Chapter 7

Evaluation and Discussion

7.1 Introduction

This chapter is to analyze result of implementation after the systems and computer program design in previous chapters have been applied to the project execution. Such analysis is a useful part of implementation assessment and is worthwhile exercise to carry out in the project. The analysis is to compare project performance of the first project **(Project A)**, the pilot project used to determine problems and needs, with project performance of the second project **(Project B)** where the systems have been applied.

Both projects are lumpsum contract basis and similar on project size (scales) and scope of work and the main materials supply; cable, steel, and cable tray are selected to be reference in evaluation. These projects are evaluated at the end of project completion by the financial figure record. In evaluation, there is assume that many factors effected to project execution i.e. individual management performance, effect of different character of clients, effect of timing difference etc. are to be ignored.

7.2 Evaluation and Discussion

The data record in table for **Project A** and **Project B** as below is to be used to illustrate result of implementation :

Project A : Total contract value 24,000,000 Baht

Material item	Value of materials (Baht)			
	Total plan (Budget)	**Total actual purchase**	**Available stock**	**Installation report**
Cable	6,500,000	6,680,000	550,085	5,920,400
Steel	1,500,000	1,537,500	130,000	1,360,600
Cable tray	2,400,000	2,445,000	197,800	2,175,240

Table 7-1 : Data record of Project A

Project B : Total contract value 21,000,000 Baht

Material item	Value of materials (Baht)			
	Total plan (Budget)	**Total actual purchase**	**Available stock**	**Installation report**
Cable	5,900,000	6,046,000	117,290	5,778,000
Steel	1,150,000	1,176,000	21,280	1,125,000
Cable tray	1,900,000	1,934,200	34,620	1,853,300

Table 7-2 : Data record of Project B

Below, the different type of percentage analysis is presented for comparing between of Project A and Project B :

	Project A	**Project B**
1.Percentage of replenishment cost over budget plan		
Cable	2.77%	2.47%
Steel	2.50%	2.26%
Cable tray	1.84%	1.80%
2.Percentage of deviation of available stock plus installation report from total actual purchase		
Cable	3.14%	2.49%
Steel	3.05%	2.53%
Cable tray	2.94%	2.39%
3.Percentage of value of surplus inventories after project complete compare with total actual purchase		
Cable	8.23%	1.94%
Steel	8.46%	1.81%
Cable tray	8.09%	1.79%

Percentage of replenishment cost over budget plan

Actual project costs are greater than was expected (budget plan) may depend on the accuracy in the plan. However, the percentage of replenishment cost over budget plan of Project B less than Project A is also probably be result of the improvement of materials planning and control apart from the accurate plan of Project B.

Percentage of deviation of available stock plus installation report from total actual purchase

This percentage is the waste of materials use in project that may be caused from scrap, materials loss, incorrect reports etc. This percentage is to identify the efficiency of materials control and reporting of stores and project team and efficiency of materials utilization. Thus, the percentage of deviation of available stock plus installation report from total actual purchase of Project B less than Project A can reflect on improving the efficiency of these.

Percentage of value of surplus inventories after project complete compare with total actual purchase

This percentage reflects on the efficiency of materials plan and control. Thus, the percentage of surplus inventories of Project B (below 2%) less than Project A(~8%) can reflect on significantly improving the materials plan and control of Project B. As a result the percentage of surplus inventories can be decreased below 2% of total order value, so if the new systems were applied to Project A,the expected cost of surplus inventories in this project value (550,085+130,000+197,800)-(2%*(6,500,000+1,500,000+2,400,000)) = 669,885 Baht or 2.79% of total contract value can be saved.

In addition to evaluation, we can summarize the waste of site operation caused by inefficient site resource and inventory management into 3 major folds :

1.Waste from the wrong articles buying

Inefficient materials plan, difficulty in materials take off and inaccurate recording are caused to the wrong materials buying that can be divided into 2 groups :

1.1 the wrong articles buying but can return or change value approximately 70% of total wrong articles buying (a lot of items but low value)

1.2 the wrong articles buying and cannot return or change value approximately 30% of total wrong articles buying (a few items but high value)

From historical data record, each projects has the wrong articles buying about 2~3 % of total order value. When the new systems are applied, we expect that more than half of the wrong articles buying probably be able to reduce (below 1%) because the material plan is to be improved, the plan has more accuracy and reduce error of understanding between the requisitioners and the purchasers by the reference of materials standard code and description.

