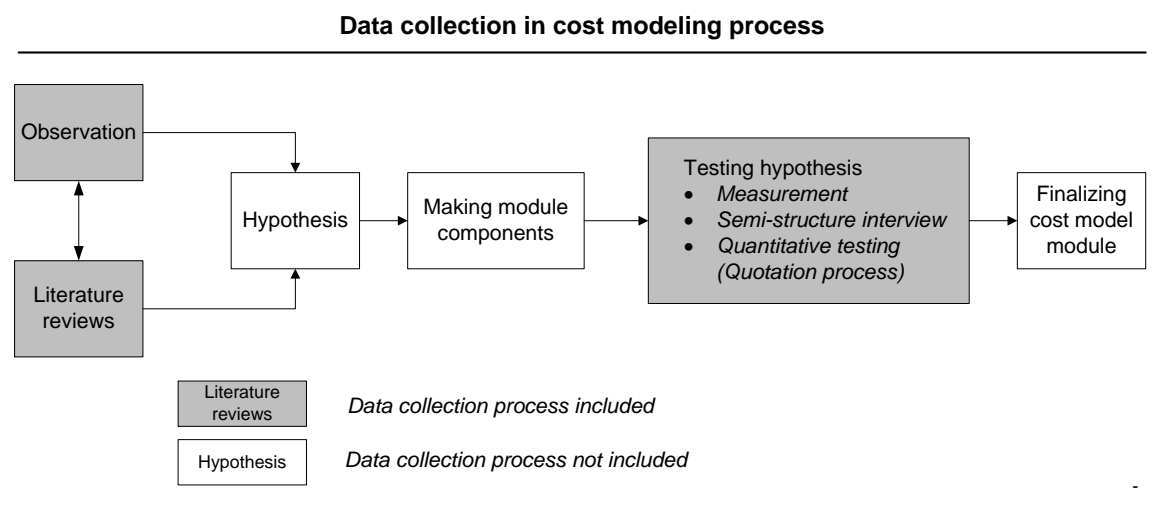


FIGURE 4. Data collection process

2.3 Modeling method

As introduced in the first part, this thesis is holistically subject to a benchmarking project with a limited and tight timeline that it is essential to carry on the cost model flexibly in a live context, or on-the-go environment. The project team cannot wait prior to the finishing of the model, but the costing tool has to be devel-

oped parallel to other project activities. Because of this, a contextual framework modeling method is applied where hypotheses are detected due to different situations along the project and modules are created, tested and finalized accordingly. In other words, this approach can be considered as a puzzling game where the author tries to complete a good cost model serving the project needs.

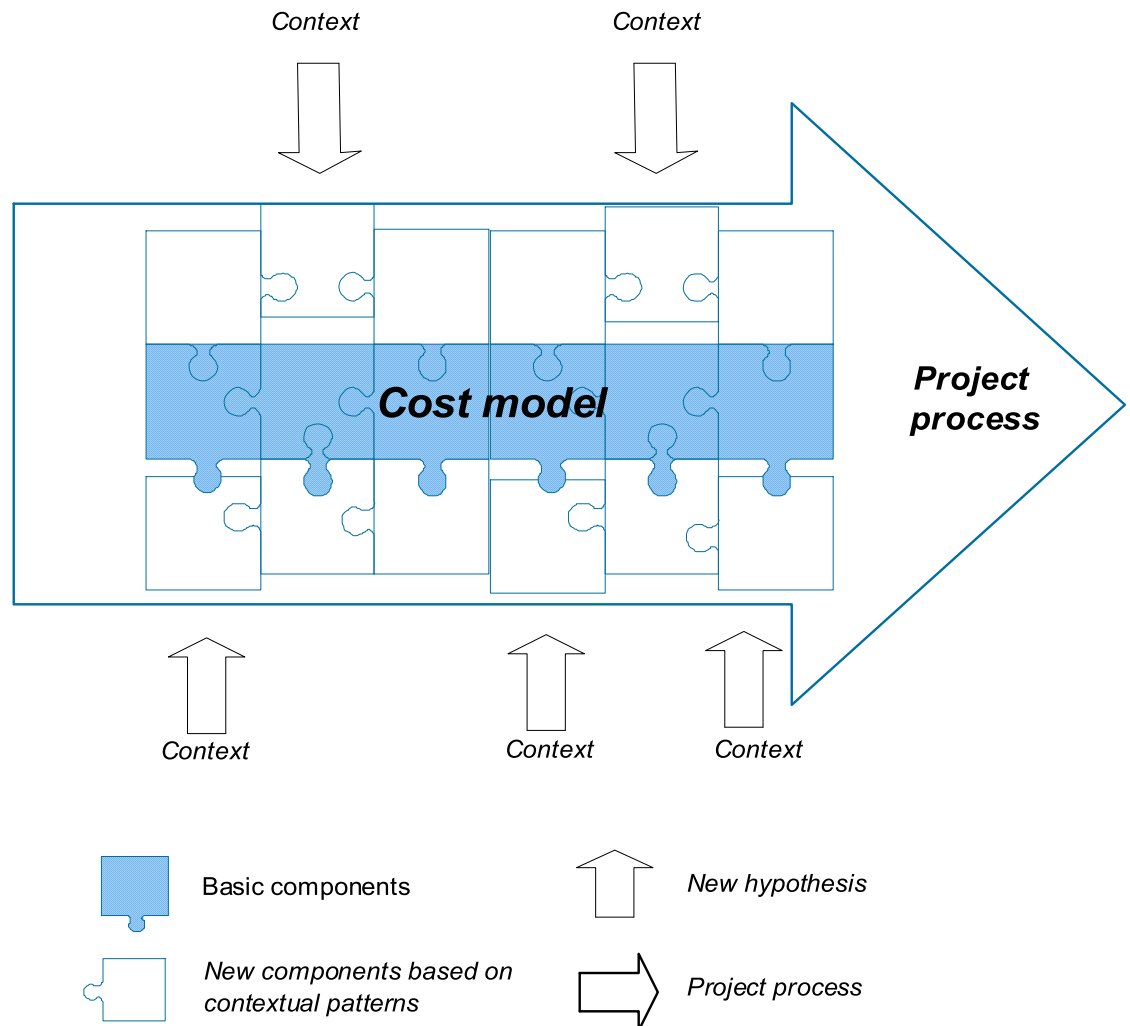


FIGURE 5. Contextual framework for cost modeling.

Depicted in Figure 5 above, the cost model is created with basic components based on the general costing method to give a kick-off foundation for the project. From time to time, new contexts arise and bring out opportunities to test hypotheses of new cost components and operational calculations. With certain control by the project manager and director, the cost model satisfies required needs in a certain level of detail and accuracy at the end of the project.

3 LOGISTICS PERFORMANCE MANAGEMENT

This chapter discusses relevant theoretical literature being used in executing this thesis. Together with the methodology part, this chapter helps to define the pre-configuration phase of the costing model as the thesis outcome.

3.1 Logistics management

3.1.1 Definition of logistics performance

This thesis focuses on logistics management, an increasingly important management concept for enterprises, from manufacturing industry to service environment. The role of logistics have been recognized as an "important component of GDP by two significant ways of being one of the major expenditure for businesses and on other hands supporting the movement and flow of many economic transactions (Lambert D.M. , Stock J.R. , Ellram L.M. 1998, 10.) Among many definitions about the concept, the author defines logistics management as in the Council of Supply Chain Management (CSMCP 2010, 114.):

“ Logistics management is... the planning, implementation and control of the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customer requirements. “

3.1.2 Objectives of logistics management

Bowersox, Donald J. & Closs, David J. (1996, 8) stated that the mission of logistics management is: "it aims at helping create customer value at the lowest total cost". The statement mentions two main issues. Firstly, the logistics management leans to increase the customer service level indicated by the delivery performance

of the company. Secondly, it seeks to achieve the agreed service level by minimizing the cost.

The challenge for a strategic level of management is to balance the trade-off between customer service level and cost expenditures in order to create the company's own competence among its rivals. In order to succeed, company has to be able to measure and compare the performance of logistics; a task that has been proven to be difficult.

3.2 Measuring logistics performance

3.2.1 Definition of logistics performance

Logistical activities can have a variety of different impacts on an organization's financial performance, especially when the logistics cost significantly make-up the major part as of percentage of sales turnover. According to a benchmark survey of UK companies by Dialog Consultants Ltd in APPENDIX 1, logistics can be dramatically different between one company and another, and one industry and another. Logistics cost comprises only under 10% of sales revenue for those industries requires little movement, such as soft drinks, gas supply, etc whilst companies in automobile parts, cement, office equipments have to bear higher cost. Especially in cement, the low-value-to-weight product in the scope of this thesis, the relative cost of its logistics is among the highest, i.e. 30% to 46% of total cost.

Main Company Business	Cost as Percentage of Turnover				
	Transport Cost	Warehouse/ Depot Cost	Inventory Investment/ Holding Cost	Administration Cost	Overall Logistics Cost
	%	%	%	%	%
Office	3.20	10.70	0.87		14.77
equipment	1.36	9.77	0.66	0.19	11.98
Health supplies					
Soft drinks	2.53	2.71	0.44		5.68
Beer (food and drink)	8.16	2.82	0.56	2.19	13.74
Spirits	0.37	0.27	0.07	0.10	0.81
distribution	25.20	9.10	7.10	4.60	46.00
Cement					
Automotive	2.07	6.35	1.53		9.96
parts	9.41	2.45	0.02		11.98
Gas supply (non-bulk)	0.45	0.10	0.29	0.05	0.88
Computer maintenance	0.65	0.78	0.09		1.52
Computer supply	0.96	1.08	1.21		3.25
Healthcare					
Specialist	7.23	1.95	0.20	0.49	9.87
chemicals	0.38	1.31	0.33		2.02
Fashion					
Food	3.14	3.73	0.85		7.72
packaging					

FIGURE 6. Logistics cost percentage of Turnover Benchmark of different industries in UK (Dialog Consultants 2000).

Performance measurement in logistics, therefore, becomes an important issue in logistics and supply chain management. (Bowersox & Closs 1996, 669.) define that logistic performance is measured to "improve the quality of information that strategic management level have at their disposal to measure, compare and guide logistical improvement". Simply speaking, the definition replicates an informal clichés that business people always imply "if you can't measure it, you can neither manage it nor improve it" (Balanced Scorecard Institute 2010).

In order to manage the performance, internal measurement is applied for detailed organizational monitoring, reflecting operational indicators for everyday management. On the contrary, external measurement focuses on the measures custom-

er perspective and applies benchmark to gain innovative insights, practices, and processes of comparable organizations within or from other industries. (Bowersox *et al.* 1996, 669.) Certainly, manufacturers are using benchmarking in important strategic areas as a tool to calibrate logistics operations.

3.2.2 Benchmarking as a strategic planning tool

The context of this thesis is within a benchmarking process, therefore, it is essential to define the benchmarking process and its features. According to CSMCP (2010,19) benchmarking is "the process of comparing performance against the practices of other leading companies for the purpose of improving performance ... and provide opportunity for gaining a strategic, operational, and financial advantage." Similarly, some advantages of benchmarking could be highlighted by ICANN Wellington (2006) are to learn from other experiences and practices, to allow assessment of current situation and to aid changing, improvement and investments. Nevertheless, there are challenges to incorrect benchmarking comparisons due to the limited information, which may lead to wasting effort and meaningless results. It is worth noticing that a good limitation and scope definition should be applied to select appropriate cost elements for benchmarking. (CEL Consulting, 2010b.)

Fundamentally, the author aims to develop a costing model to assist a benchmarking project of bagged cement distribution. The metrics of the benchmark is not only the delivery cost of the products, but also the methods their rivals have applied to distribute to their customers. In short, cost and flows are included in this benchmark. The following paragraphs discuss the theoretical bases being used to decide the costing approach and flows mapping.

3.3 Costing approach

3.3.1 Total cost concept

Fundamentally, the benchmark project requires a certainty elaboration of total cost that is "close to the reality of the current market". (CEL Consulting company. 2010b) There are numerous actions to reach this target, including combining cost modeling using parameters from field survey with a quotation process to be aligned with Indonesian circumstances. However, as the matter of consultancy quality, the project should also provide the client a good "big picture", i.e. overall vision, on determining what should be inside the cost and how. Total cost concept has been chosen to give the client a overall evaluation.

The total cost concept compels management to view logistics processes as a whole system and consider all logistics activities cost at the same time. Instead of focusing on each activity as a separate process, the goal of management should be to reduce the total cost of all logistics activities, because locally optimizing one cost component can lead to increasing in costs of others. (Lambert D.M. , Stock J.R. , Ellram L.M. . 1998, 14.)

