CHAPTER 4
IMPLEMENTING PRINCE2 IN RELOCATING MOBILE SERVICE CENTER

PRINCE2 methodology is worldwide accepted and vastly used in managing project, however, there are no identical project and each project is unique. Therefore, when applying PRINCE2 to manage a project, it has to be adjusted and optimized in order to conform to project and ensure that project will succeed effectively.

A case study is set up to study the appropriate way to apply PRINCE 2 in a telecommunication project. "The MSC Relocation Project" is selected as pilot project for this case study. The project deals with site preparation, equipment installation and commissioning the mobile phone exchange located in a province.

Although the telecommunication equipment uses high technology and it is very complicate product, however, the nature of telecommunication project is similar to other types of project. That means it can be divided into phases according to the project life cycle. For this case, the MSC relocation project is divided into four phases, but this case study focuses only on the first three phases which are start-up phase, planning phase and implementation phase. When the case study project is divided into phases, PRINCE2 can be easily applied because it is designed as process-driven approach. PRINCE2 processes are applied with the project execution process based on the phase of project life cycle. The relation of PRINCE2 processes and the project execution process of the case study project is shown in figure 4.1.

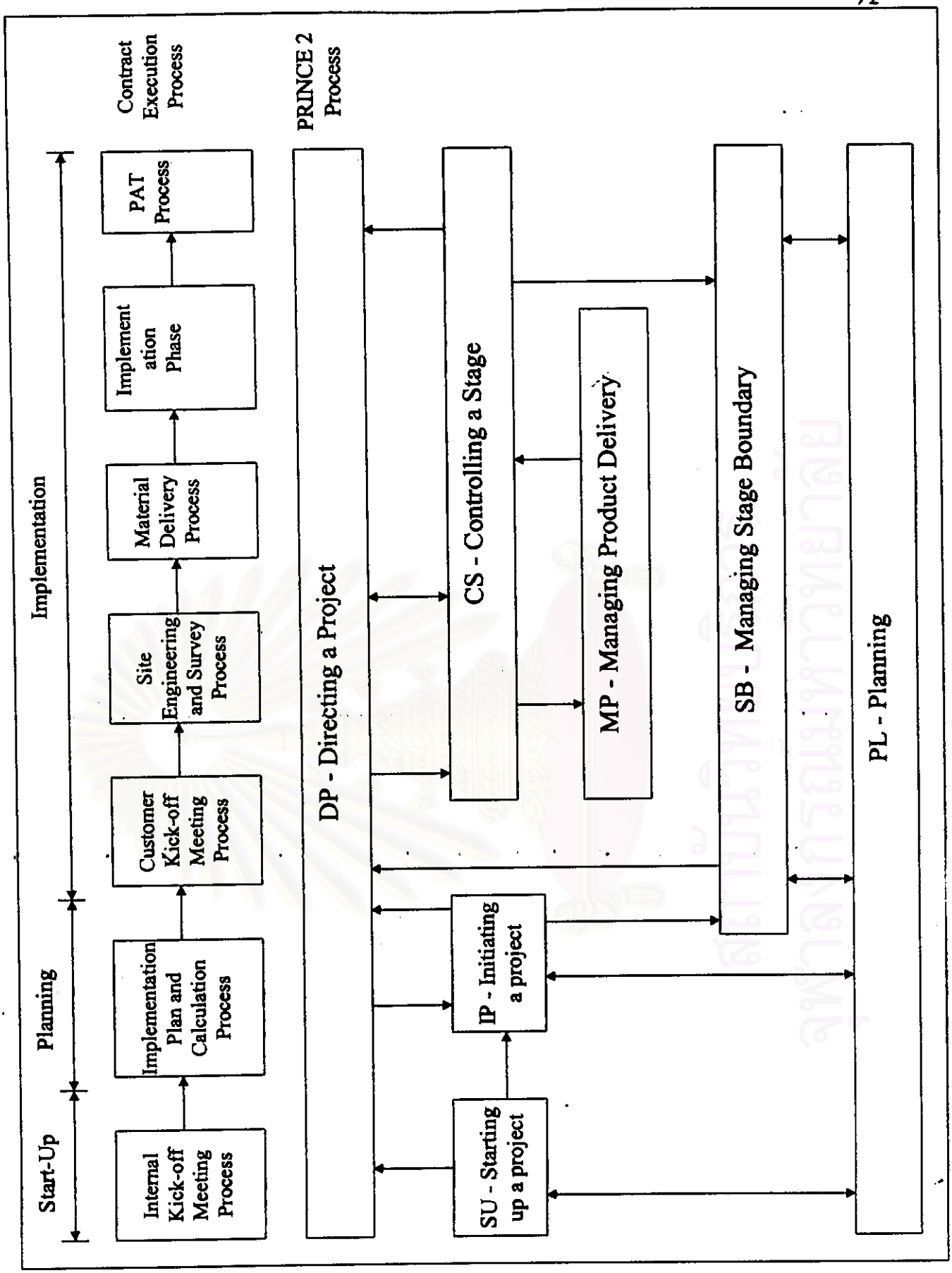


Figure 4.1: Relation of PRINCE2 process and the project execution process of the case study project

4.1 Start-Up Phase

Start-Up Phase is the first stage of the project life cycle. The main work of this phase is to set up fundamental structures which are necessary for planning and implementing project in later phases. Figure 4.2 presents how the PRINCE2 processes are applied with the existing project execution process to build up processes for the case study project during start-up phase. The left block shows the existing project execution process which consists of only one process, 'kick-off meeting process'. While three of PRINCE2 process (SU, DP and PL) were also applied in this phase and they are shown as the right block of figure 4.2. Both kick-off meeting process and SU process contain the task of 'appointing a project management team'. When applying PRINCE2, the case study project not only cover the existing work process but also include some additional works of PRINCE2 processes like defining roles and responsibilities of project team and creating initiation stage plan. The process of the case study project is shown as the central block of the figure 4.2. It contains the combination of processes as well as tasks of the existing project execution process and the PRINCE2 process.

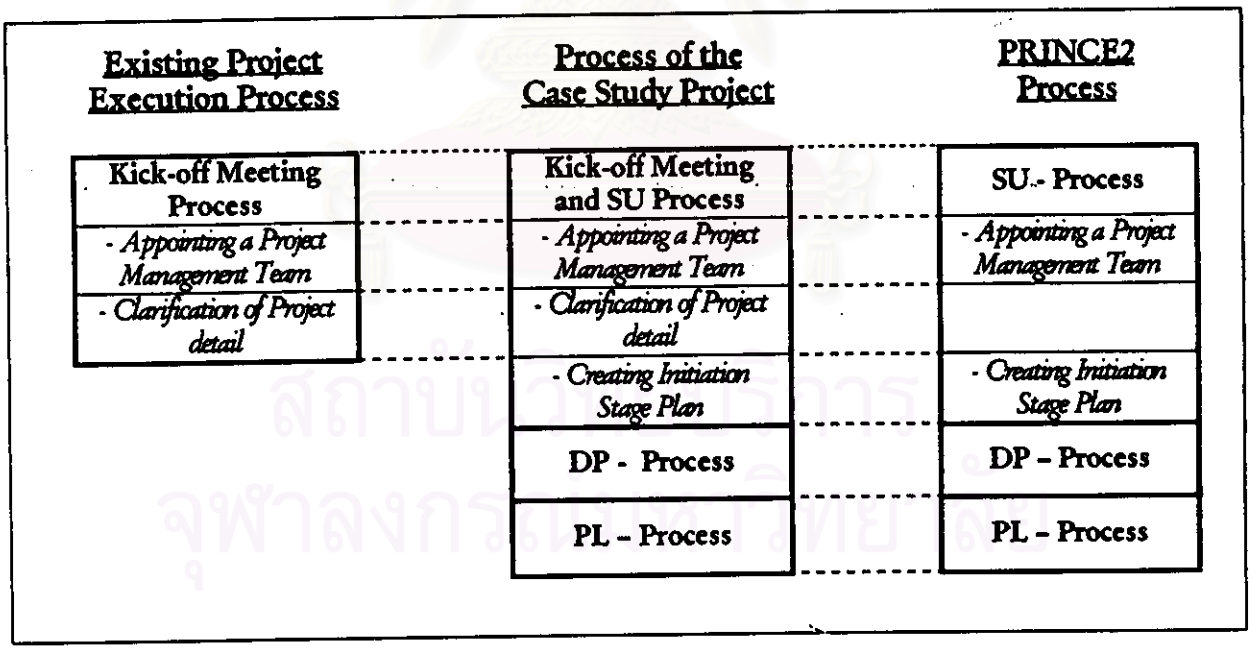


Figure 4.2: Process of the case study project during start-up phase

During Start-Up phase, three processes of PRINCE2, as shown in figure 4.3, are applied in organizing start up of the project.

- Starting Up a Project (SU) process
- Planning a Project (PL) process
- Directing a Project (DP) process

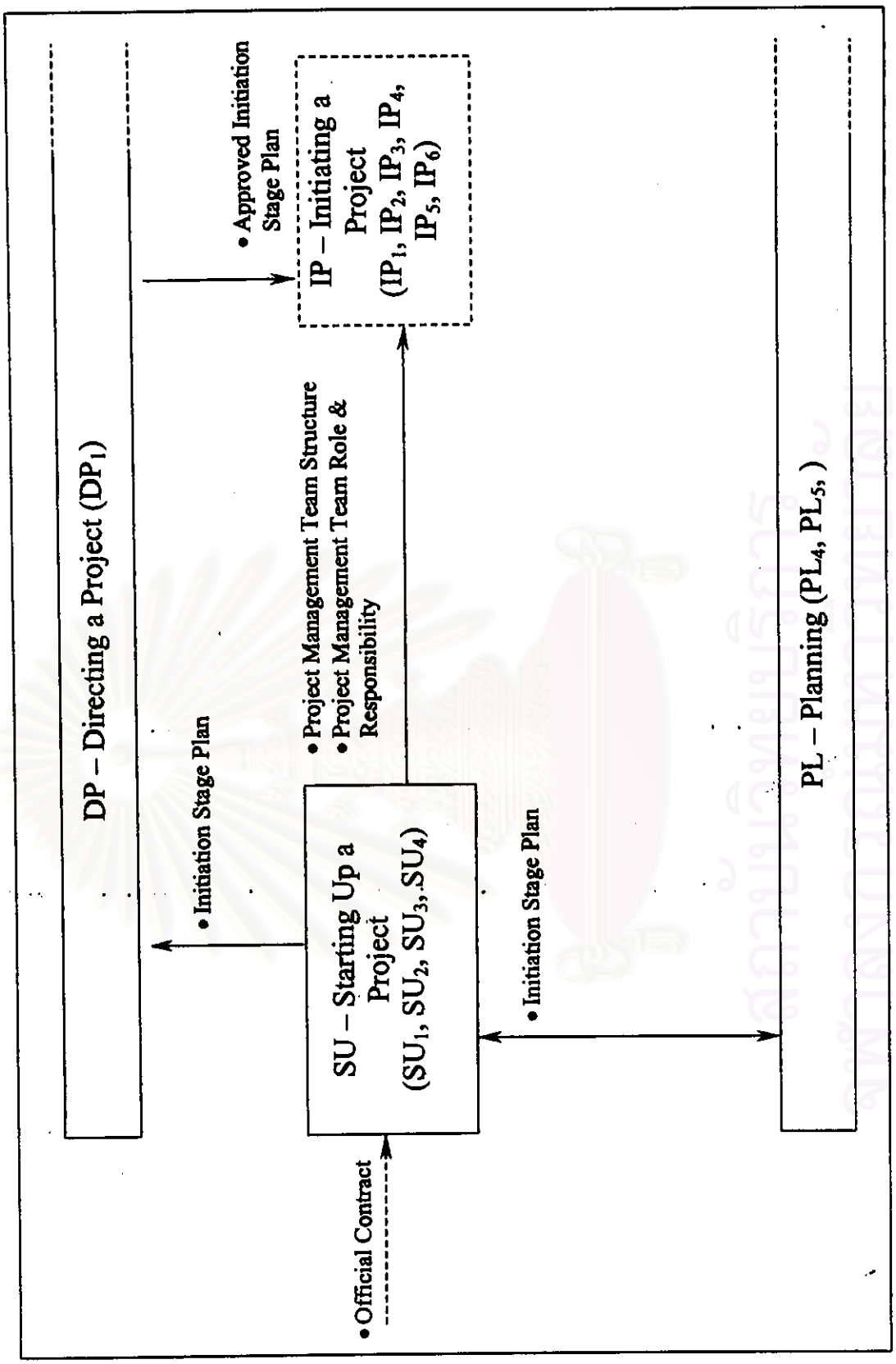


Figure 4.3: Relation of PRINCE2 processes during Start-Up phase

1. Starting Up a Project (SU) process

For PRINCE2, the "Starting Up a project (SU)" process is the main process for the start-up phase. The main objective of this process is to create.

