

The Situation of Cost Management in Execution of Building Projects in Syria¹⁾

Sarab Kasem and Mohammad Bachar Alhaffar²⁾

¹⁾ This research has been conducted as part of a master dissertation by Eng. Sarab Kasem and supervised by Dr. Mohammad Bachar Alhaffar.

²⁾ Department of Engineering Management and Construction, College of Civil Engineering, University of Damascus, Damascus, Syria

ABSTRACT

This research aims at studying the situation of cost management in building projects in Syria, evaluating the applied ways of cost management and finding the suitable means to improve it.

To achieve that aim, a questionnaire was distributed to a number of workers in the building contraction sector in Syria to collect data and investigate the existing methodology in cost management in the building field.

This research shows that cost management methodology is not applied in Syrian building projects and suggests some solutions that contribute in developing the condition of cost management based on universal methodologies in this field.

KEYWORDS: Cost management, Building projects, Construction project management.

INTRODUCTION

In the construction phase, when the work performed is in progress, records of costs computed are filled with numbers that express the actual costs, then these numbers are compared with others that express the estimated costs as in the project plan, in order to clarify the deviations, correct them, treat the deviation causes and return the situation to the natural path as in the project plan and in time .

Cost management is an effective tool in the evaluation of the performance of building projects. It consists of the operations of planning, estimating, budgeting and cost control to finish the project within the approved budget.

Applying correct management methodologies in cost

variance analysis and highlighting the flaw in the construction and how we can treat this flaw, are responsibilities of the project team. This team should use cost management effectively to achieve the project goals with the least costs.

Cost management in building projects in the construction sector suffers from weaknesses in application and from the absence of clear universal methodology in performance. This problem is obvious in the records of many projects in different firms. Actual costs are higher than approved budgets. Timetables of work performance are absent, control is weak and there is no care about the relation of cost and time in the evaluation of construction projects' performance.

This research aims to describe the situation of cost management in building projects in Syria, evaluate this situation according to the universal trends and scientific bases of cost management in construction projects and

conclude with a set of suggestions and recommendations to improve the condition of

construction projects and develop the situation of cost management in Syria.

Background

Gold and Joyce (2000)	It is necessary to do a mixed watching of time, cost and work performed, and this watching becomes uncompleted if it is unable to show the relationship between these constraints and their reactions.
Flemming and Koppelman (1998)	Computerized programs are the most important tools of cost control.
Lewis , Ronald (1995)	The essential standard of cost management depends on the results of managerial decisions.
PMBOK (2004)	Cost management contains planning, estimating, budgeting and controlling.
Hilton, Maher and Selto	Costs must be managed to achieve the best value.
Jae K. Shim and Norman Hentelff (1994)	Every engineer must know how to analyze the cost and prepare the suitable reports of the cost.
Kim Heldman (2005)	It is necessary to determine the operations that contribute effectively in project management.
PMI (2000)	The management of true elements determines the cost, not the opposite.
Young Soo Jung et al. (2004)	The formation of work breakdown structure (WBS) must be elastic.
Aronld, Edward (1974)	It is necessary to do the ideal usage of existing resources.
Baker, Sunny and Kin (2000)	Cost control must be applied in the construction.

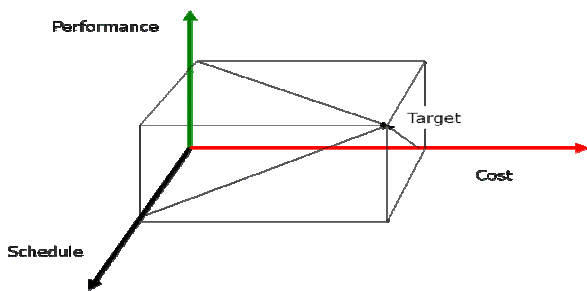


Figure 1: An Eplanatory Scheme of Cost Management

To obtain the necessary information, a questionnaire was distributed to the workers in the building sector,

including all the major projects. The results were analyzed by using statistic programs like SPSS.