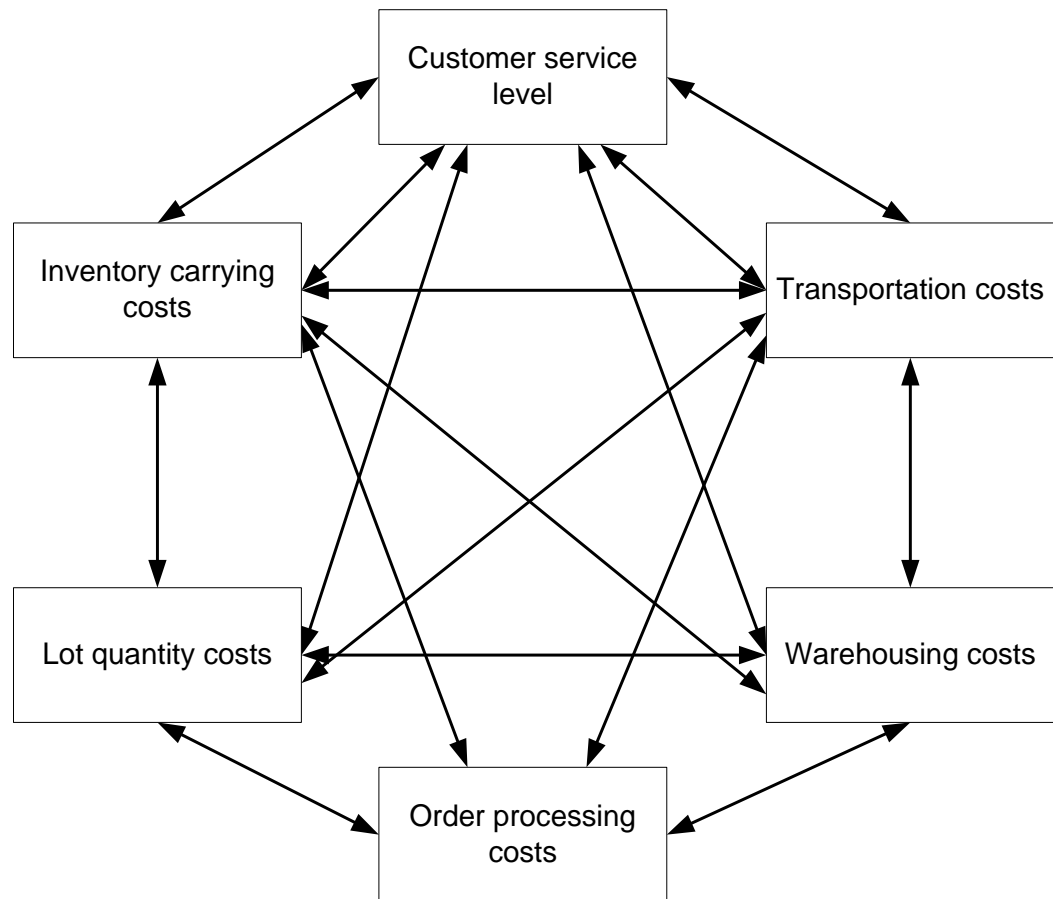


FIGURE 7. How logistics activities drive logistics costs (Lambert et al. 1998)

According to Lambert et al (1998,15.), logistics costs are generated according to the activities that support the process of serving the customers and are related to each other. Also in his concept, Lambert categorizes the logistics costs into customer service, transportation, warehousing, order processing, lot quantity and inventory carrying.

However, Lambert et al (1998,15.) also point out that this model and different activities can be adapted depending on the situation of each industry or each company. In some complex environment, such as retail industry or automobile, some components can be added upon some conditions. In contrast, the model is omitted in other simpler industry. In this thesis, the author has omitted many cost components due to the scope of a benchmark project and the fact that cement industry has one of the simplest logistics systems. Details of each component will be presented in the empirical part.

3.3.2 Transportation cost

According to Lambert et al (1998, 21.) transportation physically moves the product to “where they are produced” to “where they are needed.” This movement adds time and place utility measuring by how fast and available the product has been offered to customers as it moves from one place to another. Cost derived by transportation activities also differs noticeably according to its transport mode, distance and characteristic of the operation including environmental factors.

Most companies nowadays outsource transport service to third parties in order to minimize their asset liability and to focus on the core business and processes. Cement is among the bulk industries who practices the outsourcing heavily but also tries to utilize own feet when possible due to the great economic of scale trade-off. (CEL Consulting company. 2010a)

3.3.3 Warehousing cost

Warehousing activities support time and place utility by facilitating a product to be produced and held for later consumption. It relates to warehousing and storage activities including layout, design, ownership, automation, training for employees and related issues. Naturally, warehousing cost varies per player according to their strategy on serving the market. However, warehousing cost is also subject to the product characteristics itself and the customer behaviors. In some occasions, customers want to get products directly after the production process (Lambert et al. 1998, 22.)

3.3.4 Lot quantity cost

Lot quantity generates cost due to procurement and production quantity. Procurement includes all activities subject to the ordering process of raw material while production lot quantity cost relates to the set-up and controlling of unexpected downtime and changeover. (Lambert et al. 1998, 23.)

3.3.5 Order processing and information cost

This category includes costs related to the controlling of stocks, forecasting demand, commuting for distribution and processing orders. These activities are very essential in modern logistics support good customer services and create visibility on the supply chain. (Lambert et al. 1998, 22.)

3.3.6 Inventory carrying cost

This cost is derived from logistics activities of controlling the inventory level, packaging, and disposing salvage and scrap. The relevant inventory costs are those that vary with the amount of inventory. (Lambert et al. 1998, 23.)

3.3.7 Customer service cost

The customer service cost is basically subject to the cost of lost sales. This cost includes not only the lost contribution of the current sale but also potential sales in the future from the current customers and new customers. The cost concept is very challenging to measure. (Lambert et al. 1998, 22.)

3.4 Activity-based costing

Since thesis is performed in an ad-hoc circumstance within the strategic benchmark project, it generally signifies a solution designed for a specific purpose. In order to refine the volume of intelligence information, which naturally needs time for acquiring, a need to structure the costing approach is particularly essential. The author has decided to choose the ABC method, or Activity-Based Costing, due to its simplicity and ease of applying.

Hicks, D. T. (1992) defines ABC as: "... a cost accounting concept based on the premise that products (and/or services) require an organization to perform activities and that those activities require an organization to incur costs. In activity-based costing, systems are designed so that any costs that cannot be attributed

directly to a product, flow into the activities that make them necessary. The cost of each activity then flows to the product(s) that make the activity necessary based on their respective consumption of that activity". In short, the principle of ABC costing method is to identify activities that form the flows of product and calculate the cost the incurred by each activity.

The basic steps in implementing ABC approach are described in a study by Brimson (1991). In simpler term, the ABC approach starts with an identification of activities that helps to structure the costing. It then follows with an assortment step to assign the cost that cannot be contributed to the cost of the service directly, usually more on indirect cost, to a non-activity cost pool. In the scope of the benchmark, the client has agreed to simplify the costing elements by taking into account only the direct cost generated by the logistics flow to distribute the bagged cement, as stated in the table below.

TABLE 1. Implementation steps of ABC method (adapted from Brimson, J. A. (1991)).

1	identify and define relevant activities carried out in the company
2	identify major elements of cost, which can be viewed as the line items on a budget or as accounts included in the expense ledger
3	determine relationships between activities and costs
4	identify cost drivers to assign costs to activities and activities to cost objectives (products, services, or customers), based on the usage of the activity
5	plan a cost accumulation model
6	gather the necessary data to drive the cost accumulation model, keeping in mind that the goal is accuracy, not precision
7	establish the cost accumulation model to simulate the organization's cost structure
8	determine crucial success factors
9	evaluate activity effectiveness and efficiency

3.5 Pareto rules in refining the cost components

Even though the costing framework has been narrowed by accounting only direct cost coming from logistics flow mapping, the amount of costing components are still too many to be considered. According to the total cost concept discussed above, at least four areas of logistics values, namely transportation, warehousing, inventory carrying and order & information cost, should be evaluated. That requires an extended time for benchmark project that is not necessary in the ad-hoc context.

According to Lambert et al (1998) the process of tracing costs cannot be done with "surgical precision", instead focus should be directed to sources of high cost. The amount of intelligence data, either from comes field survey or derives from reports reviews, in order to elaborate the costing will be plentiful and therefore difficult to be performed in short period of time. In order to refine the complexity and focus on the values needed, Pareto rule has been applied to select the most important costing activities for the project.

Pareto rules, or commonly referred to as the 80/20-rule, stresses "the vital of a few" that suggests business management to focus on the most important few part reflecting almost 80 percent of problems. Applying Pareto allows a quick focus on the major problem (Moore, Ron. 2006, 143.)

4 COST MODELING FOR BENCHMARKING PROJECT

This part contains the descriptions of key components making the cost model in the pre-configuration and configuration phases of the model and discusses its benefits in the application part.

4.1 Cost modeling

4.1.1 Cost model definition

It is necessary to define what a cost model is. We can start to answer the question by the analysis of what a typical cost model can perform. According to Kaplan R.S. & Copper R. (1998) the main functions that any cost model can supply are: firstly, conducting valuation of inventory and measurement of cost of goods and services sold for financial purposes; secondly, providing estimation of the cost of activities, products, services and customers; and thirdly, supplying economic feedback to managers and staffs in general about process efficiency.

By this approach, a cost model may be defined as a useful tool that companies use to gain a better understanding of the cost of running their businesses. One of the core objectives of a cost model is to gather the right information to support the right managerial decision. In the context of this thesis, the cost model is created to collect intelligent patterns from field survey and generate a costing benchmark of the Cement Group A distribution cost in comparison with other players. The usefulness of the cost model may be evaluated either in the way the cost model has helped in the project itself or as results to the strategic planning of the Cement group A. Discussions on the essential benefits of the cost model will be presented at the empirical part.

4.1.2 Main costs for benchmarking

As discussed earlier about benchmarking process, it is essential to refine the appropriate cost components in order to successfully compare the logistics cost

within the scope of the project while committing to the deadline. According to a study made by Dialog Consultancy (2000) on cost breakdown of different industries and sectors, transportation and warehousing costs remain the biggest components in logistics cost of cement company.

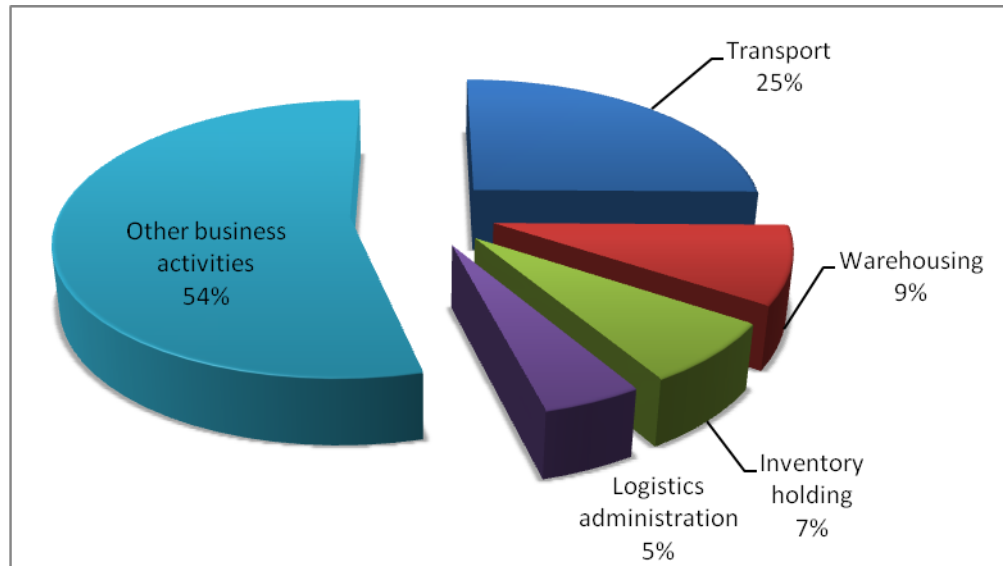


FIGURE 8. Cement industry cost breakdown (adapted from Dialog Consultants 2000.)

Transportation and warehousing cost together make up for 75% of logistics cost in the cement industry. Applying Pareto rules, we can state that these two main costs may relatively represent the total cost of logistic process from the scope defined by the project. In agreement with the client, cost modeling approach takes into account transportation of the flow of cement from the source of production to the center warehouse of the capital city of the market, while warehousing cost of are taken as constant from best practice and applied for all players. In addition, handling costs between different transport modes or from-to facility will be added according to the flows. In Indonesia, handling in maritime and rail transports is managed by the cement company while handling in trucking is subject to the service provider's cost.

On the other hand, the cost delivered from the benchmarking project is logistics unit cost, not a total cost. Therefore, capacity factors from different competitors

may not have great influences on the calculation. Plant capacities are taken just for referencing purposes.

4.1.3 Quotation process

The consulting service proposal has clearly stated that ” .. the model will have to be calibrated upon quotations so that total cost will be closer to the reality of the current Indonesian logistic market ..” (CEL Consulting company. 2010b.) In other words, the cost should be modeled according to the reality market price that the logistics service provider would have actually charged to cement players in Indonesia. A quotation process is conducted parallel to the costing gives a testing method for the model. Detail quotation processes for each transport modes are explained in the module detail parts.

4.1.4 Excel-based model

Hicks (1992) recommended in his book that the right platform for the model is spreadsheet due to its simplicity in setting-up, modification and maintenance. With an base of excel application, the model can be easily built by linking several worksheets comprising of different cost modules, references, cross data input with the client’s data, final result presentation using graphical functions and perform extra analyses when needed.

These spreadsheets require no complex mathematical calculations and can be adjusted upon new findings. It is essentially a good feature in the uncertain context of the field survey, where the author had to update the formula and cost component from time-to-time. For all these reasons, either maintenance of the model or its development due to the future requirements is very straightforward.

4.1.5 Black-box approach

Contextual approach makes the configuration process of the cost model resemble a ”black-box” process, where the author has to calibrate either the input and the process of the model according to the requests which has been set up by the client.