I. Project Management Team Structure [SU_1, SU_2/Figure 4.4]
II. Project Management Team Roles & Responsibilities [SU_3/Table 4.1]
III. Initiation Stage Plan [SU_4/Figure 4.5, Table 4.2]

I. Project Management Team Structure

Input: Official contract
Sub-process: SU_1, SU_2
Components: -
Techniques: -

In managing a project, initially, project management team structure was designed and formed up. It consisted of a group of people with various skills to manage and conduct project work. The sub-process SU_1 and SU_2 were applied in forming up project management team structure. Since, the chief of the contract management department has accountability in the outcome of all contracts which company has been awarded from the customer. Thus the senior project manager who was the head of contract management department was represented as project board of the PRINCE2 project organization structure.

After that the senior project manager selected and appointed a project manager to manage this project. This major decision of the senior project manager was mainly based on background of the project manager and his loaded task at that moment. Finally, the project manager, who had experience in that field of project and product and also had ever dealt with the customer, was appointed as project manager for this case study.

When the project manager confirmed his availability and acceptance of his role and responsibilities in carrying out this project, he began to study the information, related to the project from the official contract. Studying the contract helped the project

manager to gain more understanding on various aspects of the project and to form up the appropriate organization structure to undertake the project. As a result, the project manager decided that project organization should consist of five main areas which were commissioning team, installation team, technical support team, commercial team, and documentation team. Project Management team structure of this case study project is shown in figure 4.4.

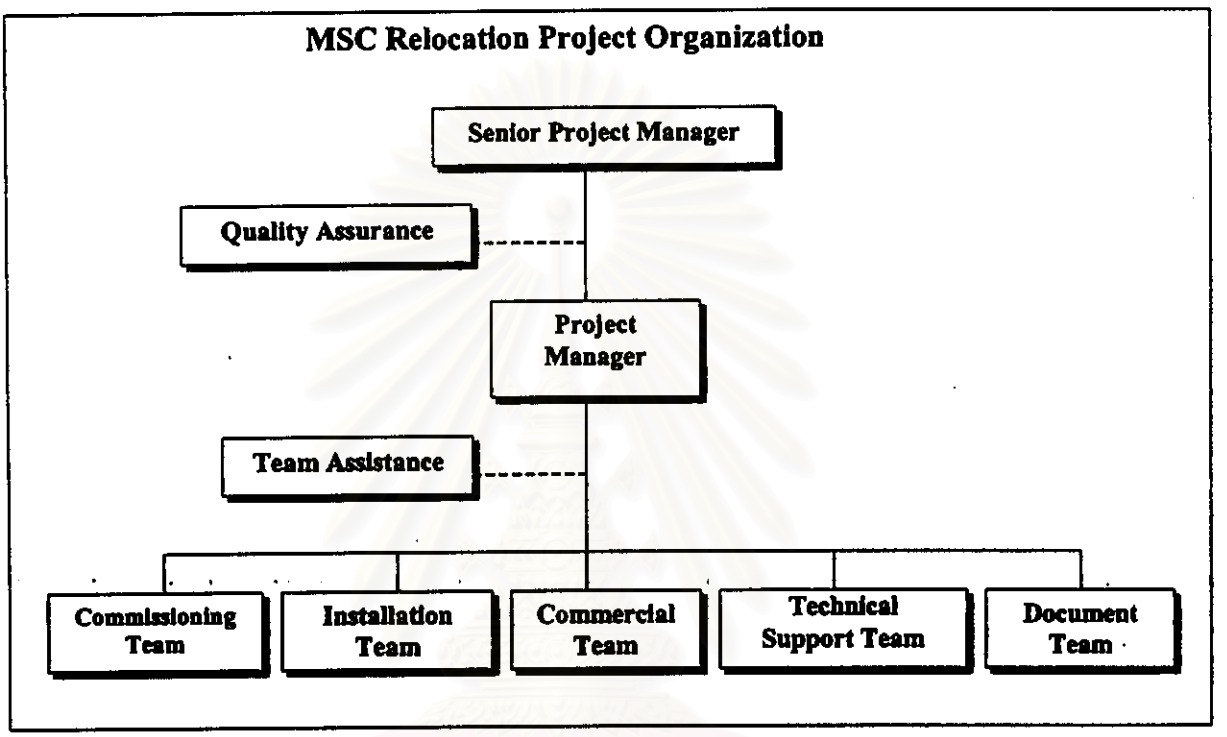


Figure 4.4: Project Management Team Structure

II. Project Management Team Roles and Responsibilities

Input:	Project Management Team Structure
Sub-process:	SU_3
Components:	-
Techniques:	-

Applying PRINCE2 methodology led to some changes in details of responsibility for each project member from the Senior Project Manager, Project Manager to the Supervisor. According to the SU_3 sub-process, the project manager with help of commissioning supervisor and installation supervisor refined the responsibilities of the key project members based on their existing responsibilities and the additional one

according to the PRINCE2 processes. Table 4.1 presents sample of the refined responsibilities of the key roles in the case study project. The refined roles and responsibilities would be documented into the Project Initiation Document (PID) later during the 'Assembling a Project Initiation Document (IP_6)' sub-process for future reference.

Project Manager
Start-Up Phase
1. Design and appoint Project Management Team 2. Define Role and Responsibility for Project Management Team 3. Create Plan for Planning Phase
Planning Phase
1. Overall Planning Project Plan and acquire resource required to perform work 2. Ensure that Project Management, project member and customer agree with the project plan 3. Set up Project Control System for Implementation Phase 4. Establish Project File 5. Assemble Project Initiation Document (PID)
Implementation Phase
1. Manage the production of the required products 2. Regularly Assess, Review and forecast stage plan 3. Direct and motivate the project team 4. Provide sufficient information for project member to do their work 5. Manage risks including develop preventive plan 6. Be responsible for change control 7. Report to the Senior Project manager through Project Highlight Report 8. Summarize stage status at the end of each stage 9. Create next stage plan and request authorization from Senior Project Manager to proceed 10. Update project plan, project cost at the end of each stage 11. Regularly meeting with customer 12. Review the results of QA reviews 13. Request Provisional Acceptance Certificate (PAC) from customer

Table 4.1: Sample of Roles and Responsibilities of project management team

Commissioning Supervisor
Planning Phase
1. Create plan for commissioning work package 2. Assist project manager in estimating and scheduling project plan 3.
Implementing Phase
1. Define responsibilities for the team members and provide plan, guidance, motivation and inspiration 2. Ensure that all members of team understand the project plan and stage plan 3. Receive authorization from Project manager to commissioning 4. Suggest changes relating to the products, which are the responsibility of the commissioning supervisor 5. Manage, direct, motivate the team work 6. Monitor the progress of commissioning work package and submit checkpoint Report to project manager 7. Advise project manager of any deviation from plan recommended corrective action. 8. Coordinate with QA, review QA results, and correct any deviation 9. Identify ways to improve project processes 10. Identify risk as they found 11. Ensure database and software are prepared correctly according to the specification identified in the contract 12. Perform Acceptance test (PAT) with customer

Table 4.1: Sample of Roles and Responsibilities of project management team (Cont.)

The project manager explained responsibilities to all staffs at the beginning of the project. This was to ensure that they understood their new responsibilities in this case study project. Consequently, project member had reference for guiding them to work in each phase of project life cycle. While the project manager also gained commitment from his staffs when they all agreed and accepted with their responsibilities.

III. Initiation Stage Plan

Input:	Official contract
Sub-process:	SU_6, PL_4, PL_5
Components:	Plans (Stage Plan)
Techniques:	-

PRINCE2 points out that initiating and preparing a project take time and consume some resources, so planning work should be planned and approved like any other project works to ensure that an initiation is not aimless and unstructured.

The objective of creating Initiation Stage Plan was to have reference for controlling work during planning phase. Creating initiation stage plan is initiated by the SU_6 sub-process, but actually project manager applied the PL_4 and PL_5 sub-process in creating the plan. The budget plan and schedule plan of the initiation stage plan are shown in table 4.2 and figure 4.3 respectively.

Resource	Amount of Resources	Duration	Cost
Project Manager	1	18 d	137,088
Commissioning Supervisor	1	18 d	115,776
Installation Supervisor	1	18 d	115,776
Team Assistant	1	18 d	47,880
		Total	416,520