It is remarkable that cost methodology is not effectively applied. What is applied is a part of the universal methodology approved by Project Management Institute PMI, relying on cost estimates in the yearly price guide published by the Ministry of Construction and Housing, far away from the term earned value.

This research defines cost management and its operations. Then, it studys the situation of cost management in Syrian building projects, and finally presents the results and recommendations.

The Definition of Cost Management

Cost management contains planning and controlling necessary to finish the project within the limited budget. It is concerned in determining the costs of all the project resources. The managerial decisions play a role in advancing the work at construction and affect immediately the project costs.

It is important to take care of the cost constraint. One of the three constraints of the success of any project

besides time and quality constraints is the cost constraint which contains the financial principles and numbers and includes human resources, materials, equipment, services and transport. Cost management should be effectively applied. It contains three operations:

- 1-Cost estimate.
- 2-Cost budget.
- 3-Cost control.

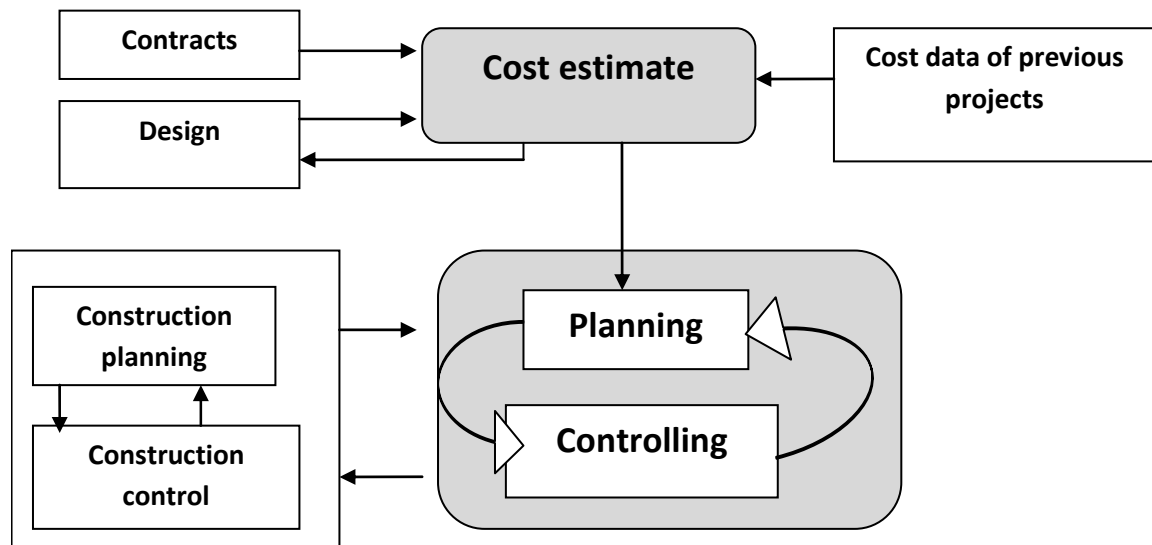


Figure 2: The Operations of Cost Management (Essentials of Cost Management, 2002)

The Operations of Cost Management

Cost Estimate

Cost estimate produces the budget of the project at its beginning. The budget is a very important document, is a part of the main project contract and is considered as a reference of planning and controlling.