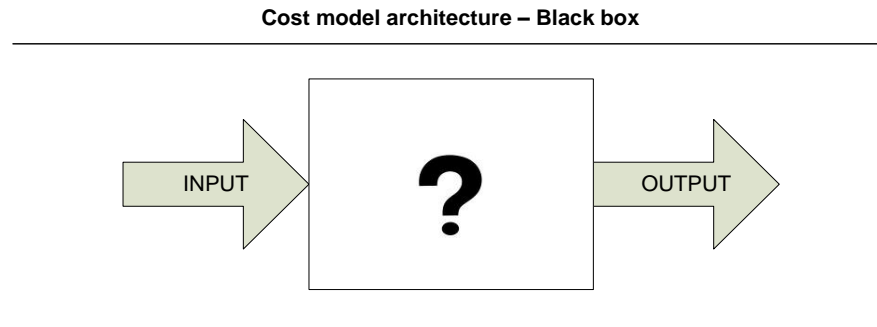


FIGURE 9. "Black box" analysis tool in building the cost model

Presenting the configuration process helps to adjust all upgrading actions of the model not to be biased by the client requests stated in consulting project.

4.2 Model configuration

Consulting firms differentiate themselves by the functional areas of their expertise together with the range of industry they specialize in. Large companies, such as Accenture, Capgemini, etc., offer a diverse range of services and expertise on all level of management. Medium-sized firms combine boutique style with knowledge in number of industries while strategic management consulting, naming a few as McKinsey, BCG or Booz & company, etc., can offer the strategic advise and business intelligence model to almost every industries. On the other hand, small or boutique consulting company has to highlight their expertise in very specific clientele. Knowing, understanding and thinking as an “insider” in the client industry are essentially important to perform and elaborate consulting works. (Wikipedia encyclopedia, 2010a)

The first step in performing a costing process in a manufacturing environment is to generate a knowledge base about the product, the market including main drivers and competition, the value chain and supply chain. In such a scope of the study, where process and cost are key deliverables, it is essential to understand the basic of the cement industry, highlighted by the products itself and the process with its supply chain characteristics.

4.2.1 Cement production process

Cement industry has a long-established history as one of the biggest heavy sectors by its scale. Cement is produced in more than 150 countries in the world and becomes a development factor that can propel or constrains world economic development. The manufacturing cement can be summarized in the 5 main processes: extraction of raw material, grinding and storage of raw materials, firing of raw materials, storage and grinding of cement and finally ends with packaging and shipment.

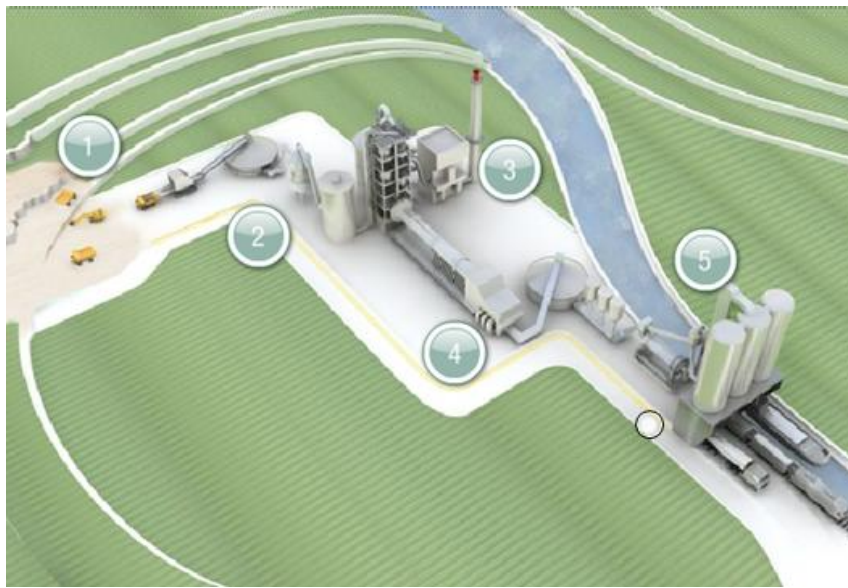


FIGURE 10. Cement manufacture process (Cement Group A. 2010.)

The raw materials of cement are limestone and clay and are extracted in the quarry closed or within the cement plant in step 1. Then the minerals will be routed to the grinding station plant in step 2 where they are initially grinded to a fine mixed powder. Some other materials, such as slag, fly ash, pozzolan, etc, can be used to replace the main minerals as an alternative. In step 3, the mixture goes for a heating process through the pre-heating tower and the vertical rotary kiln. At the end of this step, a mixture of hard granules called “clinker”, a form of work-in-process product that can be already traded in the market.

Step 4 begins with a cooling process and the clinker is stored in silos and transformed to cement. Gypsum and other materials will be added to clinker according the product requirement and the mixture finely ground as cement. The final step is

the storage of cement in silos and distributed to the market used of different transportation modes. Due to the local-oriented characteristic of construction material market, cement is transported within a short to medium distance.

By widening the manufacturing process of cement toward the customer as end-user, we can define the supply chain process of cement using mapping techniques of key equity.

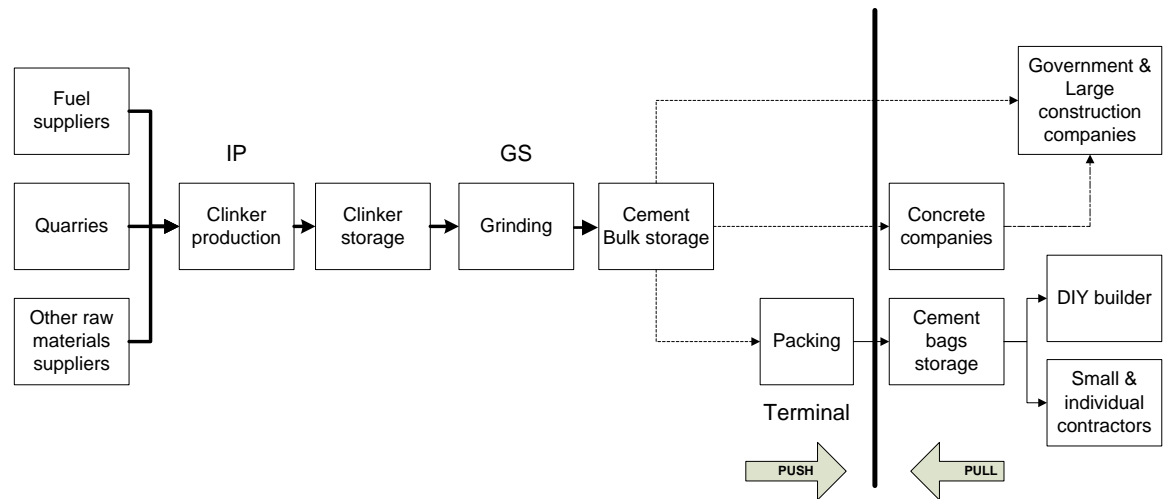


FIGURE 11. Cement supply chain with Push-Pull boundary. (Agudelo, Isabel 2009.)

Storage of raw materials and deciding where to serve the customer create push-pull boundaries between customer expectation of product and ability of company to fulfill the demand when needed. In fact, cement companies can deliver to customer at almost any point along the supply chain process depending on their strategy how to serve their customer. For a benchmark project, it is essential to define the common flows to backbone the model with its basic modules. The approach is to outline the infrastructure of cement industry, conduct mapping of all potential flows and refine the flows to get the basic patterns. The above actions are described in the following paragraphs.

4.2.2 Cement industry infrastructure

The infrastructures of the cement industry, on another hand, are simply three types of facility: integrated plant (IP), grinding station (GS) and Terminal (Ter.). An IP is an integrated facility which includes the extraction quarry and all other facility to produce to the final cement product. In fact, the IP normally build in a very large area; up to 150 hectares and normally a choice if its capacity is consumed within the local market or its location facilitate the product movement cost-efficiently. A majority of players in Indonesian market decide to implement the integrated option due to the great consumption of the local market, especially in Java island market.

Notwithstanding, a cement plant can also be integrated to produce the final product while sending the work-in-process to other places for the finalizing stage. A grinding station, therefore, receives the clinker from those IP and continues the later process. In practice, company only put their GS that is very close to the market they want to penetrate using the IP remaining capacity. Only few players in Sumatra island of Indonesia apply this set-up, including Baturaja and Bosowa. It is believed that the reasons falls on political issues rather than the companies' own strategies. (A.B. 2010).

At last, a cement terminal, which is basically a set of silos containing fine bulk cement ready to be packed with a bag packing facility, is another option company can apply with low investment cost and flexibility to tackle new market. Cement terminal normally locates alongside the river with a private jetty for handling activities. Players usually place their terminals within a public port to utilize the basic infrastructure and shipping traffics, as of Holcim and Indocement for their terminals in Tanjung Priok, one the biggest port of Indonesia.

4.2.3 Cement supply chain

According to Gardner (2010), mapping of the flows is a simple process to understand a firm's supply chain, yet a powerful tool for evaluating the current supply chain and contemplating realignment of a supply chain. Nevertheless, they also

points out that there is not yet a universal set of mapping conventions to represent a supply chain.

In the benchmark approach, the author applies a current practice in CEL Consulting of mapping the cement supply chain through logical thinking and industrial expertise. As a result, logistics flow of cement is depicted as below, taking into account the major steps and all correlated relationships, i.e. inbound, outbound, inter-unit production, internal and inter-unit distribution.

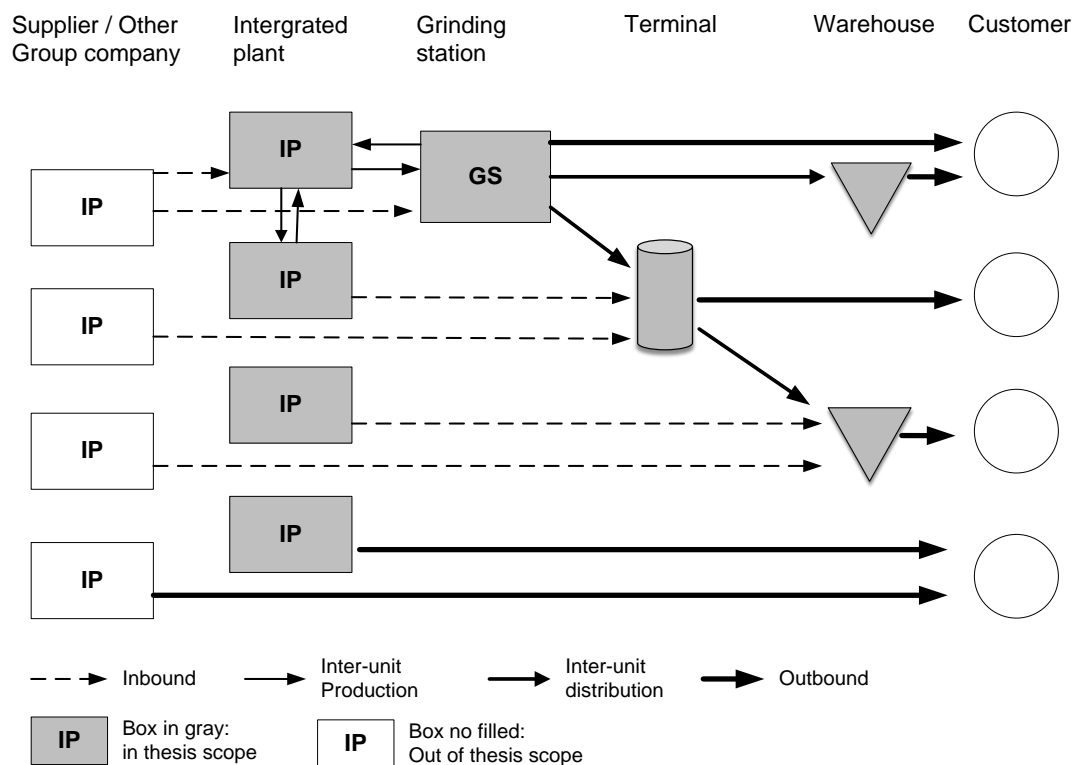


FIGURE 12. Logistics flow in Cement Group (adapted from Cement Group A (2010a.))

4.2.4 Refining possibilities to basic model flows

As outlined in the last paragraph, cement manufacturers can find many ways to deliver the final products to their final consumers. The simplest way is to deliver the cement right from the IP. However, by moving the push-pull boundary back to its source of materials, other two options can be used. First, Grind-to-Order where cement is kept in clicker and then grinded in the grinding station (GS) as orders

appear. Second, Pack-to-Order, where cement is kept in bulk and then packed as orders appear in its compact terminal. (Agudelo 2009)

The scope of the benchmark is defined as costing the supply chain of bagged cement from the IP to the market primary storage. Therefore, we can simplify all the possibility above to down to three flows, as illustrated in Figure 13 below. We can notice that the last in the last option, the flow includes two separate forms of the product, cement and clinker as its intermediate product. Therefore, a separate calculation section should be prepared for the clinker flow and its result will be transferred to the cement calculation using a conversion step.