Table 4.2: Budget Plan of the Initiation Stage Plan

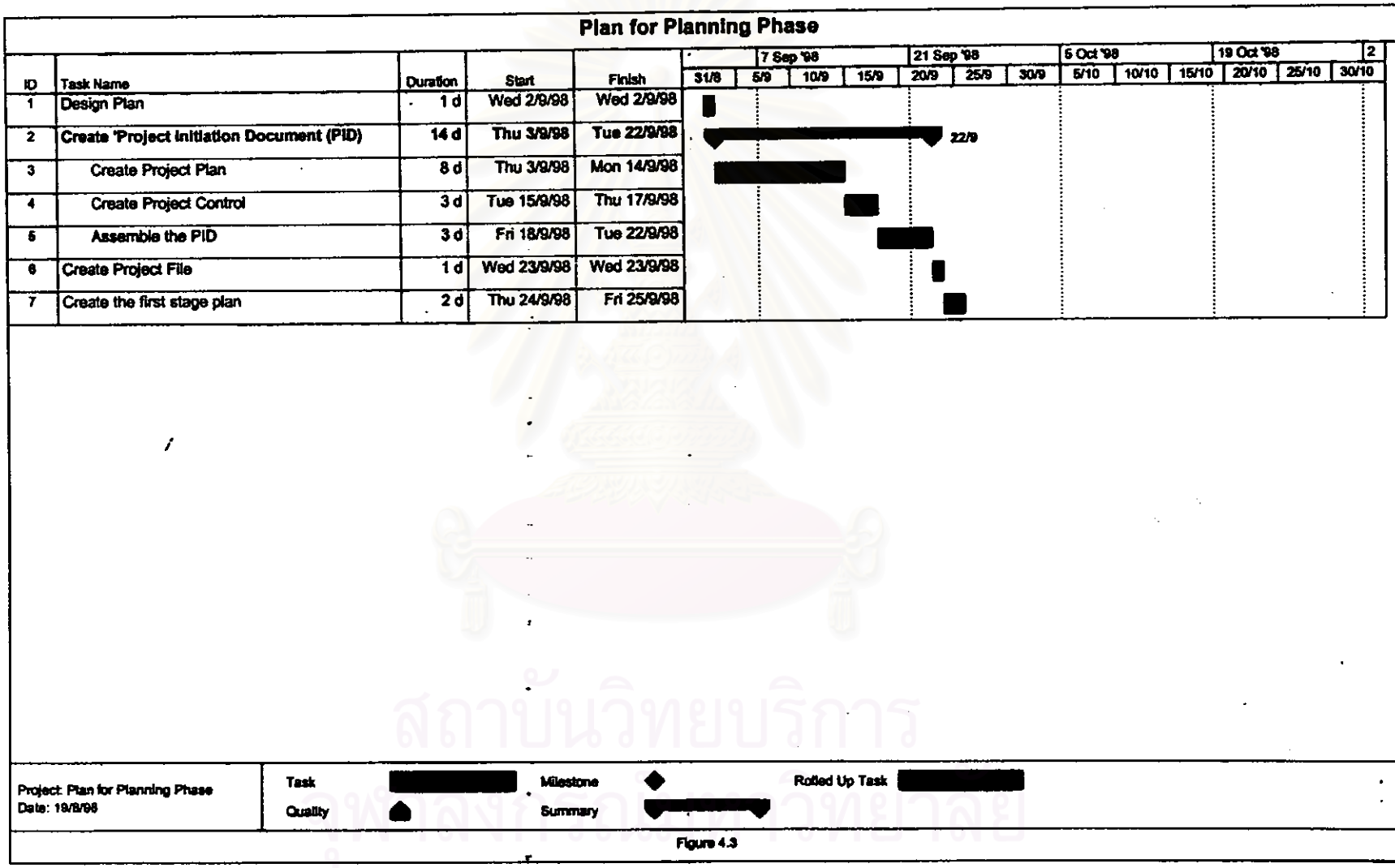


Figure 4.5: Schedule plan of the initiation stage plan

From figure 4.5, planning phase started around 9/9/98 and spent about 18 days. Each task was identified with starting date, finishing date and duration. Thus the senior project manager could monitor work progress of the planning phase. From budget plan, senior project manager could realize that project required a project manager, a commissioning supervisor, an installation supervisor and a team assistant to perform works of the planning phase. In addition, planning phase required budget about 416,520 baht which was 7.3% of total budget. In summary, without initiation stage plan, the senior project manager could not effectively control work progress of project manager during the planning phase.

2. Directing a Project (DP) process

According to the 'Authorizing Initiation (DP_1)' sub-process, at the end of the start-up phase the initiation stage plan was submitted to the senior project manager for an approval to proceed. The senior project manager examined the plan proposed by the project manager whether it was reasonable to proceed as well as the availability of the requested resources. Finally, the approval of senior project manager at the end of this phase triggered start-up of the next phase, planning phase.

4.2 Planning Phase

Planning phase is the second phase of this case study project. Figure 4.6 presents how the PRINCE2 processes are applied with the existing project execution process to build up processes for the case study project during planning phase. The left block shows the existing project execution process which consists of one process, 'Implementation plan and calculation process'. While four of PRINCE2 process (IP, SB, DP and PL) were also applied in this phase and they are shown as the right block of figure 4.6. Both 'Implementation plan and calculation process' as well as IP process contains the task of creating project and budget plan. For this case study project, in addition to implementation plan and calculation process as usual, project manager needed to do additional works like performing risk management, designing control tool and creating project file according to the PRINCE2 process. The process of the case study project is shown as the central block of the figure 4.6. It integrates the processes and tasks of the existing project execution process and the PRINCE2 process.

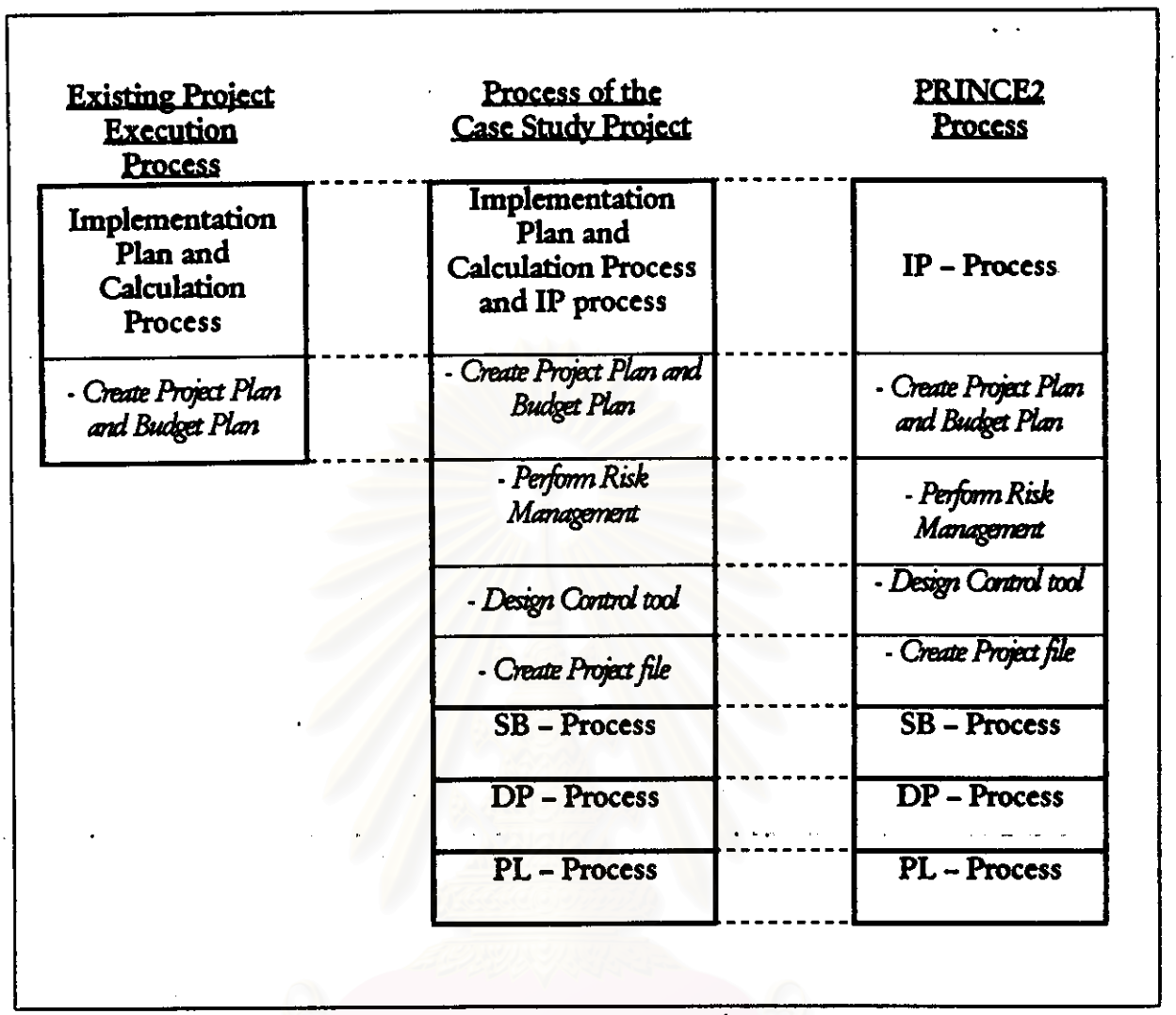


Figure 4.6: Process of the case study project during planning phase

For PRINCE2, the main objective of planning phase is to create Project Initiation Document (PID) and the first stage plan for managing and controlling project during implementation phase. Four processes of PRINCE2 as shown in figure 4.7 were applied to serve such purpose.

- Planning (PL) process
- Initiation a Project (IP) process
- Managing Stage Boundary (SB) process
- Directing a Project (DP) process

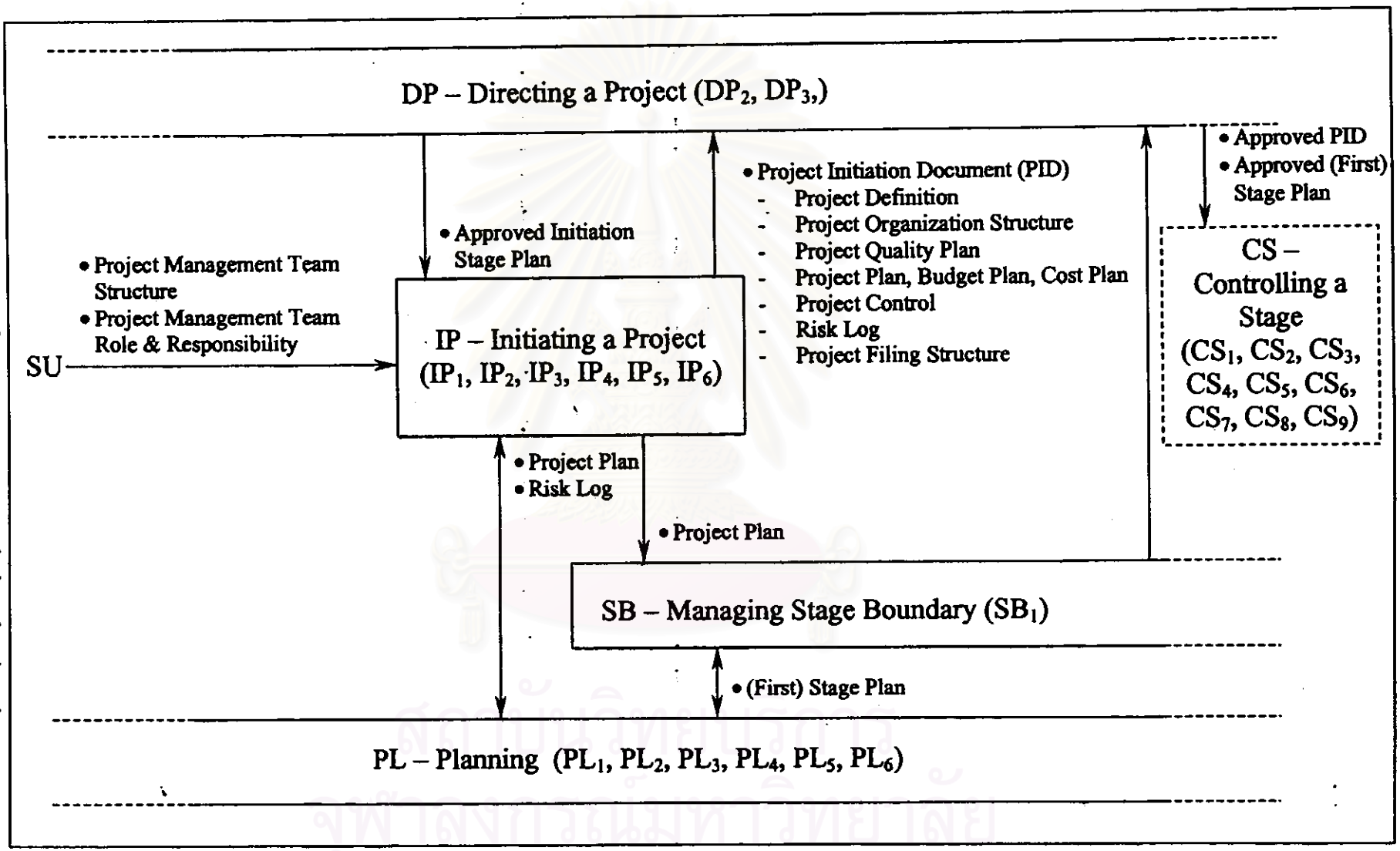


Figure 4.7: Relation of PRINCE2 processes during planning phase.