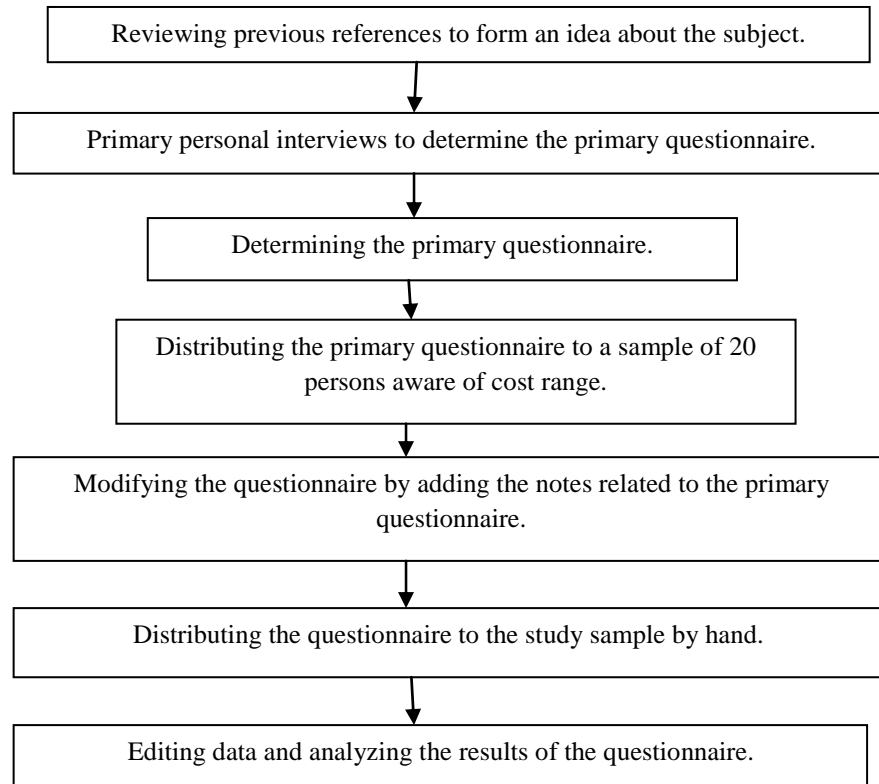
While the cost estimate is a complex operation because of uncertainty in the interrelations associated with the construction nature, cost control will provide us with a background of cost estimate for improving the quality of existing information and using it in future cost estimation.

Cost Planning and Controlling

After cost estimate, financial operations will be planned and controlled in the construction phase by the cycle that is composed of two sub-operations: cost planning and cost control.

Cost planning contains repeating the primary cost estimate and generating the cash flow depending on the additional information generated through the project, like scheduling of payments to the main resource suppliers and sub-contractors. This generation depends on the construction plans and this sub-operation effectively supports the decision-making.

The Steps of Questionnaire's Design



The Properties of the Questionnaire

Level of response	Number of respondents	Number of distributed forms	Number of pages	Number of selections	Number of questions
Very good	70	75	3	40	20

Besides cost estimate, cost planning depends mainly on the feedback of cost control. Plans may be changed according to situations, and these plans need always paying attention to them and highlighting them.

Cost control aims at assessing the actual cost performance and determining the improvement opportunities. Cost control doesn't finish by comparing the estimated performance and the current performance, but it concentrates on generating value. Figure 2 shows the operations of cost management.

The Questionnaire

The questionnaire was distributed to 75 persons. The number of respondents was 70 with a ratio of response of 93.3%. The response ratio was high, because every form was given to each person by hand.

The questionnaire was distributed to the following entities working in construction:

- 1- The directory of technical services/Damascus (5 contractors).
- 2- The order of engineers (7 contractors).

- 3- Contractors of the public sector within the municipalities of Demas, Sahnaya, Zabadany, Bettema, Gdedtartoz in rural Damascus (25c).
- 4- University of Damascus, College of Civil Engineering, the persons who supervise the projects (3c).
- 5- The Firm of Military Constructions(2c).
- 6- The Public Firm of Building and Construction (2c).
- 7- The Firm of Military Housing (2c).
- 8- Private offices working in contracts (3c).
- 9- The Organization of Classification in the Ministry of Construction and Housing (12c).
- 10- The central order of contractors(3c).
- 11- The order of contractors in rural Damascus(3c).
- 12- The order of contractors in Damascus(3c).