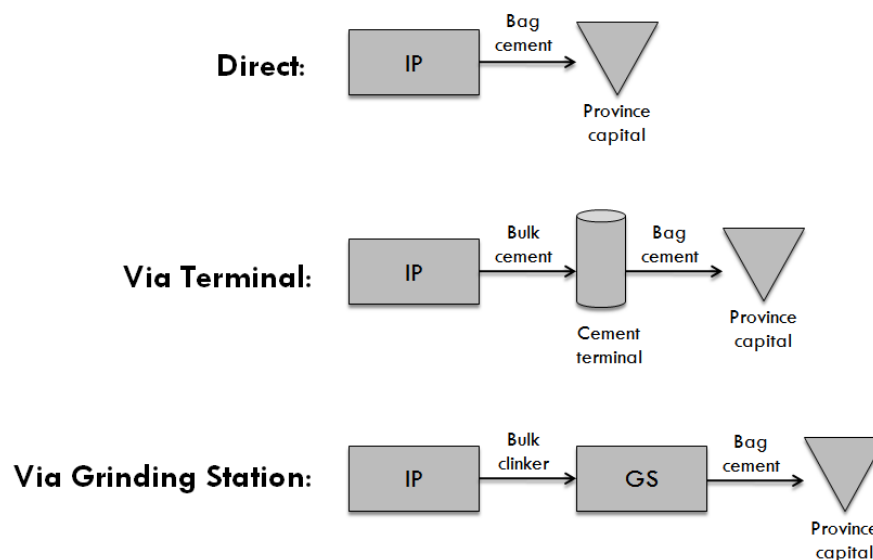


FIGURE 13. Basic model flow scheme (CEL Consulting, 2010c.)

4.2.5 Clinker to cement conversion

As an intermediate process of cement, “clinker, if stored in dry conditions, can be kept for several months without appreciable loss of quality. Because of this, and because it can easily be handled by ordinary mineral handling equipment, clinker is traded internationally in large quantities. Cement manufacturers purchasing clinker grind it as an addition to their own clinker at their cement plants. Manufacturers also ship clinker to grinding plants in areas where cement-making raw materials are not available.” (Wikipedia encyclopedia, 2010b)

However, quality of limestone as the basic component of clinker and the defined quality of the product according to companies' strategy, the amount of additional materials to be grinded with clinker varies per player. (A.F. 2010b). In order to align the costing unit, a conversion table is established to translate the cost of clinker flow to a cement unit before it is added into the final cost of bagged cement. In-house reference from the cement group A is used to elaborate the conversion table instead of the industry standard as requested. The ratio varies from 1.05, i.e. 1 ton of clinker to be used to produce 1.05 ton of cement, to 1.3 as the highest ratio in the market of Indonesia. In Greenfield survey, the conversion part is slightly adjusted to include other material costs.

TABLE 2. Clinker / cement conversion table

	Cement A	Cement B	Cement C	Cement D	Cement E
\$/ Ton clinker	\$/T	\$/T	\$/T	\$/T	\$/T
Clinker / Cement Conversion ratio	1.3	X	X	X	1.05
\$ / Ton cement	\$/T	\$/T	\$/T	\$/T	\$/T

4.2.6 Model architecture

In structuring the model using excel-based application, it is necessary to distinguish between spreadsheets where input data is provided; workspaces that contain main calculation; and results cells.

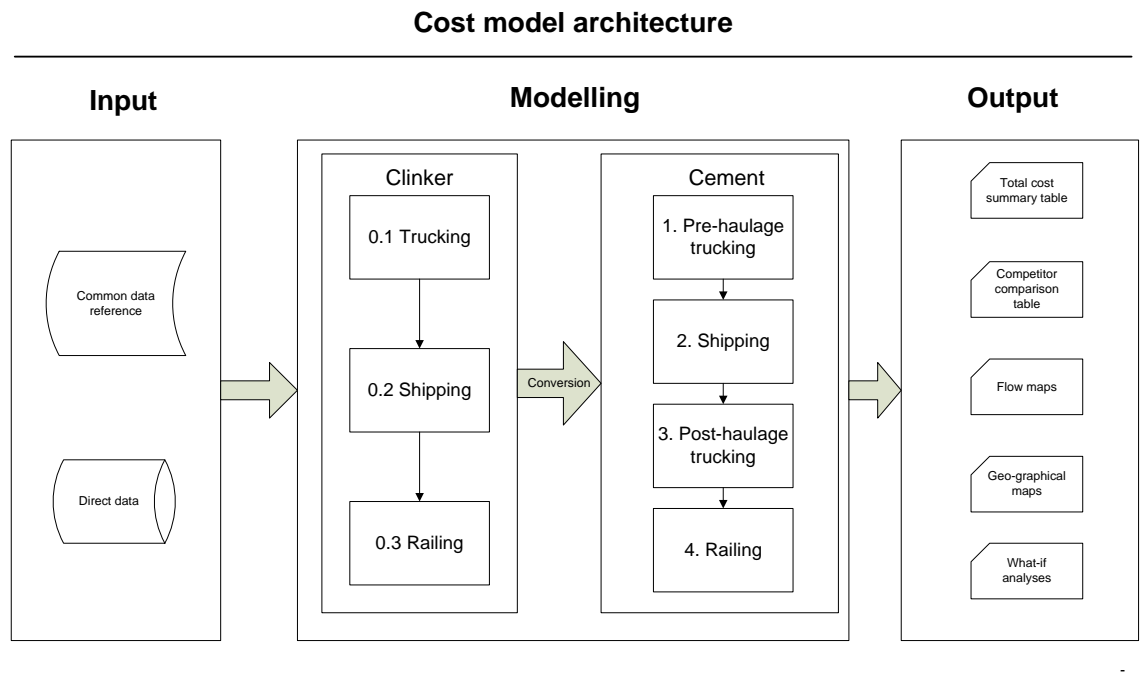


FIGURE 14. Cost model architecture

Input section

In the input section, according to the types of data, the author has assigned two separate ways that data from field surveys should be inputted into the model. One spreadsheet named “Common Data Reference” has been created to collect all parameters that are commonly used across the modules. These data are classified into categories of:

- General market information: such as exchange rate, fuel market price (including gasoline & diesel for trucking and rail transport and special oils used in maritime transport), climate observatory per region, etc.
- Common modular information: sea module (charter-time reference, weather observatory, port and handling-at-port charges including cargo-doring and stevedoring references, ports info including distance matrix, queuing time, etc.); road module (contractor margin per province, truck general info per truck size, etc.); rail module (rail cost per distance reference, truck/train conversation table, etc.)
- Other references: other undiversified data such as clinker/cement conversion per competitor, factories capacity, etc.

On the other hand, the “Direct Data”, located at the same calculation worksheet, contains information that related only to the designated flow. Direct data varies per module, depending on which kind of information collected from the field. For example, data for road module such as distance, road quality, truck size allowance, average speed, police constraints, etc. are varied per specific route and is typed directly to that route. Cells containing “Direct data” is colored with Red and required manual input every time parameters are collected from field survey.

Main modeling

Main model calculation is centralized into one spreadsheet to benefit from formulating, cell tracing and cross references. Lines representing cost components and operational parameters are displayed in row on the most left sides while market, players, flows, origin-destination info are located on the top as columns. All calculation cells is colored in black, hidden if possible and protected to prevent unwanted modifications. A modification log is recorded with date, actions and special notices as a diary of all adjustments to the formulas or layout. More detail on layout of main modules are discussed in later parts.

Output

Results of the calculation part are shown per province in each sheet and colored with different color to enhance visibility. Results of cost benchmark are updated automatically while other results, such as flow maps with data derived from the cost model is updated manually using VisioTM software. The updating process with VisioTM helps to cross check the flow and cost, however, is time-consuming. Results of cost model will be discussed in depth with illustrations at the later part of “Model application” chapter.

4.3 Road module

All transport modes in Indonesia's transport system are quite complementary rather than competitive, in which road transport is the predominant mode, comprised of about 70 percent of freight ton-km and 82 percent of passenger km. (The World Bank, 2010). Therefore, trucking is one of the most important modules within the cost model as the popularity of using trucks as the main transport modes from cement players in Indonesia.

4.3.1 Trucking costing method

The objective in conducting the road module is that the author tries to elaborate a vehicle-route oriented costing taking into account the profit-taking from the service provider. In short, the cost follows what the contractor often calculates in pricing a certain quotation request, which is defined as operating vehicles to transport the certain payload over a specific route with its characteristics.

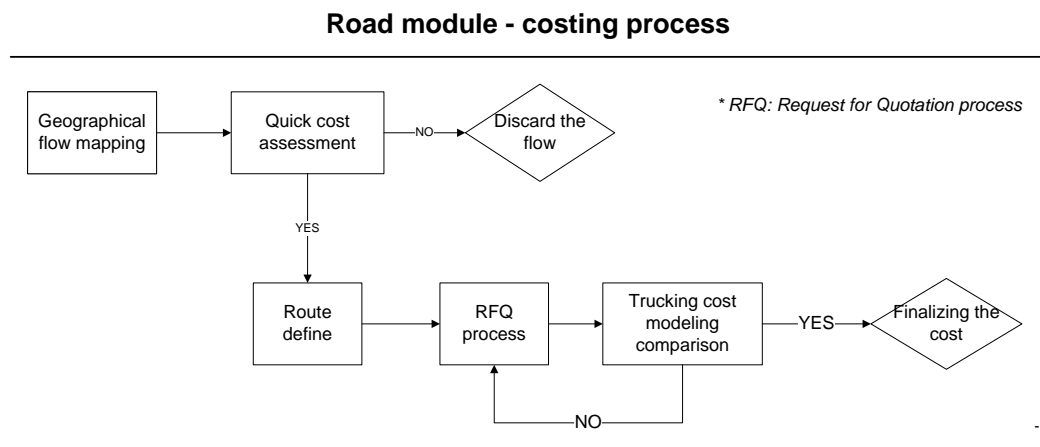


FIGURE 15. Road module - Costing process

A process of trucking costing is generated in order to control the working process and ensure the validity of the model. The process is as follow: “flow mapping” defines which route of road transport should be evaluated, followed by a quick cost assessment by the model. After significant route is chosen, “route define” then specifies the patterns for “RFQ” – Request for Quotation process. After receiving result from contractor, the quote is consequently compared to the cost

derived from the model. If the difference between the quotation-based price and the model-based final cost are significant, i.e. more than the defined error variance (CEL Consulting company. 2010b.), the RFQ is required to restart: clarifications from contractors are requested and/or the cost model is adjusted accordingly.

4.3.2 Road module structure

As shown in the model architecture, road modules appears three times along the flow of cement, possibly can be in trucking of clinker (module 0.1), pre-haulage (module 1) and post-haulage of cement (module 3). While most of the trucking is done with cement in bag, in some flows the trucks can contain bulk: clinker in tipper trucks or bulk cement in cement tanker. Adjustment on truck type & its operation parameters were applied to adapt to the different commodity: normal truck, dump truck or trailer. (Figure 16)

Module A - Truck		X
from		Cibinong
to		Cilegon
Volume from plant (IP)	T/day	4000
Distance Plant (IP) to Grinding Station (GS)	km	150
Truck Type	Normal/Dump/Trailer	Dump truck
Truck payload	T/truck	25
Round trip		
Average speed loaded	km/h	25
Average speed empty	km/h	27

FIGURE 16. Truck type for different commodity

Referring to the road module structure and main components in Figure 17 below, the module is organized in such order where input data of commodity, trucks and route are supplied to the operational calculation to generate a trip summary; all these steps prepare the variables for the main costing, which is subtotaled into different cost components ranging from fleet operation cost, management cost and other cost and risk management cost. The cost components are designed to follow the trucking service providers' concerns in allocating their cost when doing quotation for specific route. These cost structures influences the negotiating process.