2.Waste from idle time, idle manpower

In old systems, there is difficulty in forecasting when materials should be placed order and how many. Some project has material items more than 1,000 records (include items of client supply). The forecasting of the old system is mostly done by experience of site purchasing representative and the error often occur and result to the under-or overstocking. The idle time or idle manpower caused by materials shortage is the result of understocking. For the new systems, the computer program design the data record as table below

Table 1 Material take off separated by each working areas

Materials code	Materials Item	Quantity	Working area

Table 2 Working areas record

Working area	Start date	Finished date

Both tables are related by working area. If we want to know what materials need on next month and how many, we will search the working areas which start date is on next month from Table 2 , then matching with the working areas in Table 1 to sum quantity of materials need of each items. By the capability of program design (Relational Database), this process can do in short time and accurately. And, if the project schedule has been revised, we only update change of schedule in Table 2 then command the re-calculation by program.

From historical data record, the waste from idle time (idle manpower) caused by shortage of materials is about 5% of total wage of manpower in project and we expect that more than half of this cost probably be able to reduce by implement the new systems (below 3%).

3.Waste from unbalance materials reconciliation

There is the problems in materials of client supply. These materials are to remain the client's property while off his premises and the contractor has to adequately protect these materials at all time. After project is completed and handovered, the contractor has to reconcile or prepare balance report of client supply materials and submit to the client. Normally, the client set the tolerance of each items about 3~5%. Unbalance reconciliation generally occurred from inefficient recording, materials stolen or pilfered caused by poor storing, and damage, spoilage or loss during installation etc.

From historical data record, the value of unbalance reconciliation outside tolerance of materials supplied by client that we have to compensate this cost to the client after project completion is about 3% of total contract value. As the new systems improve on the efficiency of site operation monitoring, so the cause of the problems is to be identified and remedial action is to be taken at early stage. Thus, we expect that more than half of this waste probably be able to reduce by implement the new systems (below 1%).

Example of **Project A** :

Total contract value 24,000,000.00 Baht

Total materials supply value 12,696,700.00 Baht

Total wage of manpower 3,600,950.00 Baht

Total compensated cost to client due to unbalance materials reconciliation

652,000.00 Baht

Expected cost reduction from the new systems applied compare with the waste assessment of the old system implement is shown in table below

Item	Description	Old systems (Baht)	New systems (Baht)
1	Waste from the wrong articles buying	114,270.30 (3% * 12,696,700 * 30%)	57,135.15
2	Waste from idle time, idle manpower	180,047.50 (5% * 3,600,950)	90,023.75
3	Waste from unbalance materials reconciliation	652,000.00	326,000
	Total	946,317.80	473,158.90

Table 7-3 : Expected cost reduction of Project A

Conclusively, if the new systems were applied to Project A, the expected cost value 473,158.90 Baht or 1.97% of total contract value can be saved due to the waste were reduced or eliminated.

Apart from such waste evaluations, one issue that has addressed to assess implementation is the reduction of client complaint. The cases of client complaint in site operation, apart from dissatisfy in quality of work, are, for example:

- project tasks delay due to insufficient resources (resources not on hand to satisfy demand for the item the moment it occurs, resulting in field work stoppage)
- loss of *client supply* items and stockout may be effected
- inefficiency of reporting (i.e. out of date, inaccurate report etc.) ,may effect to client plan of their supplied items

These cases can be improved by the systems implementation, so the number of client complaint can be reduced. However, the trade off between operational cost for resource management to satisfy the client or field work and the effect of complaint should be investigated case by case.

As a result, the percentage above is significantly decreased and the waste can be reduced or eliminated by applying the new systems development, this is a significant improvement on site resources management and site inventory management to attain the objective proposed in chapter 1.