1. Planning (PL) process

After the initiation stage plan was approved by the senior project manager, the first task of project manager during this phase was to create project plan. Project plan is a mandatory product of the planning phase. It provides the overview of main activities of the project. Project manager was responsible for creating project plan with guidance of installation supervisor and commissioning supervisor. They used the common planing (PL) process to produce the project plan and the outputs of this process were

I. Project Plan [PL_1, PL_2, PL_3, PL_4, PL_5/Figure 4.11, Table 4.4]
II. Risk Log [PL_6, Table 4.7]

I. Project Plan

Input:	Official contract,
Sub-process:	PL_1, PL_2, PL_3, PL_4, PL_5
Components:	-
Techniques:	Product-Based Planning technique

Project manager applied the product-based planning technique and the sub-processes PL_1, PL_2, PL_3, PL_4 and PL_5 in developing project plan. The product-based planning consists of three steps which are creating product breakdown structure (PBS), defining product description and converting PBS to product flow diagram. Starting with product breakdown structure (PBS), the Customer Accepted MSC (SP01), which was the project final product of this case study project, was drawn at the top of the tree diagram. Then it was divided into sub-products which were Network Integrated MSC (SP02) and Site Specific Document (SP03). Next, the sub-products were broken down continuously into lower level until each of them could be individually planned, scheduled, budgeted, monitored and controlled. Finally the product breakdown structure of this project was drawn up as a diagram in a hierarchy manner as shown in Figure 4.8.

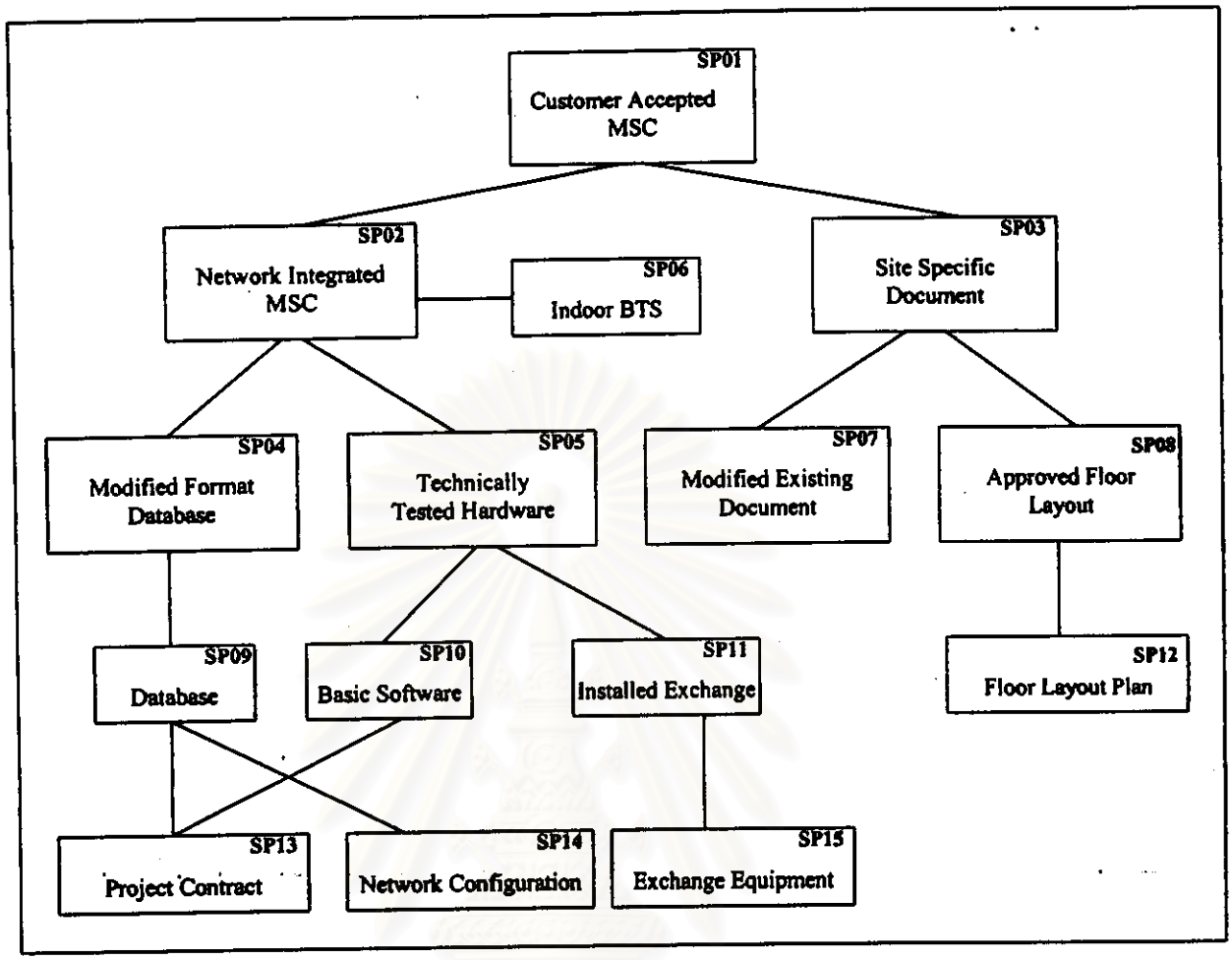


Figure 4.8: Product Breakdown Structure

In order to ensure the correctness of product specification and quality of product, Product Descriptions were developed for the project final product and some key components such as the Customer Accepted MSC (SP01) and Installed Exchange (SP11). The product description contained detail about product; for example, purpose, composition, derivation and quality attribute of the product. One sample of product description about the Customer Accepted MSC (SP01) is shown in figure 4.9.

PRODUCT DESCRIPTION

REFERENCE: SP01 – CUSTOMER ACCEPTED MSC

PURPOSE/DESCRIPTION

To provide a fully technically tested MSC (including technical-related document) and hand over then to customer.

COMPOSITON

1. HARDWARE: - The type and number of hardware equipment are relevant to what identified in the 'List of Material'
   - All hardware equipment (Rack, Module, cable, etc) are in the right position according to the 'Site Specific Document'
2. SOFTWARE: The MSC can serve all functions and features as identified in the 'Technical Project Folder'
3. PATCH: The complete patch set are installed and their status are 'Active'
4. DATABASE: The MSC database can serve mobile phone call from/to other network element according to the network configuration, numbering plan and routing plan that provided by customer.
5. DOCUMENTATION: Site Specific Document
   Operation Manual
   Command Manual
   Maintenance Manual
   Command output Manual
   Emergency Manual

DERIVATION

1. Hardware – Installation team
2. Software – Technical Support Team
3. Patch – Technical Support Team
4. Database – Commissioning Team
5. Documentation – Documentation Team

QUALITY CRITERIA: Refer to the 'In process control checklist'. Total quality score of the product must be higher than 95%.

Figure 4.9: Product description

From figure 4.9, since the sample product consisted of a number of components therefore all components and specification of them were defined in the subject 'composition' of product description. This was for staffs to check specification

of product during producing product and for project manager to do the same when receiving completed product. The subject 'derivation' of product description identified sources of each component so that staffs could realize where the components would come from. In addition, the quality criteria of product was also declared in the product description to ensure that staffs knew the quality level that project manager required from product.

After the product breakdown structure (PBS) was depicted and the product descriptions were defined, project manager converted the PBS to Product flow diagram in order to identify the sequence of product development. To create product flow diagram, project manager drew all products from the PBS and placed the product that already existed at the left most of the diagram. Then arrow lines were drawn to connect one product to other showing sequence in which they would be created. Figure 4.10 shows the product flow diagram of the case study project.

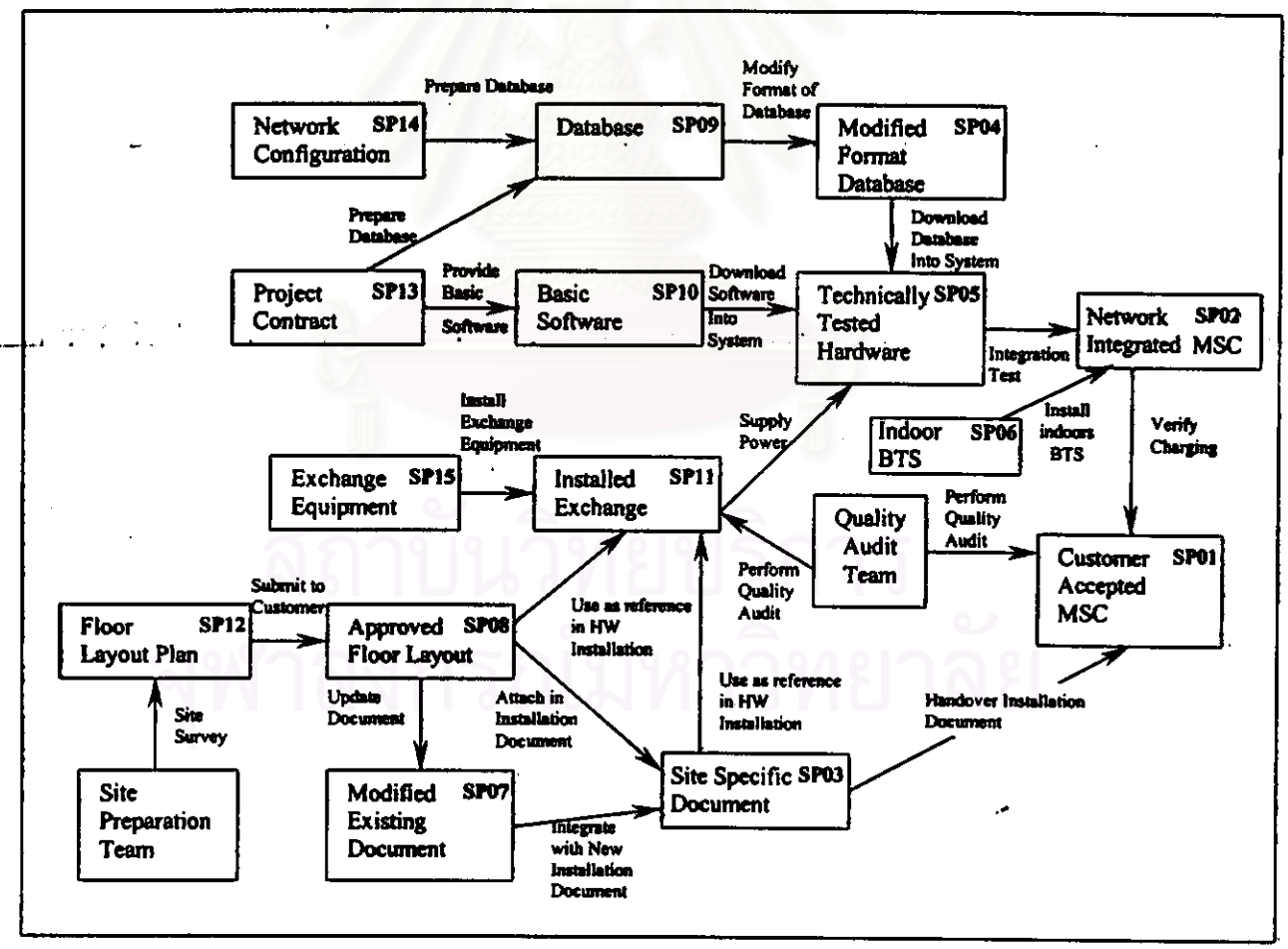


Figure 4.10: Product Flow Diagram

From figure 4.10, to identify all necessary work packages which were required to complete the project, and their relationships, the project manager considered links between each product and then identified work packages needed to transform one product to another product consecutively. For example, to build up Technically Tested Hardware (SP05), it required electrical power to supply to the Installed Exchange (SP10) and also Basis Software (SP09) to download into the hard disk. After completing the product flow diagram, project manager knew all key work packages and their inter-dependencies.

From the product flow diagram, project manager considered individual flow of the product including the activities used in transforming one product to another, then he identified the required resources for each activity. In order to make estimating more accurate, the estimation of effort for the work package was done twice, first by the Project Manager himself and second, by the staffs who had responsibilities in the work package. For example installation supervisor and commissioning supervisor were responsible for estimating installation work package and commissioning work package, respectively. The expected benefit of getting staffs to be involved in estimating was that Project Manager could have the estimating result from the view of staffs, moreover, he also gained commitment from his staffs.