Road module – structure and main components

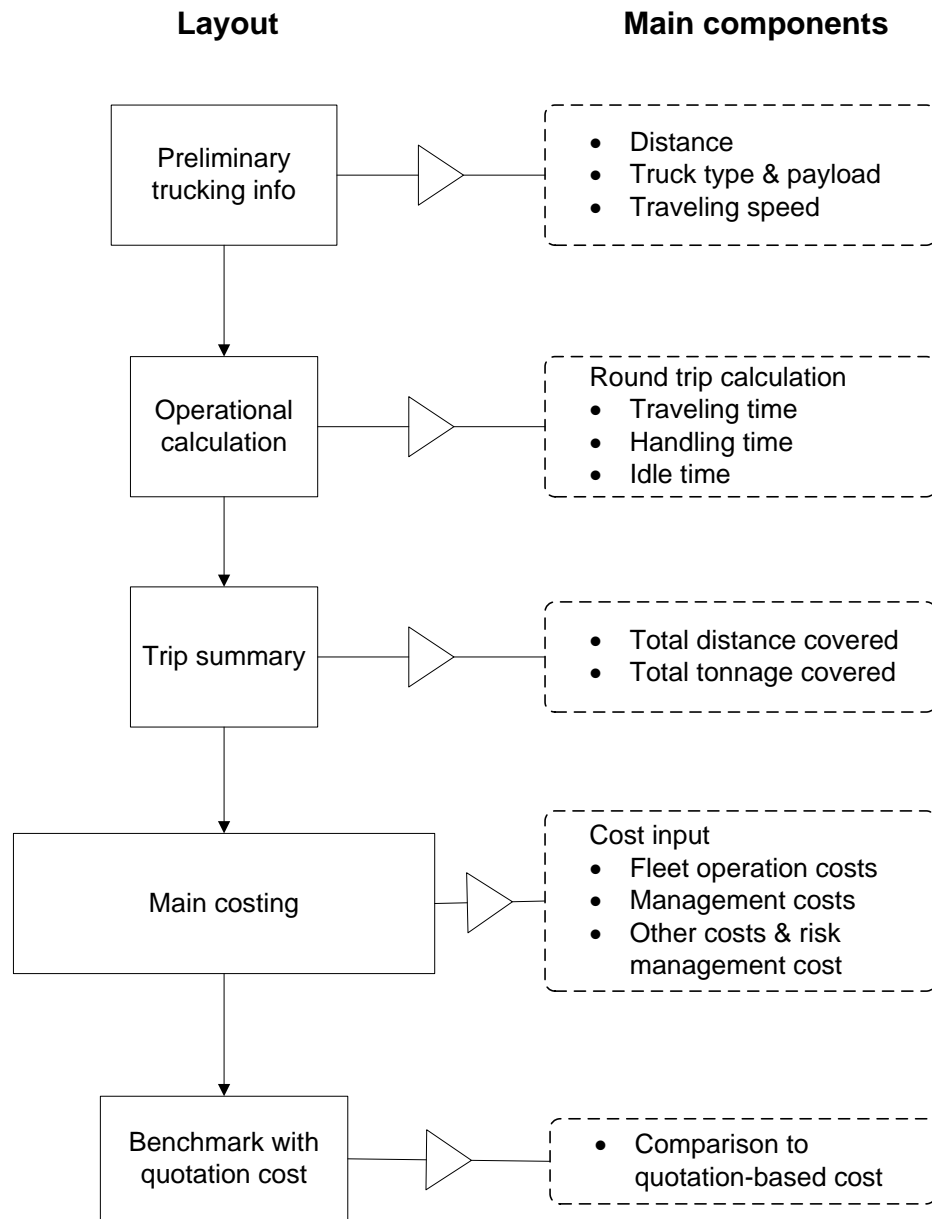


FIGURE 17. Road module structure and components

4.3.3 Trucking cost components

The cost model is designed to estimate 12 components of trucking cost, including 1) fuel consumption, 2) Maintenance, 3) Driver, 4) Depreciation, 5) Tyres, 6) Interest, 7) On-the-road charges (police, user charges, weight bridges), 8) “Preman”, 9) Lubrication, 10) Insurance, 11) Licensing and 12) Risk coverage, respectively in its modeling order. The breakdown of these cost vary per route of transport, distance and road conditions and truck specification. These factors make up the main cost drivers that user of cost model should notice on collecting data from field survey, inputting parameters and running the model. Main cost drivers will be discussed in the later part.

For an average distance of 50km, trucking cost for average 25 tonnage of bagged cement payload could be breakdown into percentage as Figure 18 below. The majority of cost can be classified into variable costs, that change in the direct manner in relation to the activities occur, and fixed costs, which are not directly influenced by the shipment itself.

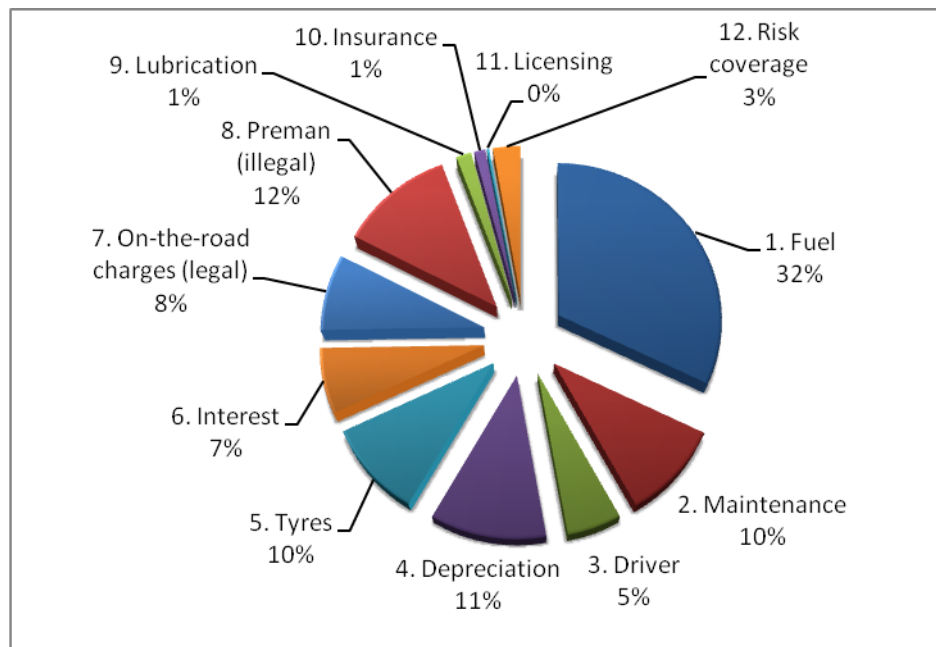


FIGURE 18. Trucking cost breakdown, adapted from the cost model

4.3.4 User-charges and “Preman” in Indonesia trucking cost

During the process of establishing components for the road module, the author has found out that apart from normal cost of operation the contractor has to bear, other unexpected costs occur due to the characteristics of Indonesian conditions. These costs were detected through comprehensive survey, expert interviews and live observation and classified as “Preman”, “On-the-road charges” and “Risk coverage” in the model.

The Asia Foundation is a private, non-profit, non-governmental organization committed to the development of a peaceful, prosperous, just, and open Asia-Pacific region. The Asia Foundation collaborates very closely with other global organization, especially the World Bank, in conducting research in a regional and national level of infrastructure and conditions for development. (The Asia Foundation. 2010a.) A series of research on transportation infrastructure and conditions for development have been conducted for many Asian countries, especially the developing ones from South East Asia. For Indonesia, the Foundation has undertaken a report to reflect the fact that unreliable and expensive road transportation constraints Indonesia’s economic development. (The Asia Foundation 2008, 5.)

According to the research (The Asia Foundation 2008, 6.), transportation firms and truck drivers have to pay significant costs, illegal and legal charges, that combine with other fleet cost vehicle operating costs in Indonesia and is among the highest of Asian countries. Legally, user charges are charges made by government, usually from “weight bridge” – kind of weight station used to limit the truck payload. Illegally, companies and drivers make payments also to the police and to local “preman”, criminal groups who normally have connection with the army or police forces. These hidden payments happen on the road or as regular payment.

These extra cost factors are taken into the model as not only the amount contributed to the total trucking cost but also as the delay in time it causes to the trucking journey. On-the-road charges, including either legal or illegal charges, make up about more than 10% of total trucking cost (The Asia Foundation 2008,35.) Plus, it also causes delay the overall trip duration by about 6% to 10%, or 19 to 25

minutes respectively as driver have get off the vehicle and proceed all procedures. (The Asia Foundation 2008, 35). These unique factors are also confirmed by observations along the field survey and interviews different drivers, contractors and experts, including the one from Indonesia National Freight Association – INFA. (Hadi R. 2010.)

In addition to user charges, contractors also take some percentage, normally 2% to 4% to the total operating cost, to cover the risks of losing the vehicle spare parts during the transport according to Hadi (Interview, 2010.) and many other contractors (Sukimin. Interview. 2010) & (P.S. Interview. 2010) These spare parts, very often truck wheels, glasses, or other components, are stolen by the theft when parking or even taken by the companies' own drivers and staffs.

4.3.5 Extra cost and contractor margin

In addition to the twelve components above, “extra cost” section and “contractor margin” are added into the trucking cost to reflect the environmental condition and influences of service provider. “Extra cost” is a qualitative indicator reflect the measurement of topographical difficulty, traffic condition and other collected info during the field survey of the route where the trucking takes place. Extra cost is normally small, about 0.1\$ to 0.3\$ maximum. An “extra cost comments” are provided after the cell allows collecting the related reasons from field survey. On the other hands, “contractor margin” is the percentage the companies make up from their own cost to get some profit. This component is used to level the trucking cost closer to what contractor may offers in average per local route.

4.4 Sea module

4.4.1 Sea module configuration process

Depicted on Figure 19 below, the configuration process of sea module is different from the road module process in its nature. In road module, the model receives quotation to adjust the costing parameters, which has been fundamentally set up. The configuration process, therefore, is dynamic and adapted to the local condition, resulting in a market-based validity. On the contrary, a cost reference curve is established for the costing process in shipping mode. Certainly, shipping lines offer lease their ship to the cement company for time-based contract, not a volume-based contract like trucking contractors. Therefore, the service render as cement companies may not concern about the asset management of the ship, i.e. taking care of depreciation, interest, licensing, and such, but drive their effort on shipping management, i.e. timer-chartering management of the shipping service. On other words, companies should try to optimize the leasing time of the ship, by reducing time spend at ports and traveling time. The configuration process is then static and inceptive, resulting in optimization-based validity or best practice approach.

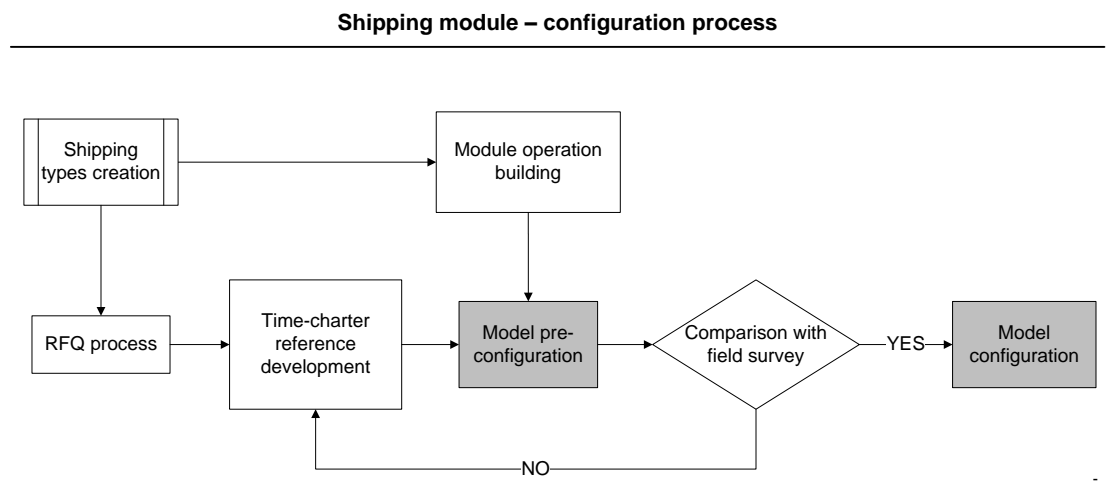


FIGURE 19. Sea module configuration process

According to the configuration process above, “Timer-charter reference” is developed from the RFQ quotation, in which requests for time-charter tariff of conventional ship, bulk ship and barge. Time-charter rates for ships and barge are quoted

per daily use and per monthly contract respectively and these entire quotes base on domestic flags only, i.e. Indonesian-registered carriers.

”Module operation building” process plus the time charter reference together pre-configure the sea module, then it is put into comparison with the field survey whether the pre-configured module is closed to reality. Formulas of the time-charter curves are subsequently configured into the module calculation of cost.

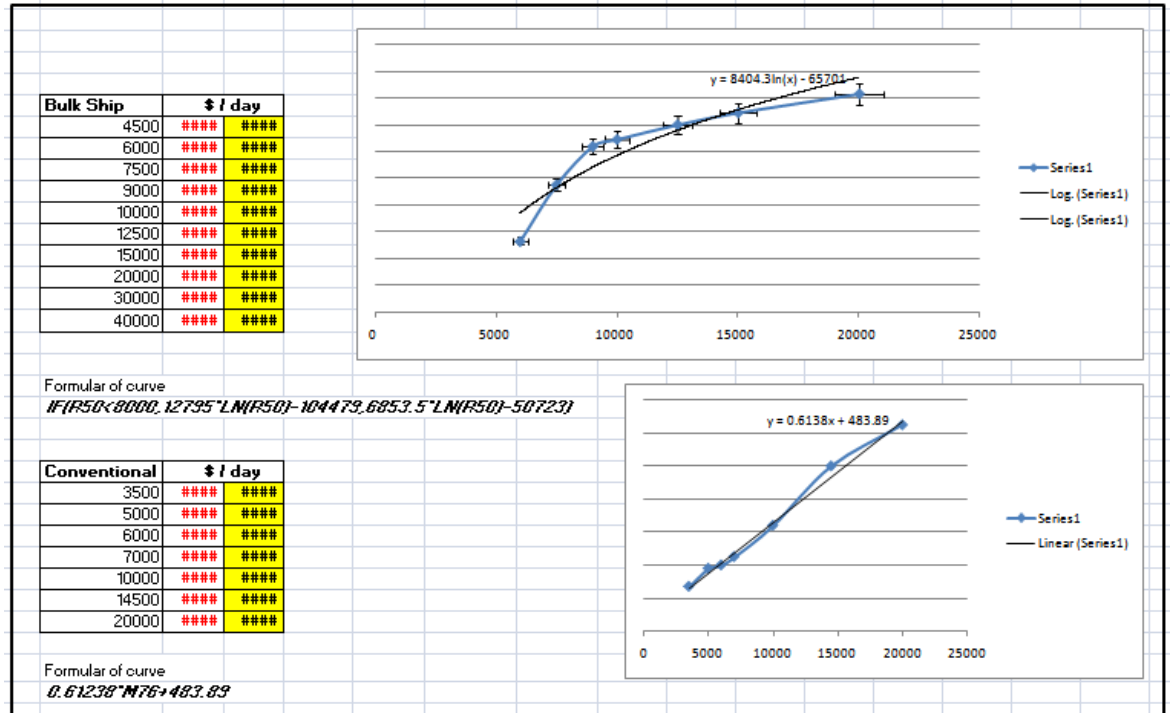


FIGURE 20. Snapshot of time-charter curve development.