Note: In this way, nearly all entities working in construction were covered.

c = contractors.

The Programs Used in Treating and Analyzing Data

- 1- Excel program: to enter data of the questionnaire and the respondents, tables of data are designed to be transferred to the statistic program (spss-v.17).
- 2- Spss-v.17 program: to treat data.

The Study Sample

The final questionnaire was distributed to 70 contractors and engineers, according to the following statistic equation, with an error estimate of ± 10% and a probability of 90%, then the sample was calculated as follows:

$$n = \frac{0.25}{\frac{e^2}{z^2} + \frac{0.25}{N}}$$

where:

- n: The size of the study sample.
- e: Mean error or estimated error.
- Z: The area of every standard deviation of the mean under the natural distribution .
- N: The size of the society.

Then, the size of the sample was calculated as:

$$n = \frac{0.25}{\frac{0.1^2}{1.64^2} + \frac{0.25}{325}} = 56$$

The size of this sample represents the statistic society, so the results of this study can be generalized on the contractors who are working in building in Syria.

Now, the number of registered contractors in the central order of contractors is 12000.

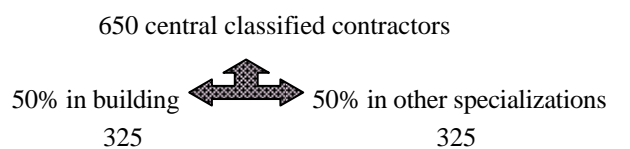
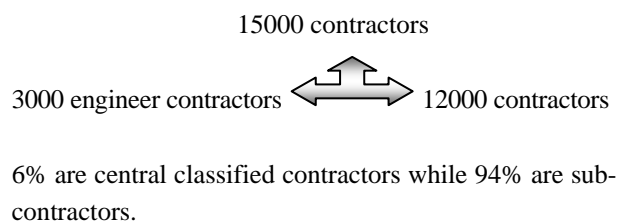
The ratio of engineers who are working in contracts is:

(25-30)%. So:

$$30\% * 12000 = 3600 \text{ engineer contractors.}$$

This means that the number of registered contractors in the central order of contractors is nearly 15000.

There are 650 central classified contractors, 325 of them are working in building.



Content of the Questionnaire

- 1- The method of cost estimate of the project in the firm.
- 2- Tools and methods of cost control at the site, as: the system of changing cost watching, performance measurement, earned value management and using computerized tools.
- 3- The used documents in construction, as: cost baseline, performance measuring and cost management plan.

The Correlations

The First Statistical Supposition

There are no differences of statistic significance between the means of the answer degrees of the sample individuals about the situation of cost management in the execution of residential building projects according to the kind of job sector.

Conclusion

Table (1) shows that the number of sample individuals in the public sector is (36) with a mean of response of about (28.81) and that the number of sample individuals in the private sector is (34) with a mean of response of about (32.912).

Table 1. Group Statistics Due to Kind of Job Sector

The Kind of Job Sector	N	Mean	Std. Deviation	Std. Error Mean
Public	36	28.8056	4.72573	0.78762
Private	34	32.9118	5.54523	0.95100

Table 2. Situation of Cost Management

Independent Sample Test							
Situation of Cost Management	Levene's Test for Equality of Variances		T-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.658	0.420	-3.341	68	0.001	-4.10621	1.22914
Equal variances not assumed			-3.325	64.974	0.001	-4.10621	1.23481

Table 3. Group Statistics Due to Years of Expertise

Years of Expertise	N	Mean	Std. Deviation	Std. Error Mean
More the 10 years	43	29.8889	5.80009	1.11623
Less than 10 years	27	31.3721	5.30060	0.80833

Table 4. Independent Sample Test Related to Years of Expertise

	Levene's Test for Equality of Variances		T-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.126	0.724	-1.099	68	0.276	-1.48320	1.34975
Equal variances not assumed			-1.076	51.630	0.287	-1.48320	1.37818