Project Manager suggested staffs to create a team plan in order to estimate effort required for the work packages. Starting with staffs broke down work package into several activities, then estimated effort required for each activity. Next, they scheduled the listed activities as a plan and summarized resources and effort required for the whole work package. The result of this kind of estimating was closer to the reality. Because, when work was broken down into lower level it was easier to perform estimating and the result of estimation was more accurate as well.

Table 4.3 shows the sample of estimation result conducted by project manager and project staffs. Some outcomes of estimation from project manager were significantly higher than those from project staffs, because they used different approach in estimating. The project manager estimated effort to complete work package as a whole while project staffs broke down work package into several activities and calculated the total effort required in completing each activity. Moreover, project manager realized that his rough

estimating was quite unrealistic so he added a number of extra effort to some risky work packages in order to avoid the problem of overbudget.

WORK PACKAGE	RESOURCE	EFFORT		
		By PM (Man-Day)	By Project Staff (Man-Day)	Final Result (Man-Day)
Site Survey at UBN	Installation Supervisor	(1) 3	(1) 3	(1) 3
UBN Layout Drawing	Draftsman	(1) 5	(1) 5	(1) 5
Site Specific Document Preparation	Documentation Team	(1) 20	(1) 20	(1) 20
Installation MSC	Installation Supervisor Installer	(2) 31 (7) 31	(2) 25 (7) 25	(2) 28 (7) 28
SW and Database Preparation	Commissioning Engineer	(3) 26	(3) 23	(3) 25
Install Indoor BTS	Installation Supervisor Installer	(1) 15 (4) 15	(1) 15 (4) 15	(1) 15 (4) 15
Commissioning and PAT HW	Commissioning Engineer	(2) 17	(2) 13	(2) 15
Network Integration	Commissioning Engineer	(5) 35	(5) 25	(2) 30

Table 4.3: Sample of Estimation result

Finally, project manager used the Microsoft Project 98 program to facilitate him in scheduling plan. From the product flow diagram and the result of estimation, the project manager entered all necessary work packages including their duration, starting date, finishing date into the form sheet of the Microsoft Project program, and created link between dependent work packages. Then each work package was identified with type and number of required resources.

After entering all key information, the Microsoft Project program automatically created schedule plan for the project as shown in figure 4.8. From the schedule plan,

project manager summarized budget required to carry out this project, then create budget plan for the project as shown in table 4.4.

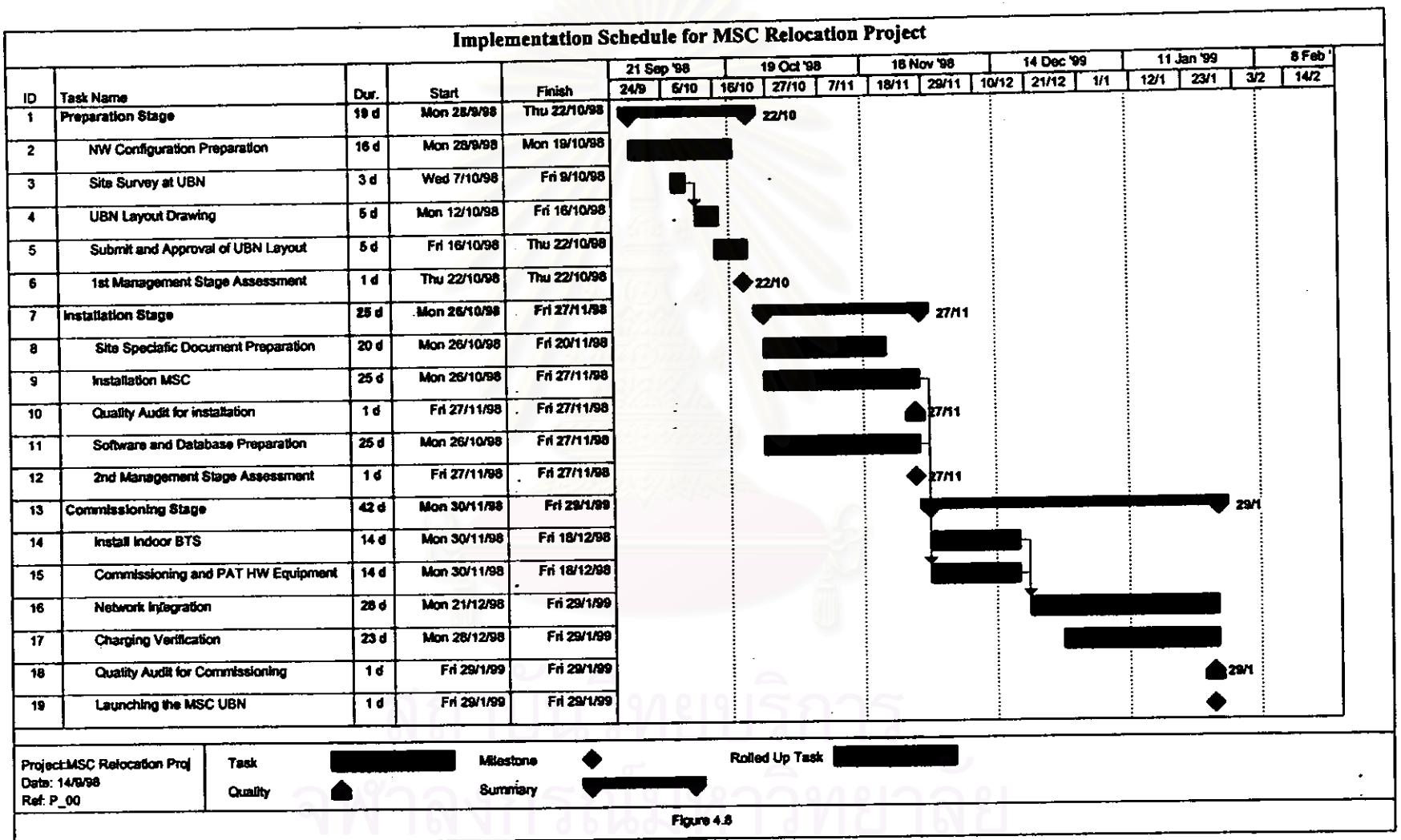


Figure 4.8

Figure 4.11: Schedule plan of the project plan

Resources	Budget		
	Stage 1	Stage 2	Stage 3
Labor Cost & Allowance			
Project Management			
- Project Manager	144,704.00	190,400.00	319,872.00
- Installation Supervisor	122,208.00	321,600.00	180,096.00
- Commissioning Supervisor	122,208.00	160,800.00	270,144.00
- Team Assistance	50,540.00	66,500.00	111,720.00
Draftsman	24,110.00	-	-
Installation			
- Installer	-	550,200.00	132,048.00
Commissioning			
- Commissioning Engineer	-	321,600.00	540,288.00
Overnight Allowance	-	266,000.00	186,200.00
Total Labor & Allowance Cost	463,770.00	1,877,100.00	1,740,368.00
			4,081,238.00
Tools & Test Equipment			
Installation			
- Installation tool kit	-	12,750.00	7,140.00
- Mobile Rental	1,710.00	4,500.00	2,520.00
- Mobile Call	2,850.00	7,500.00	4,200.00
Commissioning			
- Commissioning tool kit	-		1,260.00
- Note book	-		13,923.0
- Mobile Rental	1,710.00	2,250.00	11,340.0
- Mobile Call	2,850.00	3,750.00	18,900.00
Data Set	-		2,251.20
K1103	-		151,200.00
Transportation			
- Car Rental	-	87,500.00	98,000.00
- Gasoline	-	25,000.00	28,000.00
Total Equipment & Transportation Cost	9,120.00	143,250.00	338,734.20
			491,104.20
Baseline Estimate	472,890.00	2,020,350.00	2,079,102.20
Total Estimate			4,572,342.20
Contingency (15%)	70,933.50	303,052.50	311,865.33
Total Budget			5,258,193.53

Table 4.4: Budget Plan of the Project Plan

From figure 4.11, the schedule plan of the project identifies that

- project started around 28/9/98 and finished around 29/1/99
- duration of the project was approximately 86 working days
- project was clearly separated into three stages consisting of preparation stage (19 days), installation stage (25 days) and commissioning stage (42 days)
- end stage assessment was set up at the end of each stage for the senior project manager to check status of the project and authorizing project manager to proceed
- quality audit was planned to do after finishing installation work package and commissioning work package

Budget plan of the project as shown in table 4.4 reveals that

- total budget required for completing the project was 4,572,342 baht
- total budget consisted of labor & allowance cost about 4,081,238 baht (89.26%) and equipment & transportation cost about 491,104 baht (10.74%)
- the budget was allocated to each stage as follow:
  - Stage 1 – 472,890 baht (10.34%)
  - Stage 2 – 2,020,350 baht (44.18%)
  - Stage 3 – 2,079,102.2 baht (45.48%)

Later, when schedule plan and budget plan were approved by the senior project manger, they were frozen and used as baseline in monitoring work progress and project status during project was implementing. In addition, they were used for evaluating the project manager's effectiveness in managing project at the end of the project as well.

II. Risk Log

Input:	Project plan
Sub-process:	PL_6
Components:	Risk management, Control (Risk Log)
Techniques:	-

According to the CCTA "Commitment to a course of action without consideration of the risks inherent in that course is courting disaster". After the project plan had been developed, Project Manager considered the risks that might happen with the project. Risks often leads to modification of project plan in order to remove or lessen the impact of them. For example, some activities must be added to the project plan in order to prevent risk or a number of budgets have to be reserved for contingency plan. Normally risk management runs parallel to all planning work and they are iterative processes.

Project manager applied the sub-process PL_6 in creating risk log. First, to identify risk in the project, Project Manager used the risk management checklist in performing risk analysis. The list provides a simple and structure way to identify the main risk areas for the project which are project management, project staffs, nature of project, maturity of development/supplier organization, customer and contract, and the third party supplier. The complete risk assessment checklist is attached in Appendix B.

From the Risk Assessment Checklist, Project Manager estimated risk score for each item associated to the project. The range of score between high risk and low risk are 0.10 to 4.00. Furthermore, the project manager also specified the weighing factor for each item, because the weighing factor was used to identify the impact of risk to the project. The range of the weighing factor was between 1 to 5. After risk score and weighing factor of each item were identified, risk factor could be calculated by multiplying risk score with weighing factor. The sample outcome of the risk assessment at the beginning of project is shown in table 4.5. While the complete outcome is attached in the appendix B.

Element	Ref:	(a) Low Risk	(b) Scale 0.1 to 4.0	(c) High Risk	(e) Weight Used	(f) Total Score
Project Mgt	1	Full time and experienced Project Manager	2.4	Part time and inexperienced Project Mgr	4	9.6
Project Staff	5	The project team is of good quality, experienced, and with the right blend of appropriate skills	2.5	An inexperienced project team, lacking experience and the appropriate key skills	4	10
	6	Staff are assigned full-time to the project	1.6	Staff have other responsibilities	3	4.8
Nature of the Project	11	The project has no, or few novel features	1.3	Pioneering new approaches are being tried out in the project	3	3.9
	14	Little or no modification needed to existing technical standards	2.3	Extensive modification needed to existing technical standards will be needed	3	6.9
	15	There is little dependence on development facilities not \under the control of the project team	3.5	There is a dependence on development facilities which are outside the control of the project team	5	17.5
	18	Few Customer Departments will be affected by the final outcome	2.5	Many Customer Departments will be affected by the final outcome	4	10
	19	Sites which the project team will visit are easily accessible	3	Sites are remote and inaccessible	3	9
Maturity of the Organizati on	21	There is a well developed and understood Quality Environment - ie an audited Quality Management System	1.7	Quality Management is ill defined and/ or not visible	4	6.8
	26	An agreed Contract is in existence - Terms and Conditions are well documented and understood by all parties concerned	1.8	No formal contract documentation exists Terms and Conditions have been not discussed, agreed and published	4	7.2

Table 4.5: Sample outcome of the first risk assessment

From the result of the first risk assessment as attached in the appendix B. To calculate risk factor of the case study project, Project Manager divided the total risk score (192.8) by total weighing factor (95) and that result in project risk factor equal to 2.03.