4.4.2 Sea module cost components

Unlike the road module, a comparison with quotation result after costing process is not included in the sea module. As seen in Figure 21 below, the sea module is organized in the order of its activities, such as loading, sailing and unloading. Handling activities are especially separated as sub-parts due to its direct impacts to the cost, in which stevedoring and cargo-doring fee are paid by cement company per volume handled, and influence its time-charter duration. “Preliminary part” supplies the trip summary with basic operational inputs where the later part, “trip summary” centralize all these info and produce two key units for “main costing”: total time and fuel consumption.

Sea module – structure and main components

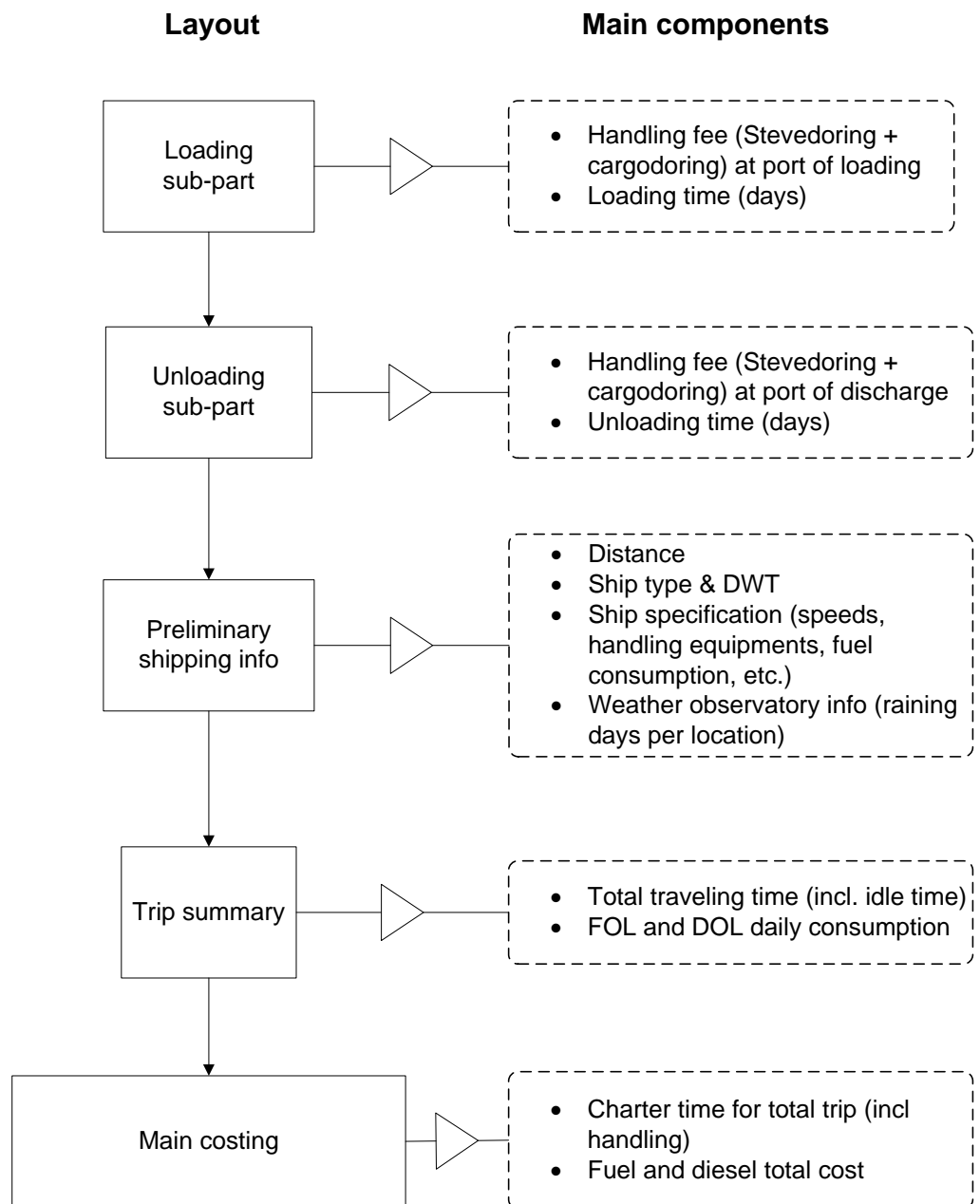


FIGURE 21. Sea module layout and main components

As discussed earlier, sea modules' main costs can be broken down into three main cost components: time-charter cost, fuel consumption cost and handling cost.

Figure 22 below shows a cost breakdown of shipping 8.000 tons of cement in bags for 594 nautical miles, or approximately 1100km. As we can see time-charter which comprises more than 50% the total shipping cost depends heavily on how efficient the loading and unloading activities are, reflecting on the time the ship spends for such processes. Fuel and diesel cost which account for 29% of total cost includes all fuel and diesel consumption during sailing and waiting at the ports. Fuel consumption cost and handling fee are fixed per ship specification and per port respectively.

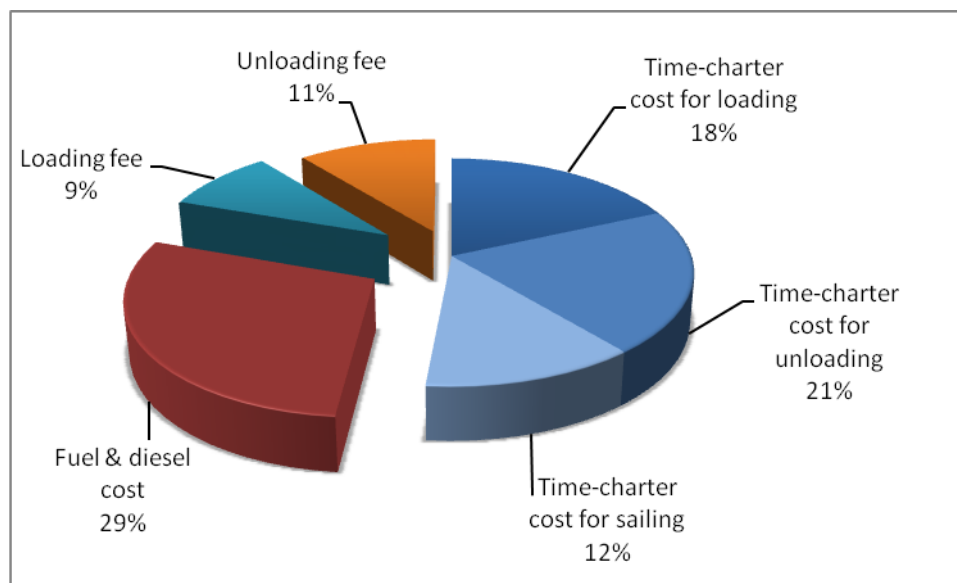


FIGURE 22. Cost breakdown of an example shipping flow.

4.4.3 Weather factor

Certainly, weather factors play a certain role in the sea module as it influences the time to almost all activities along the shipping journey. Bad weather, especially rainy conditions, affects the handling activities in different levels according to their shipping type. As matter of fact, rainy weather seriously delays the handling activities of bagged cement as stevedoring of this cargo relies heavily on manpower and takes place in outdoor environment.

On the contrary, handling of bulk cement takes place in a closed-loop process where a pneumatic cement system equipped in bulk tanker ship connect directly with silo via long pipelines. In that condition, bulk cement handling is not affected

by rainy weather. At the same time, sailing would take a slightly longer time in unstable sea conditions, which can also be indicated by rainy conditions from climatological info. Figures 23 & 24 below are pictures taken from cement bags which are stevedored manually using manpower at Sunda Kelepa port and bulk cement loading using pneumatic system.



FIGURE 23. Cement bags loaded with manpower (CEL Consulting, picture library, Indonesia, May 10 2010)



FIGURE 24. Bulk cement loading with pneumatic pump (CEL Consulting, picture library, Indonesia, July 17 2010)

4.5 Rail module

According to Lambert et al (1998), train & railway systems are used to transport product over long distance to gain economic of the great scale of volume it can carry. In making rail module, the author has to decide whether it is necessary to generate freight cost per ton according to operational parameters for rail transportation. There are two key arguments help to simplify rail module: scarcity of the practice and fixed official tariff applied.

In the first place, the limited number of players in the scope of project use rail as mean of transportation. According to preliminary field survey prior to the project, few cement players in Indonesia has their facility connected to the rail system. In fact, there are only two plants have such facility: Baturaja IP in South Sumatra island and Holcim in Cilacap. (CEL Consulting. 2010d.) Therefore, the author should choose a quick cost assessment method to simplify the benchmark project which has limited time duration.

Secondly, similar to other South East Asia countries, the Indonesian railway department, Kerata Api (KA), apply official tariff to all industrial user except a tailored discount scheme to whom cooperate on building the infrastructure. To put it differently, only if the users spend some investment (CAPEX) to build partly or wholly the railway route together with the government, they will benefit from the operating cost (OPEX) in future usage (O.S (2010), I.P. (2010) and P.B. (2010)). The two current players, which two plants currently use railway for distribution, and other cement players, if decided to use railway transport, is subjected to the similar freight cost no matter how they use such service in term of operation.

With the two arguments above, the train module was established with similar method as sea module in using cost reference curve, but cost per ton bases directly to the reference. Operational info is collected for reference only. Fundamentally, cost-per-ton reference curve bases on either rail-tariffs collected from government transportation department or true cost from players info. Figure 25 below show the snapshot of train cost per ton reference curve subjected to the distance. In

practice, distance of railway flow is collected by field survey and routing software and cost per ton is generated accordingly.

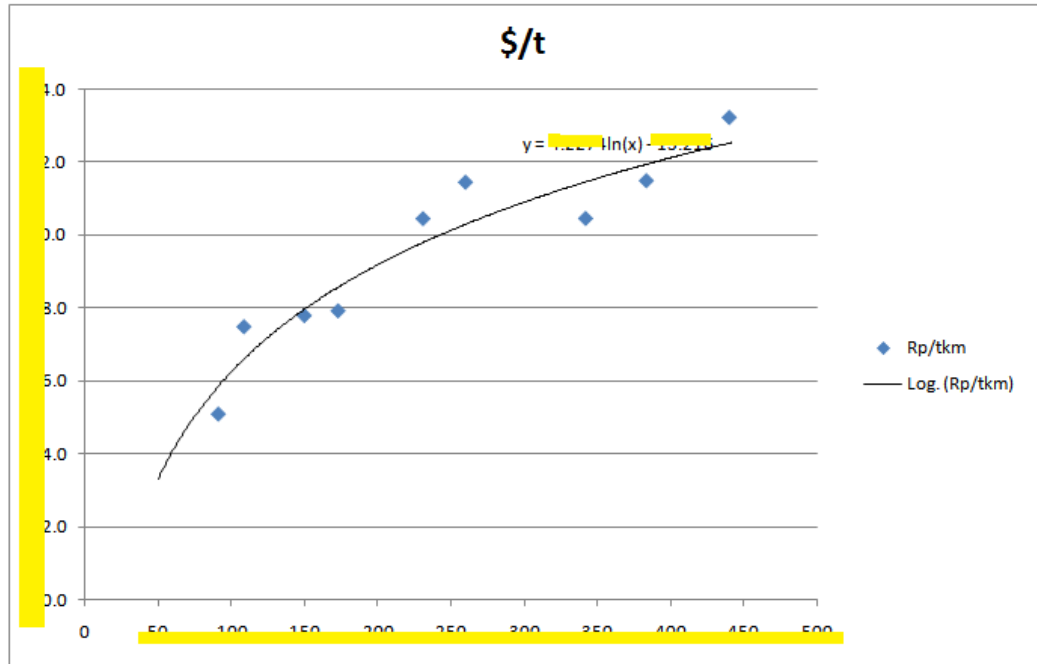


FIGURE 25. Train cost per ton reference curve

4.6 Modules summary and main cost factors

As mentioned earlier, modeling transportation cost requires special attention to its main cost drivers, especially when these main drivers have to be the key take-away after any field surveys being made. (Quentin 2010). The main drivers below are used to mentor the field survey team to conduct an appropriate field survey that can supply adequate parameters for cost modeling. At the same time, good definition of main drivers help cost modeling user keep pace with the most important data input in establishing flow and cost.

A summary table of model modules and their main and secondary cost drivers are presented in the Table 3 below.