Table 5. ANOVA Test for Cost Management

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	115.311	3	38.437	1.284	0.287
Within Groups	1975.889	66	29.938		
Total	2091.200	69			

Table (2) shows that the value of significance level is (0.001) which is smaller than the level of considerable statistical significance ($\text{sig.value} < 0.05$). As a result, the null hypothesis was refused and the result concluded was: There are differences of statistical significance between the means of respondent degrees of the sample individuals about the cost management situation in executing building projects according to the kind of job sector. These differences are in favor of the private sector as its mean is higher. The cause is the dependence of the government on the public sector in governmental projects for a long time. The private sector entered as a competitor to the public sector, so it developed its ability in this field.

The Second Statistical Supposition

There are no statistically significant differences between the means of degrees of respondents about the situation of cost management in the execution of building projects according to the years of expertise.

Conclusion

Table (3) shows that the sample individuals of the second class (27) have a response mean of about (31.38) and that the sample individuals of the first class (43) have a response mean of about (29.88).

It is concluded that ($\text{sig.value} = 0.276 > \alpha \text{ value} = 0.05$), which means that the null hypothesis was accepted: There are no statistically significant differences between the mean degrees of sample respondents about the situation of cost management in executing building projects according to the variable of years of expertise.

The Third Statistical Supposition

There are no statistically significant differences between the mean degrees of sample respondents about the situation of cost management in executing building projects according to the nature of the job.

Table 6. Results of Questionnaire Questions

	no	yes	No.
Relating to cost planning	45.71	54.29	Question 1
Cost management documentation	24.29	75.71	Question 2
Having WBS	62.86	37.14	Question 3
Using previous information in estimation	41.43	58.57	Question 4
Determining the cost resources at the beginning	70	30	Question 5
Using computerized programs	62.86	37.14	Question 6
Causes of selecting ways of estimate and cost control	34.29	65.71	Question 7
Cost plan documentation	54.29	45.71	Question 8
Considering work changes in the execution	41.43	58.57	Question 9
Considering resource cost changes	55.71	44.29	Question 10
Determining cost estimate according to WBS	58.57	41.43	Question 11
Determining project financial ways in the beginning	48.57	51.43	Question 12
Financial change documentation	40	60	Question 13
Developing cost baseline after the change occurrence	54.29	45.71	Question 14
Actual cost change of the cost estimate	27.14	72.86	Question 15
Considering the deviations of cost in the construction	52.86	47.14	Question 16
Applying earned value management	54.29	45.71	Question 17
Showing out the reports of actual cost performance	55.71	44.29	Question 18
Owner control contains the accuracy of construction	54.29	45.71	Question 19
The level of contractor observance of conditions and descriptions	45.71	54.29	Question 20

Conclusion

Table (5) shows a significance level of ($p=0.287>0.05$). There are no statistically significant differences between the mean degrees of sample respondents about the situation of cost management in executing building projects according to the nature of

the job (supervisor, studier, manager, contractor).

Not applying cost management methodology in engineering projects in Syria is due to the ignorance of most works in the construction sector of cost management information.