Project risk factor indicated overall risk status of the project. Project risk status was assessed according to the conditions identified by Ken Bradley in his book named as 'Understanding PRINCE2'. The conditions are follow:

- A risk factor of less than 2.00 indicates a low risk project
- A risk factor between 2.00 to 2.20 indicates a moderate risk project
- A risk factor between 2.20 to 2.60 indicates a high risk project
- A risk factor in excess of 2.60 indicates very high risk project

Comparing project risk factor with the above condition, Project Manager concluded that this case study project was a moderate risk project.

From the result of risk assessment, for the total 26 risk items, there were seven items of risk that had risk factor exceed of eight. Such risks required high awareness of project management. Therefore, project manager considered cause and effect of those risks and developed action plan in order to response to them. After that, all detected risk were recorded into risk log for future tracking. The risk log at the beginning of project is shown in Table 4.6.

Ref. No.	Date Last Update	Description	Initial Risk Factor	Latest Risk Factor	Counter Measure	Owner	Status
R01		*Initiate Date : 3/9/98* Project Manager is slightly overload because of handling three project concurrently	9.6		Assign a project management consultant to advice and support project manager during start up of project	Senior Project Manager	Open
R02		*Initiate Date : 3/9/98* Insufficient co-operation between company and customer	9.2		Request customer to assign a person as contact interface for this project	Project Manager	Open
R03		*Initiate Date : 3/9/98* Commissioning engineer has no experience in doing commissioning	10		Commissioning Supervisor provide guideline procedure for his staffs	Commis-sioning Supervisor	Open
R04		*Initiate Date : 3/9/98* Unpredictable technical problem in commissioning work package	8.4		Arrange test with high risk to be done early	Commis-sioning Supervisor	Open
R05		*Initiate Date : 3/9/98* Facilities for project are outside the control of project team	17.5		- Prepare checklist which identify required facilities and planned date - Hand over the checklist to customer and asks them to update it every week	Commis-sioning Supervisor	Open
R06		*Initiate Date : 3/9/98* Project has to deal with many departments of customer	10		Ensure that all departments of the customer accept and agree with project schedule	Project Manager	Open
R07		*Initiate Date : 3/9/98* Customer's site is quite fare from company's office. It's difficult to provide support to staff at site if there are problems occur such as - forgetting special tool or test equipment - defected modules	9		- Equipment checklists are created by commissioning supervisor and installation supervisor - If possible all modules and equipment should be tested before traveling to site	Supervisor	Open

Table 4.6: Risk log at the beginning of project

From table 4.6, each risk was assigned with reference number for ease to refer to. Initially, the details of risks such as description of risk, initiate date, counter measure and risk owner were identified and written in the risk log. The risk owner was the person who was close related to the risk so project manager assigned him to monitor such risk within the condition that if risk was significantly changed then he must inform to project manager immediately. In addition, risk management is continuous work therefore project manager decided to review risk log every month and at the end of each stage.

2. Initiating a Project (IP) process

The 'Initiating a Project (IP)" process was the core process of planning phase. The objective of this process was to create the "Project Initiation Document" (PID) which was an important document and was used throughout the project life from planning to phase-out. At the beginning of the project, senior project manager used the PID as source of key information for deciding whether to authorize the project. During the project, PID was used as reference and source of information for project member and people interested in the project. Lastly, it was used by the senior project manager in evaluating efficiency of project management at the end of the project.

I. Project Initiation Document (PID)

Input:	Project management team structure, project management team role & responsibility, Approved initiation stage plan, official contract.
Sub-process:	IP_1, IP_2, IP_3, IP_4, IP_5, IP_6
Components:	Plans (Project Plan) Stages (Management Stage/Technical Stage) Control (Risk log, Tolerance, Checkpoint Report, Project Highlight Report)
Techniques:	Project Filing Technique

By applying the 'Initiating a Project (IP)' process, the PID which was created for this case study project contained the following contents

- Project Definition [Table 4.7]

- Project Organization Structure
  - Project management team structure [SU_1, SU_2/Figure 4.4]
  - Project management team role and responsibility [SU_3/Table 4.1]
- Project Quality Plan [IP_1/Table4.8]
- Project Plan
  - Schedule Plan [IP_2, PL_1, PL_2, PL_3, PL_4, PL_5/Figure 4.11]
  - Budget Plan [IP_2, PL_1, PL_2, PL_3, PL_4, PL_5/Table 4.4]
- Project Control [IP_4/Table4.9]
- Risk Log [IP_3, PL_6/Table 4.6]
- Project filing Structure [IP_5/Table4.10]

1. Project Definition

Project definition was the first part of PID. It contained general information relating to the project such as project background, project objectives and project dependencies/constraints. Since project manager had to study the contract before planning the project therefore he summarized part of his understanding about the project into the project definition. The project definition of this case study project is shown in table 4.7.

Project Definition
Project Background
This project involves an idea created by AIS, in an effort to implement the segmentation of its supplier. Its goal is to divide their whole service area into three sub-area; Ericson take care of Bangkok and Central area, Nokia handle Northern and Southern area, and Siemens is in charge of North Eastern area. Consequently, Siemens has to de-install and shifted the two existed MSC (Mobile Service Center) , at Phitsanuloke , and then re-install them at new area, Ubon Ratchthani. After finishing installation, the two MSC will be tested and brought to service.
Project Objectives
Bring MSC to be ready for service (passing HW acceptance test and Charging verification) by February 1999
Project Dependencies/Constraints
Project must be finished by Feb, 1999 Operating Budget for project implementation is 5.3 million Baht All project work must comply with ISO9000 Standard

Table 4.7: Project definition of the case study project

2. *Project Quality Plan*

Input:	Official contract, Quality management system
Sub-process:	IP_1
Components:	-
Techniques:	-

Because the company had certified for ISO9000 Quality Management standard since 1996; therefore, this case study project was planned to run under the existing quality management process. During planning phase, project manager together with the

quality audit team discussed and made agreement about the project quality plan, then the agreed project quality plan was documented as part of the PID. Project quality plan consisted of quality audit process, quality management tool and quality criteria. The project quality plan of this case study project is shown in table 4.8.

Project Quality Plan
Quality Audit Process Quality audit will be conducted at the end of installation work and commissioning work by the quality audit team. ***Quality Management Tool*** The 'In Process Control Checklists' are used for auditing quality of installation work and commissioning work. ***Quality Criteria*** Refer to the 'In Process Control Checklist', each failure of major quality item subtract 5 percent from the total quality percentage, while failure of minor quality item cause 0.75 percent reduction of the total quality percentage. Project has to pass the quality criteria at 95 percent.

Table 4.8: Project Quality Plan

3. *Project Control*

Input: Project Plan, Risk Log, Project Quality Plan
Sub-process: IP_4
Components: Control (Tolerance, Checkpoint Report, Project Highlight Report)
Techniques: -

Project Control is a key to success for managing any project. For effective control system, each decision on the project has to be made in a timely manner by the person or group most appropriate to make that decision, and must be based on accurate information.

Project control was set up during the planning phase to ensure that an appropriate communication, control and monitoring framework were put in place. After project organization was clearly defined and project plan was created completely, project management team set up control system in order to support different types of plan and levels of management.

1. Control tools for senior project manager

Senior project manager and project manager agreed to apply the concept of 'Management by Exception' in managing this case study project. To apply the 'Management by Exception', project was divided into three stages according to the nature and characteristics of the work packages. The three stages of the project comprised of Preparation stage, Installation stage and Commissioning stage. During each stage, Project Manager gained full authority from senior project manager in managing project on day-to-day basis, while senior project manager highly focused only on the stage boundary. Senior project manager had function to check project status at the end of each stage including approved the next stage plan that was prepared by project manager. However, if the project manager forecasted and detected tendency that time and cost of the project would deviate from the tolerance which had early agreed, the Project Manager must report to Senior Project Manager at once. To set up control system for senior project manager according to 'Management by Exception' project manager had to consider three key factors which were tolerance, frequency of reporting and control report.

I. Tolerance

For 'Management by Exception', tolerance was the major factor which Senior Project Manager used for control and limit authority assigned to Project Manager. When project plan had been created, Project Manager submitted project plan to Senior Project Manager for evaluating and defining project tolerance. To define tolerance for the project, the Senior Project Manager considered these following factors.

i) Project Size: The case study project was approximately four months long and required project budget about 4.6 million Baht. This

project was a quite small project in comparing with other projects of the company.

ii) *Project Complexity*: From the schedule plan of project plan as shown in figure 4.8, most of work packages were dependent and needed to be run in series. Thus project plan was neither complicated nor difficult to control.

Besides, the Project Manager, the commissioning supervisor and the installation team had some experiences in other similar project, therefore the senior project manager inferred that project was not so complicated.

iii) *Project Risk*: According to the result of risk analysis from the sub-process IP_4, this project was assessed as moderated risk project.

From historical data, the senior project manager found that the average schedule deviation and cost deviation of the small to medium sized project (2-10 million baht) was about 15 percent. After consideration of size, complexity and risk of the project as well as the historical data, the senior project manager identified tolerance of the project as 15 percent.

II. Frequency of reporting and control report

Although the senior project manager delegated his authority to project manager in managing project on day-to-day basis, but he still needed to know project status from the project manager in regularly. The frequency of reporting is divided into two categories.

i) At the end of each month

According to the CS_7 sub-process, project manager had to prepare and submit senior project manager with Project Highlight Report every month and at the end of each stage. The Project Highlight Report provided the

senior project manager with the status of the current stage in term of earned value analysis. It also presented status of each risk items existed in the risk log. Project manager used the Project Highlight Report to escalate project issue to senior project manager as well.

ii) At the end of each stage

According to the SB process, at the end of each stage, project manager had to summarize status of the project and prepared plan for the next stage. This was for asking authorization from the senior project manager to proceed to the next stage. The following plans and reports would be provided by project manager for helping and supporting senior project manager in making critical decision at the end of each stage.

- Next stage plan
- Updated project plan
- Updated project budget
- Updated risk log
- Project Highlight Report

iii) During stage (if stage status exceed tolerance of 15%)

Due to the SB_6 sub-process, the exception report would be used to inform the senior project manager in case that stage status was exceed of the pre-defined tolerance.

2. *Control tool for Project Manager*

Project Manager received authority from the Senior Project Manager to monitor and control project on day-to-day basis, however the gained authority was limited as one stage at a time. That means at completion of each stage, Senior Project Manager had to review project status before authorizing Project Manager to carry on to next stage. Project Manager realized that if he wanted to succeed in each stage he had to manage all

work packages in the stage to finish as close as plan. Thus the control tool for the project manager was necessary and was identified as follow:

I. Frequency of Reporting and control report

According to the CS_2 and MP_2 sub-processes, project manager asked the supervisors to prepare and send him the checkpoint report and the updated team plan every week, because the average time frame for most activities of the work packages was approximately one week. So, if the frequency of reporting was less than one week then the project manager could not obviously see the progress of the work package. In contrast, if the reporting frequency was more than one week, then it may be too late in detecting problem and also difficult to bring project back to in line with the original plan.

The project control for this case study project are summarized as shown in table 4.9.