TABLE 3. Model modules and cost drivers summary

	Main cost drivers	Unit	Secondary cost drivers	
Road module	<ul style="list-style-type: none"> • Driving distance • Truck payload • Average speed (loaded vs. empty) • Round trip or back-haul • Contractor margin • Negotiation margin • Road conditions 	Km Ton Km/h % % Toughness, up-and-downs, curviness, pot-holes	<ul style="list-style-type: none"> • Fuel consumption • Truck unit price • Average driver salary • Average maintenance cost per truck sizes • Annual truck working days • Current interest rates • Current tires and lubrication price 	Lit/km \$/truck \$/month \$/year/truck Days/year % \$/each & \$/lit
Sea module	<ul style="list-style-type: none"> • Sailing distance • Ship payload (DWT) • Ship specification: handling rate • Round trip or back-haul • Negotiation margin • Weather observatory 	Nautical miles DWT Ton/h % Raining days/year	<ul style="list-style-type: none"> • Current interest rates • Fuel and diesel oil price • Current stevedoring cost • Current cargodoring cost 	% \$/ton \$/ton \$/ton
Rail module	<ul style="list-style-type: none"> • Traveling distance • Train payload 	Km Ton	---	---

4.6.1 Distance factors

Distance is the main cost factor of all cost modules: trucking, shipping and railing. According to Donald et al (1996,366.), distance is a major influence on transportation cost as its direct contribution to variable cost, such as labor, fuel, maintenance (incl. maintenance cost, spare parts, lubrications and tires). Relationship between distance and cost are related in a logarithmic curve, as the cost curves increase at a decreasing rate according to the increase of distance. From the costing model for cement industry in Indonesia, the maximum distance for trucking is up to 300km before the companies decide to switch to better economic-of-scale transport modes, such as rail or sea transports.

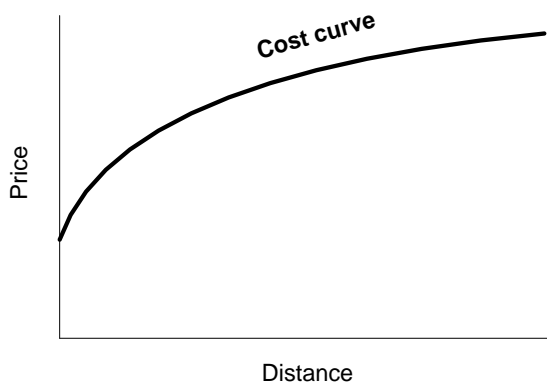


FIGURE 26. A generalized relationship between distance and transport cost (adapted from Donald et al (1996,365.))

A typical method to acquire the distance in field survey is to interview drivers and contractors and cross-check with a geographical tracking program. Geographical tracking programs, such as Google EarthTM or Map SourceTM, are very practical and easy-to-use software where a route can be measured automatically or by GPS tracking in live context. Cross checking by interviewing drivers and contractors are especially useful since many times the shortest route done by routing software are not the same as the common route the transport vehicles will use. Very often, the truck drivers or ship captain do take a longer route but consider better conditions in planning their journey.

4.6.2 Volume factors

Volume is the main cost factor of all cost modules: as “truck payload” in trucking, “ship size” in shipping and “load per train” in railing. Transport, as many other logistics activities, tends to achieve economic of scale in every transport modes. It is directed to other variables as the costing objects to find delivery cost per ton.

In the sea module, volume varied from 3.000 DWT (Deadweight tonnage) to 20.000 DWT according to the distance and type of commodity. For bagged cement, the optimum volume the conventional ship should carry is about 6.000 DWT for a distance under 1.500 km. For the bulk tanker ships containing cement in bulk, equilibrium point yields at 15.000 DWT for over 2.000 km in distance. In road modules, a normal truck carrying bagged cement has sizes around 20T to 35T maximum payload; whereas bulk cement trucks and dump trucks can carry up to 50T in payload, depending on the road allowance. Finally, in the railing module, a typical train can carry from 500T to 1000T depending on the needs. Therefore, in getting the volume data, field surveyor should pay attention to the infrastructure conditions, meaning road condition, port draft and maximum DWT, rail and wagon capacity, and the best practice the players are currently using or would have been applying in the future development.

4.6.3 Infrastructure condition factors

Quality of road for trucks, port limitation and rail with its topographical condition are infrastructure factors that affect costing of relevant modules. In road module, road quality effects directly to the speed of vehicle and possible extra cost. Good speed yields at 30 to 35km per hour and only about 25 km per hour in a bad-conditioned route. It is better to define a scheme where observations from the route survey can be translated into speed or extra cost. In the sea module, draft and port maximum ship size allowance affect directly the choice of ship type and ship size. In railing module, topographical condition of railing can give some impact to the cost; however, the influence is small in this model as railing costing is

based heavily on fixed cost scheme. Infrastructure in railing module is more or less for reference only.

4.6.4 Handling factors

Handling, including loading and unloading activities, is the main influencer in sea modules, quite a fixed parameter in road module and just for reference for the railing module. In the sea module, handling rates at port of loading and port of discharge particularly contribute to total cost of sea module as the cost relates directly to ship time-chartering. The more the ship spends time at the port the higher the total cost increases, whereas the shorter the traveling distance is the higher percentage handling cost comprises. In getting a handling rate for shipping, the surveyor has to focus on port characteristics, ship specification and weather influence. The correspondent factors are listed on the table below, according to ship type.

TABLE 4. Handling factors in sea modules

	Conventional	Bulk tanker	Common
Port characteristic	Port cranes Loading facility & equipment (conveyor, lifts, etc.) Stevedoring	Bulk pipelines at wharf	Port ownership Handling space Queuing time Maximum trucks size Berthing time
Ship specifications	Ship cranes (number and speed)	Ship pipes (number and speed)	Max ship load
Weather influence	Raining average	No	

4.6.5 Market factors

Market factors, such as transport service competition and market balance, also influence the transport cost. Firstly, competition level at each region and local has its direct and overall influence on the cost by the level of margin the contractors apply and the negotiation level acquired. In the sea module, the negotiation margin of time-charter differs according to ship types, conventional ship, barge and bulk ship: 7%, 7% and 5% respectively. (S.P. Cement Group A, interview, 2010). Bulk ships are quite special pieces of equipment tailored according to the cement industry. Therefore, the scarcity makes it expensive and difficult in negotiating price of the quotation. On the other hand, conventional ships and barges are used very commonly by many industries across Indonesia, making the negotiation process a bit easier. In road modules, most trucking freight volume is centralized in Java island, Western and Eastern parts in particular, making the competition touch onto many players offering similar service. In fact, contractors have to give competitive price already in the quotation process to attract new customers. Negotiation margin, therefore, is quite low in such a competitive marketplace and the contractor margin is medium at the same time.

Secondly, market balance occasionally gives a strong impact on the cost when transporters are able to find back-haul, or load-to-bring-back, in a specific route. In the sea module, it is essential to raise the question if the ship, normally a conventional ship, can bring something else on the return journey. In Indonesian cement industry, the transport planner usually plans the way back with other bulk commodities, such as coal, iron, sand or other materials. Some utilize the back-haul with containers or other bagged cargo. (M.J. 2010.) In trucking, if there's obvious back-haul detected, either the contractor margin should be decreased significantly or traveling time is adjusted in half while retaining the same margin. As observed, transporting of goods between Lampung and the Western part of Java (Jakarta, Banten, etc.) can apply back-haul calculation as consumer commodity moves in large scale from production in Java to Sumatra and agriculture and mining goods come on the way back.

4.7 Model application

This part represents the applications of the cost model within the context of the benchmark and strategic study project.

4.7.1 Competition cost comparison

Since the purpose of this holistic project is to benchmark the distribution cost of players, a cost comparison is provided as the main result of the cost model and the project. Cost comparison of each market is displayed in separate spreadsheet and under column graphical chart, for better readiness.

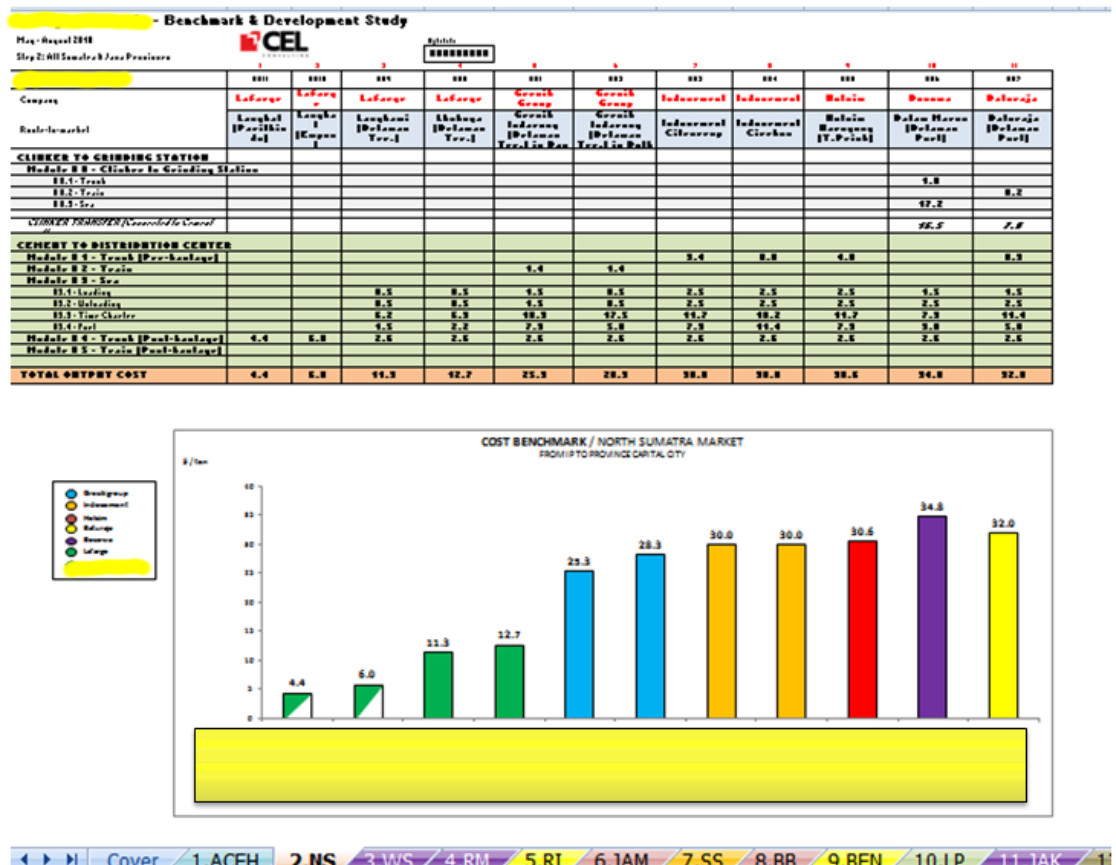


FIGURE 27. Cost benchmark summary

All flows of all players including their projections, i.e. future investment’s estimated flow, are arranged in increasing order of its cost. Cheapest and most expensive players in the market are detected while the client can decide if they should enter the competition. According to M.J. (Cement group A. 2010) the Group may

put new investment into a market if the distribution cost is X \$ cheaper than the current most cost-competitive competitor. Additionally, a table showing the breakdown of cost is also provided to support the logistics department in their planning.

4.7.2 Flow mapping

In the scope of this paper, mapping is a powerful tool to establish the data collection process of the model and delivers values to our client as one of the project deliverables. There are two mapping products derived from the project where one is the preliminary step of the costing process and another is the product of the costing model.

Firstly, “geographical flow mapping” is conducted as a brainstorming process when the project team enters a new market. Gardner (2010) states that this mapping should create a form of visualization to communicate the items of information and is descriptive as “what is” or prescriptive as “what can be”. Brainstorming in team, including the business development unit of the client, the local logistics consultant and cost model controller, helps to make sure all major routes-to-market are detected for all players. Either current (“What is”) and potential future (“What can be”) flows will be presented in this stage. Then, the cost model will run all flow possibilities to refine the best flow one player could use to deliver products to the destination

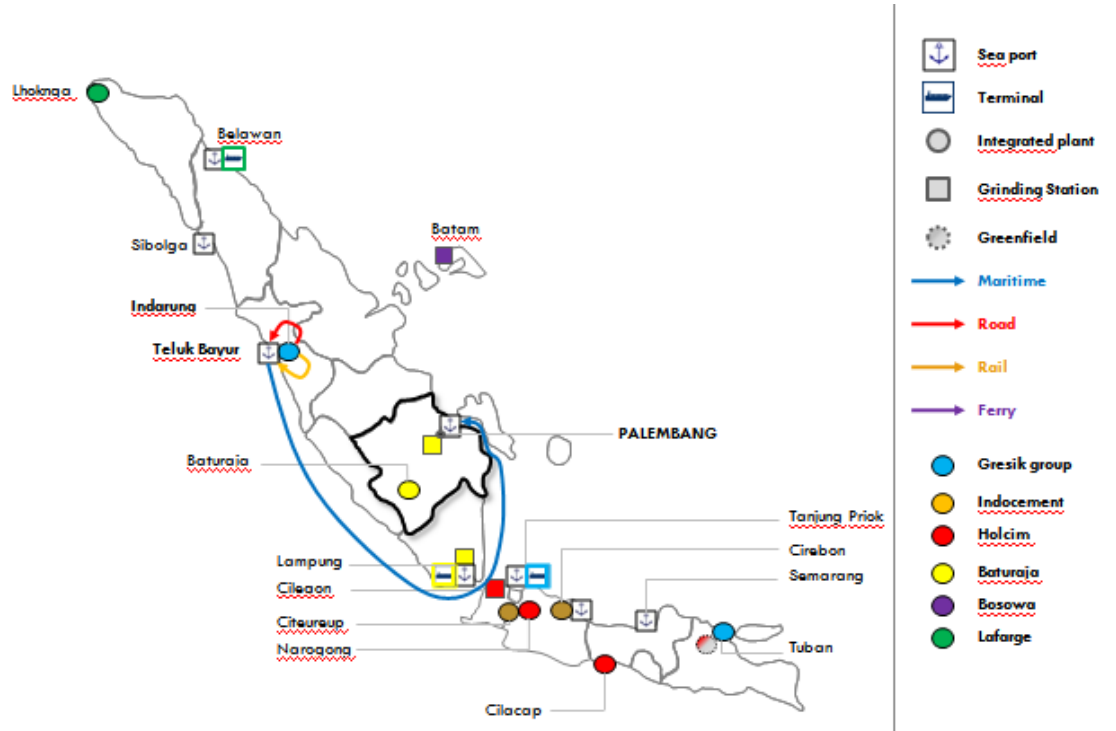


FIGURE 28. Example of geographical flow mapping

Secondly, a systemic flow mapping with information from the cost model itself is conducted as the granted need to understand the competitor operations. Systemic flow mapping is arranged in modular box style with operational info and cost elements of each step along the process. A total cost is shown at the end of the flow.

