

EVALUATION OF CONSTRUCTION EQUIPMENT ACQUISITION
METHODS IN MALAYSIAN CONSTRUCTION INDUSTRY

MASOUD NAVAZANDEH SAJOURI

UNIVERSITI TEKNOLOGI MALAYSIA

EVALUATION OF CONSTRUCTION EQUIPMENT ACQUISITION METHODS
IN MALAYSIAN CONSTRUCTION INDUSTRY

MASOUD NAVAZANDEH SAJOURI

A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

DECEMBER 2010

To, my lovely mother and great father, for your love, support and advices. Without you, I just could not have done this. THANK YOU

ACKNOWLEDGEMENT

This project would not have been possible without the support of many individuals, who provided support and encouragement during the work leading up to, and during, my dissertation research and writing.

In particular, I would like to thank my supervisor Associate Prof. Aziruddin Ressang. His guidance and thoughtful suggestions and also his critics and friendship, have greatly inspired me. He guided and encouraged me patiently through this journey step by step.

My deepest thanks go to my parents, who always love and support me unconditionally in every way. They are the reasons I can work hard and be happy every day.

At last but not least, I am grateful to all of my close friends and classmates especially Miss. Hoha Rezaei, Mr. Saman Kasraei, Mr. Amir Ghahramanpoori, Mr. Mehdi Noorbakhash and Mr. Shervin Mehmandoost for all their help and supports to make this process enjoyable.

ABSTRACT

Purchasing with cash, financing through a loan, renting and leasing are four most common ways for construction equipment acquiring. Each of these ways has its own advantages and disadvantages, both from financially and non-financially point of view. For having a best result in profit for a construction industry choosing a best alternative for obtaining a machine is one of the most important issues that should be considered. The optimum acquisition strategy come from accurate estimates of revenues and cost and also some non-financial factors that effect on choosing acquisition mode. The purpose of this report is to identify these factors classify them and make a decision making for obtaining a best alternative of acquisition mode through the case study.

ABSTRAK

Pembelian dengan wang tunai, pembiayaan melalui pinjaman, menyewa dan sewa guna merupakan empat cara yang paling umum untuk mendapatkan peralatan pembinaan. Setiap cara ini memiliki kelebihan dan kekurangan, baik dari kewangan dan bukan kewangan. Pemilihan alternatif yang terbaik mendapatkan sebuah mesin Merupakan salah satu isu yang paling penting yang hams dipertimbangkan bagi memiliki hasil terbaik dalam mendapatkan keuntungan di industry pembinaan. Strategi pengambilalihan yang optimum berasal dari anggaran tepat pendapatan dan kos beserta beberapa faktor bukan kewangan yang mempengaruhi terhadap cara pemilihan pengambilalihan. Tujuan dari laporan ini adalah untuk mengenalpasti faktor-faktor mengklasifikasikan mereka dan membuat keputusan keputusan untuk mendapatkan alternatif yang terbaik daripada cara pengambilalihan melalui kajian kes.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xi
1	INTRODUCTION	1
	1.1 Background of Study	1
	1.2 Statement of the Problem	2
	1.3 Purpose of the Study	3
	1.4 Aim and objective of the Study	3
	1.5 Significance of the Study	4
	1.6 Scope of the study	6
2	LITERATURE REVIEW	5
	2.1 Introduction	5
	2.2 Definition	6
	2.2.1 Cash Purchase	6
	2.2.2 Conventional Financing Purchase	7
	2.2.3 Leasing	9

	2.2.4 Renting	14
2.3	Acquiring Heavy Equipment	18
2.4	Financing Methods	20
2.5	Equipment Financing Comparison	21
	2.5.1 Acquisition Comparison	21
2.6	The Buy, Lease or Rent Decision	23
3	RESEARCH METHODOLOGY	25
3.1	Introduction	25
3.2	Research Procedure	25
3.3	Research Instruments	27
	3.3.1 Literature	27
	3.3.2 Interview	28
	3.3.3 Questionnaire	29
3.4	Data Analysis	29
	3.4.1 Statistical Analysis of Questionnaire	30
	3.4.1.1 Frequency Analysis and Mean Index	30
	3.4.1.2 Average Index Analysis	31
	3.4.1.3 Single Sample T-test	32
	3.4.2 Analysis of Financial Factors	33
	3.4.2.1 Caterpillar Method for Calculating Ownership and Operating Cost	33
	3.4.2.2 Non-discounting Techniques	33
	3.4.2.3 Discounting Technique	34
	3.4.3 Multiple Attributed Decision Making	34
3.5	Respondents of the Study	35
3.6	Case Study	35
4	DATA ANALYSIS AND RESULTS	
4.1	Introduction	36