Project Control

Project Control is dividend into 2 levels

1) Control tools for senior project manager

   Frequency of reporting

   i. At the end of each month
   - ➢ Project highlight report

   ii. At the End of each stage
   - ➢ Plan for next stage
   - ➢ Updated project plan
   - ➢ Updated project budget
   - ➢ Updated risk log
   - ➢ Project highlight report

   iii. During stage (if project status exceed tolerance of 15%)
   - ➢ Exception report

2) Control tools for project manager

   Frequency of reporting

   i. At the end of each week
   - ➢ Checkpoint report
   - ➢ Updated team plan

   ii. Every fifteen days
   - ➢ Time sheet

Table 4.9: Project Control

4. Project Filing Structure

Input:	Project Plan
Sub-process:	IP_5
Components:	-
Techniques:	Project Filing Technique

Normally, a lot of documents are created throughout project life, for example project plan, internal and external correspondence, minute of meeting etc. These documents are constantly updated and re-created, so the number of project document continually increase over the time. As a consequent, without well-organized filing system, some documents may lose and it is difficult for project manager to search for the required document. Project manager knew this problem and also awared that it would become more serious since there would be much more project documents would be created in this case study project because of change in control system.

To manage project effectively, it is important to keep track of all information being produced on the project. In addition there are needs to be able to manage different versions of documents and to be able to retrieve information quickly and reliably. Therefore, establishing a sensible and pragmatic project filing system at the start of the project can ease the problems.

Project manager applied the project filing technique in creating project file. It was used for collecting all documents, which were created through out the project. The project file consisted of three sections- management section, technical section and quality section.

i) Management Section – was planned to collect all management documents such as project plan, Project Initiation Document (PID), Minute of Meeting and control documents (e.g. Checkpoint Report and Project Highlight Report).

ii) Technical Section – contained technical documents related to products e.g. raw data from customer for preparing database, command file for creating database, network configuration, routing plan and etc. This section was very important for

configuration management and change control. Any changes caused to the data in this section, either initiated by customer or by supplier, it needed to be documented.

iii) Quality Section – this section was reserved for storing quality control documents such as ISO9000 Quality Audit Checklist, and results of quality audit.

Project Filing Structure of this case study project is concluded as shown in table 4.10

Project Filing Structure
Project Filing Structure is divided into three sections
1. Management Section ➢ Project Initiation Document (PID) ➢ Project Plan and Updated Project Plan ➢ Stage Plan and Updated Stage Plan ➢ Team Plan and updated Team Plan ➢ Project Highlight Report ➢ Checkpoint Report ➢ Project Issue Log ➢ Risk Log
2. Technical Section – contains technical documents related to the project
3. Quality Section ➢ In process Control Checklist for installation work ➢ In process Control Checklist for commissioning work

Table 4.10: Project Filing Structure

3. Managing a Stage Boundary (SB) process

Normally, project manager performs the SB process at the end of each stage in order to summarize the result of the finishing stage and prepare plan for the next stage. The first stage plan was created at the end of planning phase by applying the project plan

with the SB_1 sub-process. It composes of the detailed work of the first stage extracted from the project plan. The first stage plan would be used as reference in control status of the first stage.

The SB process was applied three times during this project because the case study project was divided into three stages and the SB process was applied at the end of each stage. Thus the practice and detail of this process would be explained in detail when describing applying SB process during implementation phase.

4. Directing a Project (DP) process

After the PID and the first stage plan were completely created both of them needed to be approved by the senior project manager before they were used to control project. So project manager submitted both documents to the senior project manager at the end of planning phase.

The DP_2 sub-process was used to guide senior project manager in checking and approve for the PID and the first stage plan. For the initial PID, there were just few points that need correction because senior project manager and project manager had been working closely together during planning phase. Most of problems and conflicts were solved during developing the PID. The criteria for checking the PID are follow:

- Project had no conflict with corporate strategy.
- Project plan is achievable.
- Budget for project is acceptable.
- Risk management was already done and acceptable.

The Senior project manager had approved the PID because all of the above conditions were met.

Once the PID was approved by the senior project manager, then it was frozen so that a record was preserved on the project's original intention. Later, review of how successful the project had been or whether it diverged from its original aims could be measured from the baseline PID. After that copies of the approved PID was logged in

the project file and also distributed to the project management team and other department relating to the project like Sale Department, Technical Sale Department and Network Planning Department.

Finally, approval of the PID indicated ending of planning phase and trigger commencement of implementation phase.

4.3 Implementation Phase

Implementation phase started after the PID was approved by the senior project manager. Figure 4.12 presents the process of the case study project during implementation phase. The left block shows five processes of the existing contract execution process which are customer kick-off process, site engineering and survey process, material delivery process, implementation process, and PAT process. While five of PRINCE2 processes (DP, CS, MP, PL, SB) were also applied to this phase and shown on the right block of the figure 4.12. The main objective of the project execution processes is to carry out the project work but the purpose of PRINCE2 processes during this phase is to control the project execution process to complete according to plan. Therefore both project execution process and PRINCE2 process are running in parallel. For instance during commissioning team performed commissioning according to the implementation process they also followed the MP process as well.

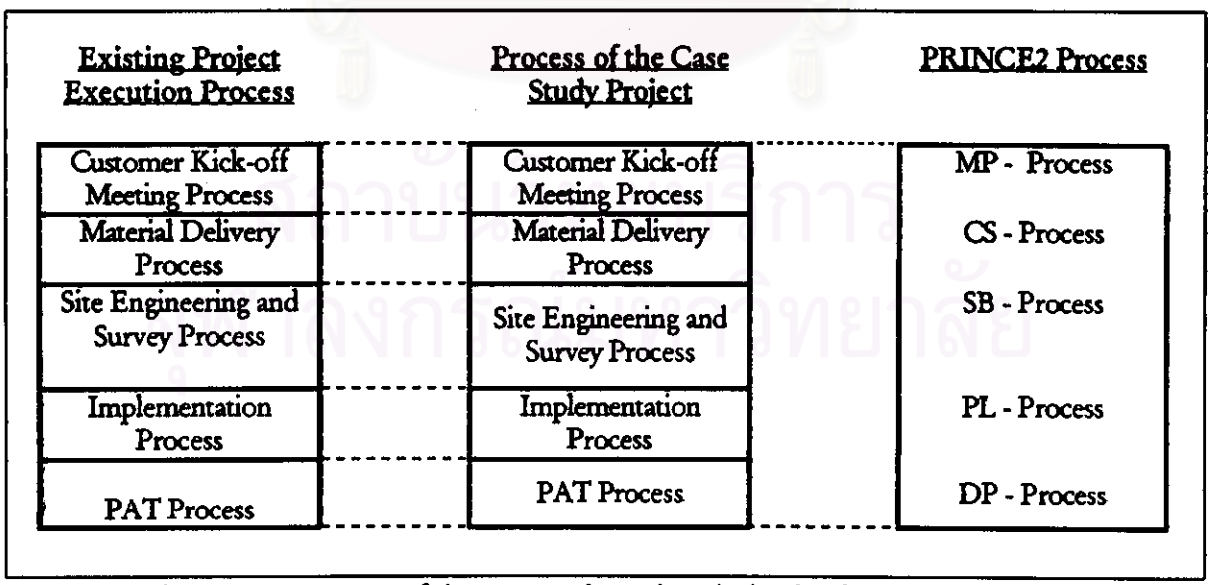


Figure 4.12: Process of the case study project during implementation phase

During planning phase, the major works of project management team were creating plans, fine tuning plans and developing control tool. On the other hand, during implementation phase, the project management team focused on applying plans and control tools for monitoring and controlling project. However, sometimes, especially at the end of each stage, project manager still had to create next stage plan as well as revised and updated project plan.

For this case study project, implementation phase was divided into three stages which were preparation stage, installation stage and commissioning stage so the continuous processes of PRINCE2 were applied three times in managing this phase. The installation stage is selected as an example in explaining how PRINCE2 processes were applied in managing and control implementation phase.

During installation stage, five processes of PRINCE2 as shown in figure 4.13 were applied in managing and control progress of the project.

- Planning (PL) process
- Managing Stage Boundary (SB) process
- Controlling a Stage (CS) process
- Managing Product Delivery (MP) process
- Directing a project (DP) process

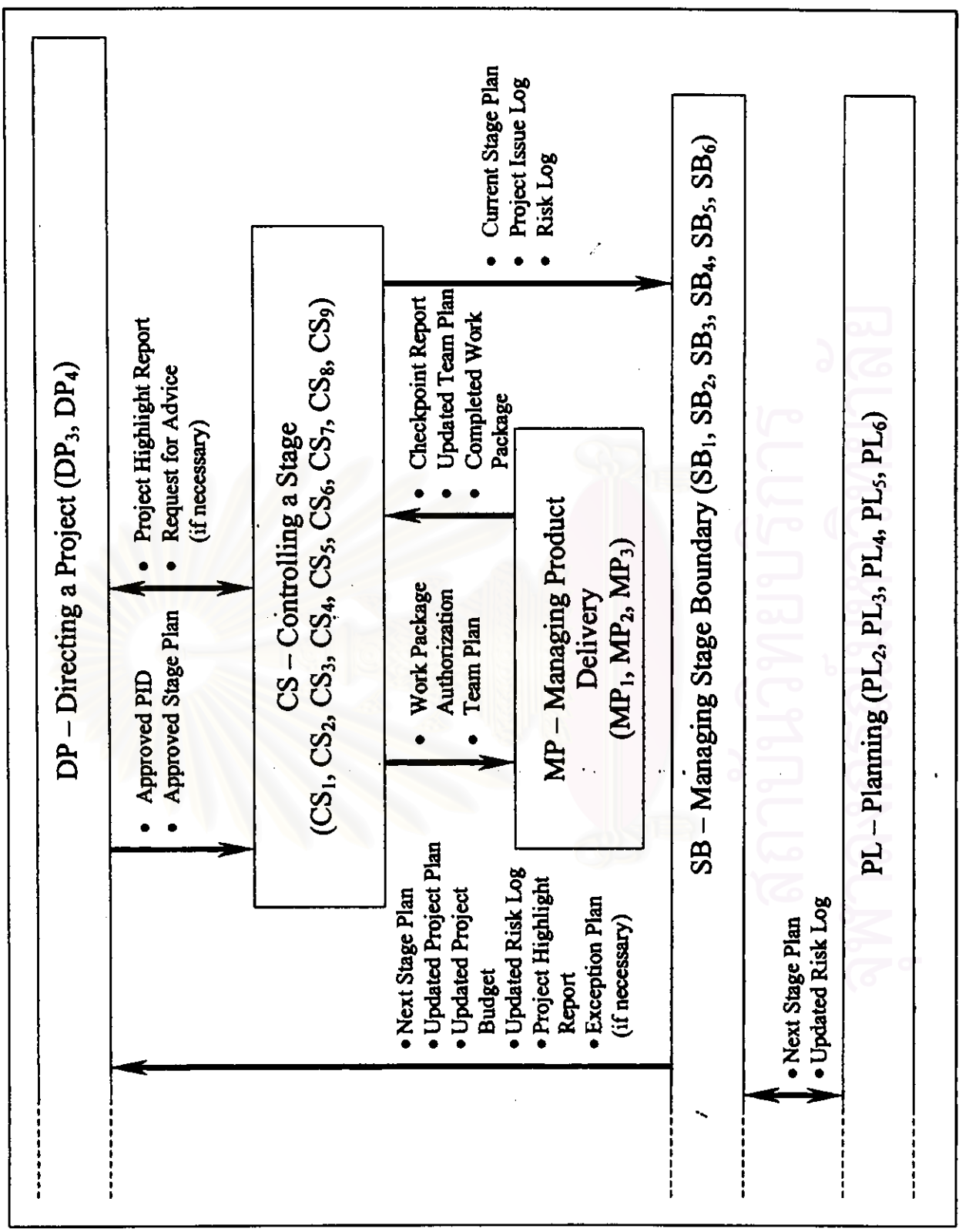


Figure 4.13: Relation of PRINCE2 process during implementation phase

1. Planning (PL) process

During planning phase, project manager applied the planning (PL) process in creating project plan and the first stage plan. Similarly, at the end of the first stage (preparation stage), the PL process was adopted in creating stage plan for the second stage (installation stage) as well. However, in creating stage plan for any stages except the first one, project manager needed to consider the actual status of the preceding stages and effect of the issues occurring in the previous stages too. The outcomes of conducting the PL process at the end of the preparation stage were:

I. Next Stage Plan (plan for installation stage) [PL_2, PL_3, PL_4, PL_5/Figure 4.10, Table 4.11, Figure 4.15]

II. Updated Risk Log [PL_6/Table 4.12]

I. Next Stage Plan (plan for installation stage)

Input: Issue Log, risk log, project plan, updated stage plan

Sub-process: PL_2, PL_3, PL_4, PL_5

Components: Stages, Plans (Stage Plan)

Techniques: Product-Based Planning

In this case the next stage plan was the plan for installation stage. Therefore, to create stage plan for installation stage, first, project manager examined whether there were any risks or issues from the previous stage that had effect on works of the installation stage. Project manager could obtain information about risk and issue from the risk log and issue log consecutively because all risks and issues occurred in the project were recorded in the log document. For example, one issue that had major impact on installation stage was about one-week unavailability of the installation team. That means project manager had to postpone the installation work one week from the original plan because of such issue. The issue log also revealed that this issue would cause additional expense about 182,020 baht, so project manager needed to arrange the rest of works to cope with this extra expense.