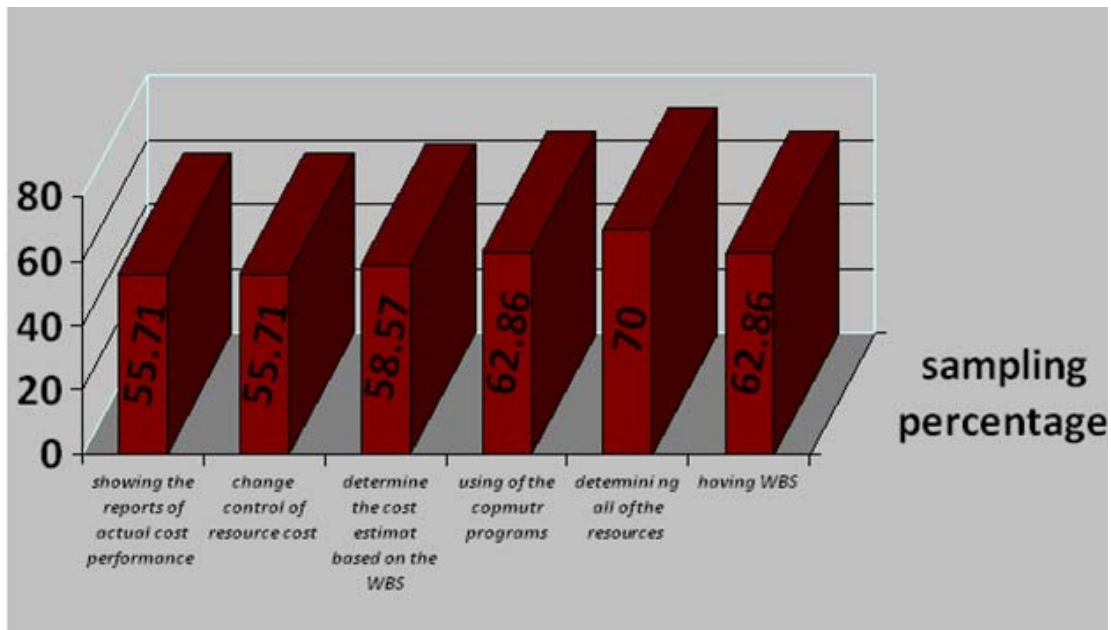


Figure 3: Most Important Factors

The standard of the factors is:

Every ratio more than 55% is one of the most important factors, every ratio between 45% and 55% is an important factor and every ratio less than 45% is less important.

Figure (3) illustrates the most important factors.

It is clear from the questionnaire that the most important factors in improving the situation of cost management in building projects in Syria are:

- 1- Determining all the project resources as: workers, machines, site equipment, materials and suppliers, in the beginning of the project and through the design stage and in preparing the primary estimated costs; where there are 70% of the studied sample individuals who don't determine all the required project resources.
- 2- Having a suitable obvious work breakdown structure that contains all the project works in logical hierarchy, where 62.86% of the studied sample individuals haven't a suitable WBS while determining the project budget.

- 3- Using computerized programs for cost analysis, as: primavera project and cost analysis programs, that saves time, where 62.86% of the studied sample individuals don't use specialized computerized programs to estimate and control the costs, and only use the EXCEL program in estimating the costs.
- 4- Making cost estimate based on work breakdown structure. The estimated cost is given as a value to contract on it without caring about the ability of the contractor in covering all the project resources that exist in the WBS. 58.57% of the studied sample individuals don't estimate cost based on the work breakdown structure (WBS).
- 5- Taking care of change control of project resources as: prices, distribution, importation and waste. 55.71% of the studied sample individuals don't apply resources' cost change control.
- 6- Preparing reports of the project progress performance, depending on earned value in execution, and avoiding the traditional way that is applied on most projects depending on planned

value and actual cost. 55.71% of the studied sample individuals don't show out the reports of actual cost performance.

RECOMMENDATIONS

- 1- Inserting cost planning effectively in the project plan, and giving time to prepare the suitable studies of project primary cost estimate.
- 2- It is necessary to put the current pricing for the project immediately before construction and create the elasticity in the private price guide of building construction to respond to the current change in material prices by finding the net connecting the current material prices and the used project material prices at the site.
- 3- It is suitable to use cost analysis program and primavera program in all building projects, because these programs produce cost reports quickly and obviously.
- 4- It is necessary to enter the earned value

management principles as a condition in project execution, because they are able to treat the cost deviations and help in ideal decision making in construction.

- 5- It is beneficial to generalize the work breakdown structure (WBS) concept and apply it in the projects of the public sector, as well as to prepare it separately in the cost planning .