4.2	Interview Results and Analysis	37
4.3	Responses to Questionnaire Survey	41
4.3.1	Demography	41
4.3.1.1	Respondents' Job Position	41
4.3.1.2	Respondents' Experience in Construction Projects	43
4.3.1.3	Respondents' Frequency about the Project's Type	44
4.3.2	Statistical Analysis on the Classification of EAM Factors	45
4.3.3	Statistical Analysis on the Classification of EAM Financial Factors	46
4.3.4	Statistical Analysis on the Classification of EAM Non-Financial Factor	49
4.4	Financial Calculation for EAM	52
4.4.1	Cost Calculation	52
4.4.1.1	Ownership Cost Calculation	53
4.4.1.2	Operating Cost Calculation	53
4.4.2	Revenue	54
4.4.3	Net Operating Income	54
4.4.4	Taxable Income	54
4.4.5	Income Tax	55
4.4.6	Net Cash Flow	55
4.5	Financial Analysis for EAM	55
4.5.1	Payback Period Method	55
4.5.2	Cumulative Cash flow Method	56
4.5.3	Net Present Value Method	57
4.5.4	Multi Attributed Decision Making for Financial Methods	59
4.6	Non-Financial Analysis for EAM	60

	4.7	Multi Attributed Decision Making for EAM	64
5		CONCLUSION	65
	5.1	Introduction	65
	5.2	Conclusion	65
	5.2.1	Objective One: To Identify the Methods of Acquiring Construction Equipment	66
	5.2.2	Objective Two: To Identify and Classify the Financial and Non-Financial Factors Affecting on Construction Equipment Acquisition Methods	66
	5.2.3	Objective Three: To Determine the Optimum Technique of Evaluating the Modes of Acquisition through the Case Study	67
	5.3	Limitations	67
	5.4	Recommendation	68
	5.5	Further research	68
		REFERENCES	69
		Appendices A-E	73-93

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Comparisons of Financial Methods	22
2.2	Advantages of Financial Methods	22
2.3	Customer Criteria for Equipment Acquisition	24
4.1	Summary of Semi-Structured Interview	38
4.2	Statistical Results for the Respondents' Job Position	42
4.3	Statistical Results for the Respondents' Experience in Construction Projects	43
4.4	Statistical Results for the Respondents' Frequency about the Project's Type	44
4.5	Degree of Importance for Factors Affecting EAM	45
4.6	Degree of Importance for Financial Factors Affecting on EAM	46
4.7	Most Important Factors in Each Financial Category	48
4.8	Degree of Importance for Non Financial Factors Affecting on EAM	49

4.9	Most Important Factors in Each Non-Financial Category	51
4.10	Total Annual Ownership Cost for HITACHI™ Wheeled Excavators ZAXIS™ 190W	53
4.11	Total Annual Operating Cost for HITACHI™ Wheeled Excavators ZAXIS™ 190W	53
4.12	Payback Period for Each Mode of Acquisition	55
4.13	Cumulative Cash Flow for Each Mode of Acquisition	56
4.14	Present worth Factor, Net Present Value and Cumulative Net Present Value for Cash Purchase	57
4.15	Present worth Factor, Net Present Value and Cumulative Net Present Value for Finance	58
4.16	Present worth Factor, Net Present Value and Cumulative Net Present Value for Lease	58
4.17	Criteria Weight, Rate and Value for Each Type of Financial Analysis for Different Modes of EAM	60
4.18	Criteria Weight, Rate and Value for Advertisement for Different Modes of EAM	61
4.19	Criteria Weight, Rate and Value for Adaptability for Different Modes of EAM	61
4.20	Criteria Weight, Rate and Value for Availability for Different Modes of EAM	62
4.21	Criteria Weight, Rate and Value for Risk for Different Modes of EAM	62