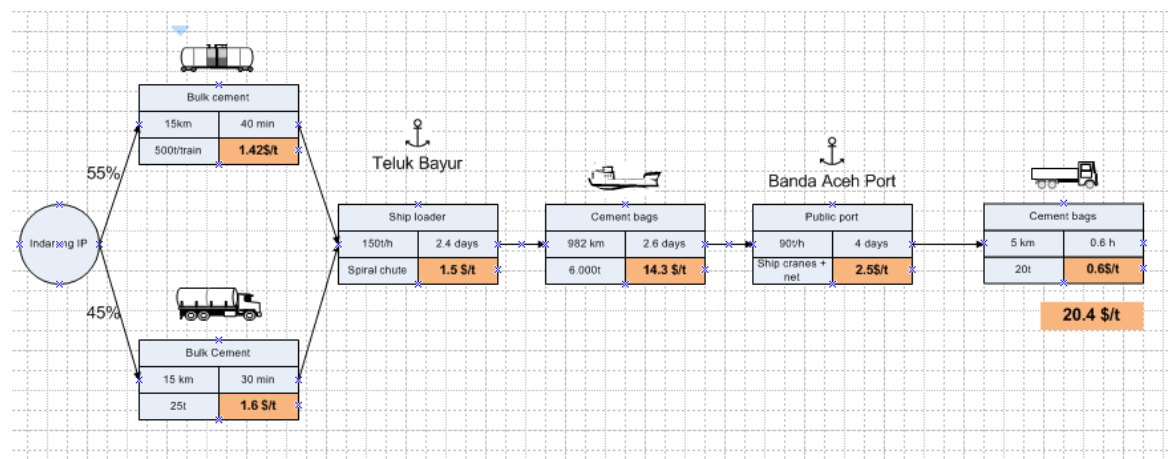


FIGURE 29. Sample of systemic flow mapping

4.7.3 Field survey information central

As previously mentioned, cost model is used in the preliminary phase for new market surveying. It helps to refine all possibilities for the initial mapping and guide the surveying team in the most reliable direction. Trade-offs such as "which port is used?" or "which routes are taken?" can be quickly answered by quick-assessment of cost.

Moreover, during the surveying process, the team would absorb a significant amount of data from the field and the information coming from different sources. Data should be evaluated and refined before inputting into the model to ensure the quality level. However, due to the time constraints, decisions on which kinds of sources to follow for investigation should be made in a real-time context that makes difficulties for the team if there is too much uncertainty on data patterns. In that context, the cost model is used to test some hypotheses of data and filter the possibilities.

4.7.4 Greenfield study

In Greenfield survey, the costing differs from normal benchmark costing by taking the cost of pozzolan flows into account, apart from the clinker and cement cost. In fact, the costing of pozzolan is applied as the same as the costing of clinker and the two components are compounded into the total cost. This extra separation helps to deliver a costing of different scenario of flow using grinding stations. The model can pinpoint which GS location is better in terms of cost when distance to its pozzolan source is varied. Similarly, when two or more limestone positions provide different investment options, the model is used to logistically evaluate its potential.

4.7.5 Pre-optimization tools

As the nature of this holistic benchmark project, the cost is calculated as per next 5 years. In fact, the flow and cost of players in the market is formulated according to all future development of the competitors themselves and taking into consideration infrastructure development, such as port development, highway, new road, new rail projects, etc. As an illustration, if a highway is projected to be built after a few years to replace a current dense traffic and road in bad condition, the cost model will take into account the distance and condition of the new highway. In case of the Cement Group A, since this project is really the first project evaluation of the new investment, the cost model has been used in a way that pre-optimizes the distribution cost by selecting the best option in term of cost.

Equally important, the model has been used in trading off different systemic options on what should be the best operation scenario. For examples, decisions can be made regarding issues such as what kind of ship should be used in a certain distance or what kind of truck sizes should be used provided extra investment in upgrading the connecting road might require. By using What-if analysis available in Excel™, the cost model provides adequate analyses to these arisen issues.

	15	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000
100	6.4	6.5	6.7	7.0	7.2	7.5	7.8	8.1	8.4	8.7	9.0	9.3	9.6	10.0	10.3	
200	7.7	7.7	7.8	7.9	8.1	8.3	8.6	8.8	9.1	9.4	9.7	9.9	10.3	10.6	10.9	
300	9.0	8.8	8.8	8.9	9.0	9.1	9.3	9.6	9.8	10.0	10.3	10.6	10.9	11.2	11.4	
400	10.2	10.0	9.8	9.8	9.9	10.0	10.1	10.3	10.5	10.7	11.0	11.2	11.5	11.8	12.0	
500	11.5	11.1	10.9	10.8	10.7	10.8	10.9	11.0	11.2	11.4	11.6	11.8	12.1	12.3	12.6	
600	12.8	12.2	11.9	11.7	11.6	11.6	11.7	11.8	11.9	12.1	12.3	12.5	12.7	12.9	13.2	
700	14.1	13.4	12.9	12.7	12.5	12.5	12.5	12.5	12.6	12.8	12.9	13.1	13.3	13.5	13.7	
800	15.4	14.5	14.0	13.6	13.4	13.3	13.2	13.3	13.4	13.6	13.7	13.9	14.1	14.3	14.6	
900	16.7	15.7	15.0	14.6	14.3	14.1	14.0	14.0	14.0	14.1	14.2	14.4	14.5	14.7	14.9	
1000	17.9	16.8	16.0	15.5	15.2	14.9	14.8	14.8	14.8	14.8	14.9	15.0	15.2	15.3	15.5	
1100	19.2	17.9	17.1	16.5	16.0	15.8	15.6	15.5	15.5	15.5	15.5	15.6	15.8	15.9	16.0	
1200	20.5	19.1	18.1	17.4	16.9	16.6	16.4	16.2	16.2	16.2	16.2	16.3	16.4	16.5	16.6	
1300	21.8	20.2	19.1	18.3	17.8	17.4	17.1	17.0	16.9	16.8	16.9	16.9	17.0	17.1	17.2	
1400	23.1	21.4	20.2	19.3	18.7	18.2	17.9	17.7	17.6	17.5	17.5	17.5	17.6	17.7	17.7	
1500	24.4	22.5	21.2	20.2	19.6	19.1	18.7	18.5	18.3	18.2	18.2	18.2	18.2	18.3	18.3	
1600	25.7	23.6	22.2	21.2	20.4	19.9	19.5	19.2	19.0	18.9	18.8	18.8	18.8	18.9	18.9	
1700	26.9	24.8	23.3	22.1	21.3	20.7	20.3	19.9	19.7	19.6	19.5	19.4	19.5	19.5	19.5	
1800	28.2	25.9	24.3	23.1	22.2	21.5	21.1	20.7	20.4	20.2	20.1	20.1	20.1	20.1	20.1	
1900	29.5	27.1	25.3	24.0	23.1	22.4	21.8	21.4	21.1	20.9	20.8	20.7	20.7	20.7	20.7	
2000	30.8	28.2	26.4	25.0	24.0	23.2	22.6	22.2	21.8	21.6	21.4	21.3	21.3	21.3	21.3	
2100	32.1	29.3	27.4	25.9	24.9	24.0	23.4	22.9	22.6	22.3	22.1	22.0	21.9	21.9	21.9	
2200	33.4	30.5	28.4	26.9	25.7	24.9	24.2	23.7	23.3	23.0	22.8	22.6	22.5	22.5	22.5	
2300	34.6	31.6	29.5	27.8	26.6	25.7	25.0	24.4	24.0	23.7	23.4	23.2	23.1	23.1	23.1	
2400	35.9	32.8	30.5	28.8	27.5	26.5	25.7	25.1	24.7	24.3	24.1	23.9	23.7	23.7	23.7	
2500	37.2	33.9	31.5	29.7	28.4	27.3	26.5	25.9	25.4	25.0	24.7	24.5	24.4	24.3	24.1	

FIGURE 30. Example of What-If analysis

5 CONCLUSION

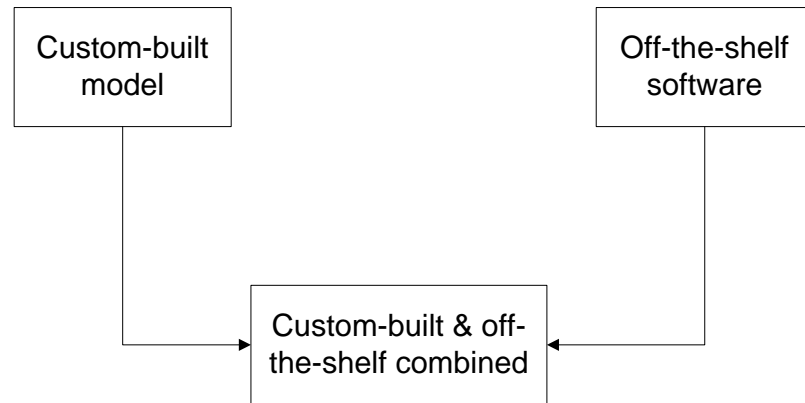
5.1 Recommendations

Improvements on interface of the model could be started to give this tailor-made model a better look and easy platform for different users to apply. This is particularly helpful for CEL Consulting, a small & boutique management consulting company, as they have a limited number of consultants that have experience in cost modeling. Visual Basic For Applicationtm is proposed as a simple tool for this upgrading. A friendly interface assists new users in applying basic costing for the cement industry, however, it may not be able to modify cost components if new constraints arise. Therefore, this upgrading is only a solution for a narrow scope of cement industry in general and Indonesian projects in particular.

Widening the scope of the cost model, a general bulk-oriented model and software-like systems are recommended in a full transformation for the cost model. On one hand, the current cost model applies only to cement with a certain product density that affects vehicle and storage volume capacity, which directly influences the logistics cost. In order to apply the model for other products, especially other bulk-oriented products due to its similarity in features, density and product characteristics should be integrated before costing. On the other hand, as shown in Figure 31 below, this custom-built model should be combined with off-the-shelf products, i.e. many other logistics costing software available in the market, to create a full- featured software that CEL Consulting can utilize in different projects in various industries and different scopes. Alternatively, the management-consulting firm can also outsource some software companies and combine with the cost model architect, normally a senior consultant who has experience in such issues, to create in-house software for the business.

Cost model to software approach

- Can be tailored to unique situations
 - Many risks
 - Expensives
 - Difficult to adjust later
- Does not fit to unique logistics issues
 - Readily available and
 - Easy to implement
 - Somewhat expensive



- Successful approach
 - Flexible
 - Cost-efficient
 - High productivity
-

FIGURE 31 - Cost model to software approach

5.2 Thesis Summary

Recognizing that the cost model holds some random errors and difficulties in operating, it has still shown good results in delivering cost modeling for benchmarking purposes of the project. This summary highlights the main discussion points from the thesis and ends with self-evaluation on the strong points and drawbacks of the cost model.

In defining the research approach, the author has decided to implement a conceptual framework to conduct the model parallel to the project, which has limited time constraint. At the same time, transport and warehousing costs are taken into account among different costs following the total logistics cost concept. The flow of materials and products are detected using mapping tools and its activities are parameter with ABC costing method. In the structure of the model, Excel™ with spreadsheet is applied to give the model a simple platform for modification and

maintenance. Input, main costing and output parts are separated in different sheets where the main layout is arranged with clinker and cement sections separated by a unit conversion. In costing method, the road module has a slightly different costing method based on its own operation whereas cost reference curves are applied in sea and rail modules. Quotation processes implemented along the costing give validity check and help the cost model orient itself to market pricing. Giving an overview picture, a summary of modules with main and secondary cost drivers are presented and the main factors are discussed in depth: distance, volume, infrastructure, handling and market condition factors. At the end, the applications of the cost model toward the benchmark project are illustrated with some snapshots of its outputs.

The cost model has its strong points as being well suited to the Indonesian market with unique local conditions and related costs. In addition, the cost model has proved to be efficient for the benchmarking project with a number of applications it delivers. Nevertheless, it also shows some disadvantages that can be improved for future use. Due to time constraint and the conceptual approach, the model is based on excel spreadsheet and has not had yet a user-friendly interface. Only the model master, who actually writes the model, can apply the model the most efficiently while new users may find it non-usable. On the other hand, as a holistic case study, the thesis allows the building of cost model to serve the benchmarking process in the Indonesian market itself. Hence, the cost model as the main deliverable of this thesis may not be used for other projects or purposes. These drawbacks give spaces for improvements, which are proposed in the previous part.

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