Suggestions

- Entering the special program of cost analysis that helps project managers in decision making in the construction works by using colors to recognize the phases of execution at the site. This program started in the UK and was then published to be used in the world. It is necessary to prepare the tools and suitable circumstances and apply the cost management methodology correctly.
- Increasing the research in cost analysis, because it is an important element in the recent world dominated by the global financial crisis.

REFERENCES

- A Guide to the Project Management Book of Knowledge. (PMBOK® Guide), Third Edition, © 2004, Project Management Institute, Four, Campus Boulevard, Newtown Square, PA 19073-3299 USA.
- A Guide to Project Management Book of Knowledge, Chapter 7, PMI, 2000.
- Architects' Essentials of Cost Management, Michael D.Dellsola, PE, CVS, 2002, John Wiley and Sons, Inc., New York.
- Arnold, Edward. 1974. Control of Engineering Projects, London.
- Avots. 1969. Why Does Project Management Fail? *California Management Review*, 12 (1): 77-82.
- Baker, Sunny and Kin. 2000. Project Management, 2 ed., Alpha Books.
- Construction Cost Management, Bowen Brain, The Architect Handbook of Professional Practice, 13th edition, Chapter 14, p 462.
- Construction Cost Control, ASCE Manuals and Reports of Engineering Practice No. 65, American Society of Civil Engineers, New York, 1985.
- Datar and Foster, Cost Accounting Managerial Emphasis, Eleventh Edition, Horngren.
- Locke, D. 1976. Project Management, St. Martin's Press, New York.
- Fellows, R. and Lui, A. 2005. Research Method for Construction, Blackwell, London.
- Field, A. 2000. Discovering Statistics Using SPSS for Windows: Advanced Techniques for the Beginner, London, Sage Publications.
- Fleming and Koppelman. 1998. Earned Value Management, A Powerful Tool for Software Projects. *Crosstalk*, July.
- Fleming, Q.W. and Koppelman, J.M. 2005. Earned Value

- Project Management, Third Edition, PMI.
- Glaser, B. 1998. *Doing Grounded Theory: Issues and Discussions*. Mill Valley, Ca: Sociology Press.
- Gold, F. and Joyce, N. 2000. *Construction Project Management*, Prentice-Hall, Inc, USA.
- Hendrickson, Chris and Au, Tung. 1988. *Project Management for Fundamental Construction Concepts*, Prentice-Hall, Inc., Englewood Cliffs, NJ.
- Hilton, Maher and Selto. *Cost Management, Strategies for Business Decisions*, 2nd Edition.
- Humphreys, Kenneth. 1991. *Cost and Optimization Engineering*, 3rd Edition, McGraw-Hill, Inc., New York, USA.
- ITRM Guideline CPM 110-01. 2006. *Project Management Guidelines*, Section 4.
- Jae K. Shim and Norman Hentelff. 1994. *Accounting and Finance*. California State University.
- Kim Heldman. 2005. *PMP, Project Management Professional*, 3rd Edition, Canada, Wiley Publishing.
- Kerzner, Harold. 1998. *Project Management, A System Approach to Planning, Scheduling and Controlling*, Harold Kerzner, Van Nostrand Rinehold.
- Lewis, Ronald. 1995. *Activity-Based Models for Cost Management System*, London.
- Lukas, Joseph A. 2008. *Earned Value Analysis-Why It Doesn't Work*. AACE International Transactions.
- Parid Nachmias and Chara Nachmias. 1997. *Research Methods in the Social Science*, 3rd ed., New York, St. Martin's Press, 200.
- PMI. 2005. *Practice Standard for Earned Value Management*, PMI.
- PMI-Project Management Institute. 2004. *Practice Standard for Earned Value Management*.
- Young Soo Jung, A.M. Asce and Surgkwon Woo. 2004. *Flexible Work Breakdown Structure for Integrated Cost and Schedule Control*. *Journal of Construction Engineering and Management*, 130 (5): 1.