4.22	Criteria Weight, Rate and Value for Organization for Different Modes of EAM	63
4.23	Criteria Weight, Rate and Value for Financial and Non-Financial Category for Different Modes of EAM	64

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
3.1	Methodology Flow	26
4.1	Respondents' Job Position	42
4.2	Respondents' Experience in Construction Projects	43
4.3	Statistical Respondents' Type of Projects	44
4.4	Cumulative Cash Flow Diagrams for Each Mode of Acquisition	57
4.5	Cumulative Net Present Value Diagrams for Each Mode of Acquisition	59

LIST OF ABBREVIATIONS

EAM	-	Equipment Acquisition Method
GDB	-	Gross Domestic Product
AED	-	Associated Equipment Distributors
NPV	-	Net Present Value
NPW	-	Net Present Worth
PVs	-	Present Values
DCF	-	Discounted Cash Flow
MADM	-	Multiple Attribute Decision Making

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Interview Survey Form- Semi Structured Interview	73
B	Questionnaire on “Evaluation of Construction Equipment Acquisition Methods”	75
C	HITACHI™ WHEELED EXCAVATORS ZAXIS™ 190W SPECIFICATION	81
D	Financial Rates for Malaysia	86
E	Ownership and Operating Cost Calculations	90

CHAPTER 1

INTRODUCTION

1.1 Background of the Study:

The construction industry constitutes an important element of the Malaysian economy. Although it accounts for only 2.5% of the gross domestic product (GDP) in 2007, the industry is critical to national wealth creation as it acts as a catalyst for, and has multiplier effects to the economy and also enables other industries namely manufacturing, professional services, financial services, education and others. Recent years decline in the performance of the Malaysian construction industry has resulted in the urgent need for it to chart its direction towards strengthening its foundations to face current and future challenges. ((CIDB), 2007)

When commercial manufacturing of heavy construction equipment began, the primary way to acquire a new piece of equipment was outright purchase. Players in the construction industry typically were wealthy and filled all of the primary roles i.e. owner, designer, and contractor. Without credit and financing, heavy equipment purchase probably would be limited today, much like it was in the late 1800s. The proliferation of various equipment manufacturers around the world has spawned

great competition, not just for the purchase price of the equipment, but financing, terms of use, and method of payment. (GRANSBERG, POPESCU, & RYAN, 2006)

In the current construction marketplace, equipment manufacturers, used equipment brokers, and rental companies provide a means for a user with proper credentials and competence to acquire just about any heavy construction machine available on a temporary or permanent basis. There are numerous options to consider when deciding on heavy equipment acquisition and financing. Traditionally, the equipment purchase process was complete when the contractor selected a specific make and model of machine from a dealer. The buyer received financing with a down payment, often the trade-in of an older piece of equipment. This acquisition process today includes numerous financing options and scenarios that banks, finance companies, leasing agencies, and manufacturers offer. (GRANSBERG, POPESCU, & RYAN, 2006)

The major methods of acquisition can be classified as purchase, leasing and renting. (Edwards, F.C.Harris, & Caffer, 2003)

But in better classification, there are four primary methods used to finance the purchase of construction equipment: OUTRIGHT CASH PURCHASE, CONVENTIONAL FINANCING PURCHASE, LEASING, and RENTING (GRANSBERG, POPESCU, & RYAN, 2006)

1.2 Statement of the Problem:

One of the big problems in Construction Companies is that the company need construction equipment but doesn't know whether to buy it rent it or lease it; in the

other word company doesn't know how to acquire it. (Edwards, F.C.Harris, & Caffer, 2003)

There are different factors that a good manager should mention in acquiring the equipment some are financial and some are non-financial factors. (Edwards, F.C.Harris, & Caffer, 2003) (Day & Benjamin, 1991)

By putting these factors beside each other and evaluate them and choosing the optimum mode of acquisition decision making is possible.

1.3 Purpose of the Study:

Widely using of different equipment in construction companies makes the “choose of right method of acquisition of machine” one of the important issues in this industry.

The purpose of this study is to evaluate and analyze different ways of acquiring by considering different factors that should mention in this purpose.

1.4 Aim and objective of the Study:

Aim of this study is to facilitate the decision making for finding the best alternative between rent, lease and purchasing the construction machines.

The objectives of this study are:

- i. To identify the methods of acquiring construction equipment
- ii. To identify and classify the financial and non financial factors affecting on construction equipment acquisition methods.
- iii. To determine the optimum technique of evaluating the modes of acquisition through the case study.

1.5 Significance of the Study:

Right decision making in construction industry lead to save money and increase the profitability and in construction industry the most important thing is making more profit.

1.6 Scope of the study:

The scope of the study focuses on a construction company in Malaysia and experts such as architects, engineers, contractors, consultants and etc who involve in equipment acquiring. Research will focus on Construction Company in Johor Bahru and Kuala Lumpur.

REFERENCES

Abd.Majid, M. Z. and McCaffer, R. (1997). Assessment of work performance of maintenance contractors in Saudi Arabia. *Journal of Management in Engineering*, ASCE, 13.

Caterpillar Performance Handbook, 29th ed. (1998.). Peoria, IL: Caterpillar Inc.

(CIDB), C. I. (2007). Construction Industry Development Board (CIDB). Retrieved June 05, 2010, from Construction Industry Development Board (CIDB): http://www.constructionportal.com.my/index.php?option=com_content&view=article&id=83&Itemid=565

Alan C. Elliott, W. A. (2007). *Statistical analysis quick reference guidebook*.

American Rental Association. (2010). Retrieved from <http://www.ararental.org/>

Blunden, G. H. (1980). *Comparison of Methods for Evaluating Construction Equipment Acquisition*.

Caterpillar Financial Services Corporation. (2009). Retrieved from <http://finance.cat.com/>

Construction Industry Forecast. (2006). *CIT Equipment Finance* .

contractors scramble to buy equipment. (1978). *construction contracting* .

Cudworth, E. F. (1989). *Equipment leasing partnerships* . Chicago: Probus Pub. Co. .

Day, D. A., & Benjamin, N. B. (1991). *Construction equipment guide*. Canada: John Wiley and Sons, Inc.

Donald S. Barrie, B. C. (1976). *Professional Construction Management*. *Journal of the Construction Division* , 425-436.

Edwards, D., F.C.Harris, & Caffer, R. (2003). *Management of off-Highway Plant and Equipment*. London: Spon Press.

Petridge, K. (January, 1991.). *Buy, Lease or Rent??* Concrete.

GRANSBERG, D. D., POPESCU, C. M., & RYAN, R. C. (2006). *Construction Equipment Management for Engineers, Estimators and Owners*. CRC Press is an imprint of Taylor & Francis Group.

<http://acbm.northwestern.edu/transport.html>. (2010, February 03). Retrieved from <http://acbm.northwestern.edu/index.html>:
<http://acbm.northwestern.edu/transport.html>

http://en.wikipedia.org/wiki/Transport_Phenomena_%28book%29. (2010, September 09). Retrieved from <http://en.wikipedia.org>:
http://en.wikipedia.org/wiki/Transport_Phenomena_%28book%29

<http://encyclopedia2.thefreedictionary.com/Transport+Phenomena>. (2010). Retrieved from <http://www.thefreedictionary.com/>:
<http://encyclopedia2.thefreedictionary.com/Transport+Phenomena>

<http://www.catfinancial.com>. (2005). Retrieved from <http://www.catfinancial.com>

http://www.wordiq.com/definition/Transport_phenomena. (2010). Retrieved from www.wordiq.com: http://www.wordiq.com/definition/Transport_phenomena

Hwang, C. L. (1981). *Multiple attribute decision making: Methods and applications : a state-of-the-art survey*. Springer-Verlag (Berlin and New York) .

J. Ožbolt, G. B. (2009). *Modelling the effect of damage on transportnext term processes in previous termconcrete*. *Construction and Building Materials* .

L.F.Webster. (1997). The Wiley Dictionary of Civil Engineering and Construction. Toronto: Wiley Interscience.

Nevitt, P. K., Fabozzi, F. J., & Mathew, J. V. (2000). Equipment leasing. Pennsylvania: New Hope.

P. Van den Heede, E. G. (2010). Transport properties of high-volume fly ash concrete: Capillary water sorption, water sorption under vacuum and gas permeability.

Palmer, W. C. (1977). Construction Accounting and Financial Management. New York: McGraw-Hill.

Robert erný, P. R. (2002). Transport processes in concrete.

(2005.). Warren Caterpillar. Oklahoma City.