Other inputs of this process were project plan and updated stage plan. the project plan identified scope of work, duration and budget allocated to each stage. Those factors were constraint in creating stage plan. The updated stage plan showed actual status of the finishing stage. From the updated plan of preparation stage, project manager found that the actual status was on schedule but slightly over budget about 4,822 baht. The reason that project manager had to check the actual status of the passing stage before planning because sometimes he had to arrange the next stage plan to cope with the problems either schedule delay or over budget of the passing stage.

The product-based planning technique as used for creating project plan during planning phase was applied in developing stage plan as well. However, from figure 4.5 the project manager focused only on products that would be produced in this stage and then broke them down into lower level for effective scheduling and easy to control of work progress. The stage plan of the installation stage consisted of schedule plan, budget plan and cost plan. The schedule plan of the installation stage is shown in figure 4.14.

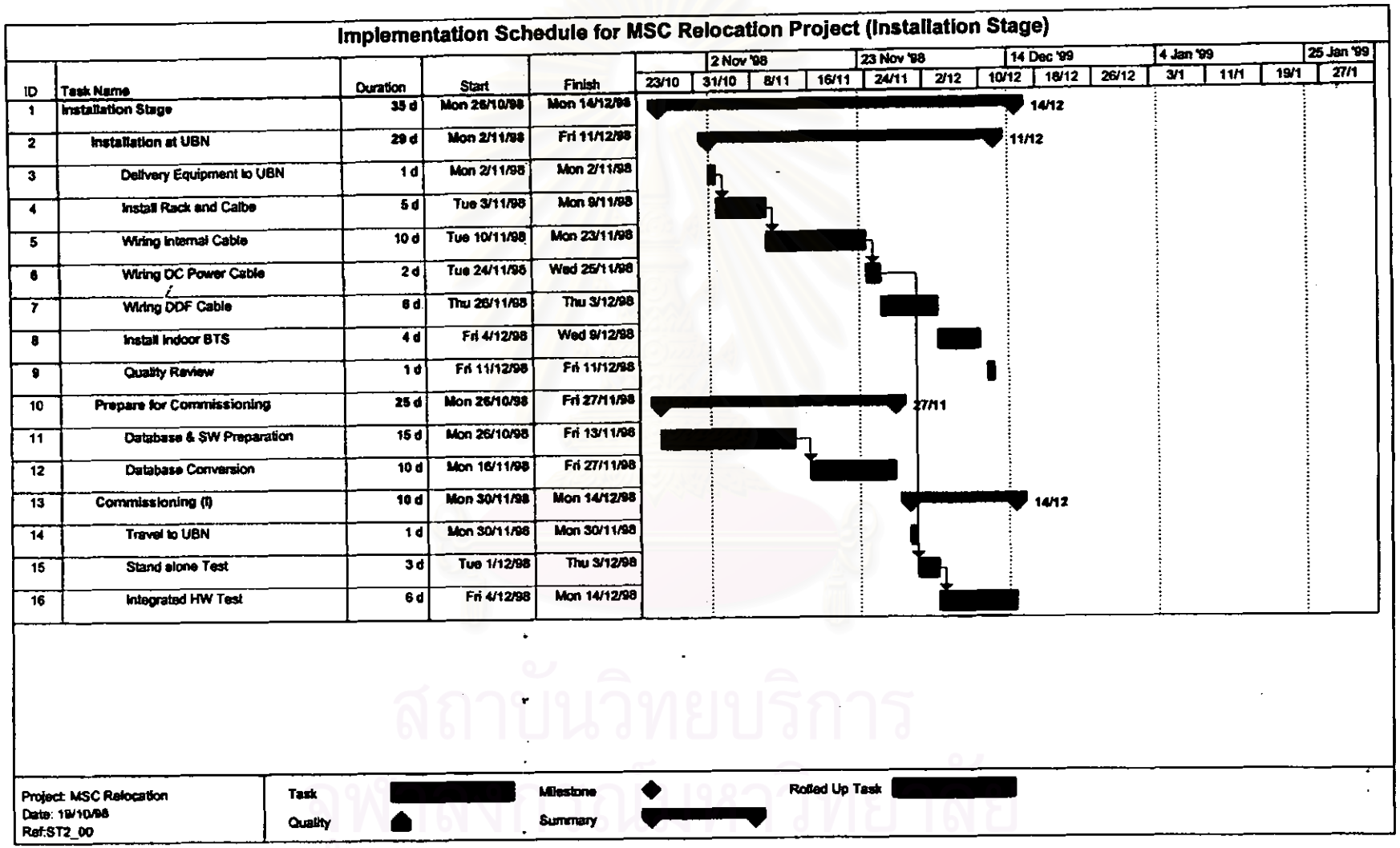


Figure 4.14: Schedule plan of the plan for the installation stage

From figure 4.14, schedule plan of the installation stage had the same format as what of project plan, except that most tasks identified in the stage plan were in activity level not in work package level as in the project plan. This is for better planning and effective control.

Scope of the installation stage was expanded from what initially identified in the project plan because project manager had to arrange project works to cope with the impact of project issue from the preparation stage. In addition, when project manager broke down few products of the PBS into lower level, he found that some works could be done in parallel for example wiring DDF cable (Task ID 17) of installation work package and stand alone test (Task ID 15) of commissioning work package. Hence, the revised plan for installation stage would include some tasks which were ever planned for commissioning stage. The duration of the installation stage was extended from 25 days to 35 days.

According to schedule plan as shown in figure 4.14, the budget plan for the installation stage was summarized as follow.

Resources	Budget
I. Labor Cost & Allowance	
Project Management	266,560.00
- Project Manager	411,648.00
- Installation Supervisor	225,120.00
- Commissioning Supervisor	93,100.00
- Team Assistance	-
Draftsman	
Installation	638,232.00
- Installer	
Commissioning	450,240.00
- Commissioning Engineer	335,160.00
Overnight Allowance	2,420,060.00
Total Labor & Allowance Cost	
II. Tools & Test Equipment	
Installation	14,790.00
- Installation tool kit	5,760.00
- Mobile Rental	9,600.00
- Mobile Call	
Commissioning	300.00
- Commissioning tool kit	3,315.00
- Note book	4,950.00
- Mobile Rental	8,250.00
- Mobile Call	536.00
- Data Set	36,000.00
- K1103	
Transportation	119,000.00
- Car Rental	34,000.00
- Gasoline	
Total Equipment & Transportation Cost	236,501.00
III. Baseline Estimate	2,656,561.00
Tolerance (15%)	398,484.15
Total Budget	3,055,045.10

Table 4.11: Budget plan for installation stage

Comparing the initial planned budget for the installation stage with the revised one, the revised budget increased from 2,020,350 baht to 2,656,561 baht because of the same reasons as the increasing duration of schedule plan.

The budget plan was created to request resources from the senior project manger for carrying out the installation stage. The total budget of 2,656,561 baht was mainly divided into 2,420,060 baht for labor cost and 236,501 baht for tool and test equipment cost. Project manager could realize that the major cost of the installation stage was the labor cost which was 91% of total budget. So he needed to bear in mind and keep aware of issues and problems which could have effect to the labor cost.

In addition, the senior project manager would use the budget plan for comparing with the actual cost at the end of installation stage. This is to evaluate the effectiveness of the project manager.

To enhance cost control during installation stage, project manager employed the earned value analysis in monitoring and controlling cost performance. The reason behind the decision was that it can provide project manager with an evident and accurate perception of stage status because project manager can see schedule variance and cost variance at the same time.

Since the Microsoft Project program also serve the earned value analysis function, project manager could extract cost plan or budget cost of work schedule (BCWS) from the schedule plan easily by using the Microsoft Project program. Figure 4.11 shows the cost plan or BCWS graph of the installation stage. This cost plan was the cumulative cost of installation stage calculated every fifteen days from starting date to finishing date. The cost plan was created before starting of installation stage so that project manager could realize how much stage should spend at each period of time. With the cost plan, project manager had baseline plan for controlling cost during installation stage.

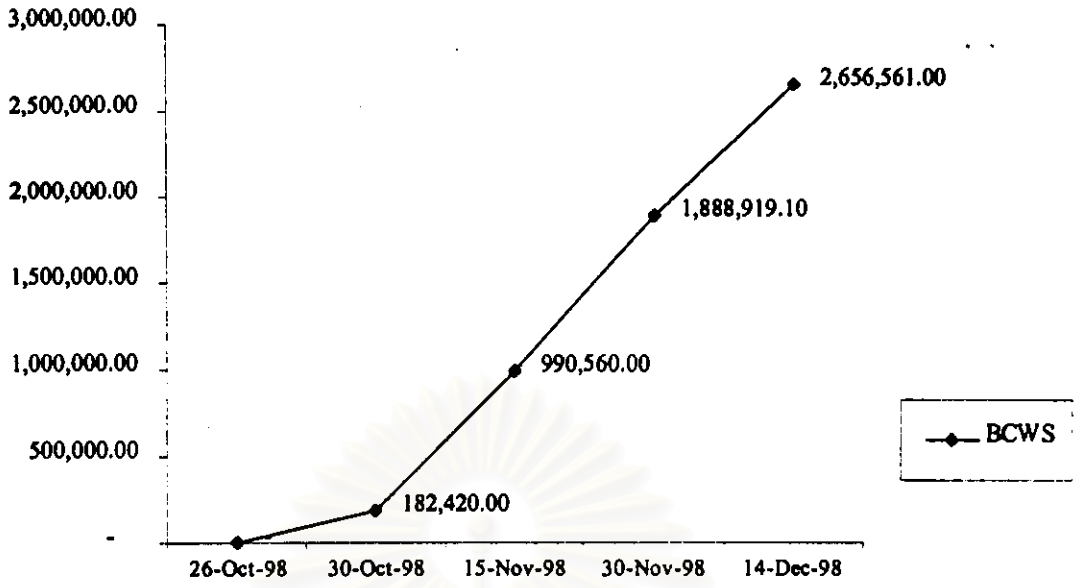


Figure 4.15: Cost plan or BCWS of stage plan for installation stage

Actually, the SB_1 is the sub-process which initiate creating stage plan, however the SB_1 itself has to call the sub-process PL_2, PL_3, PL_4, and PL_5 to create stage plan. Therefore, the stage plan which was the output of the PL process as shown in figure 4.14, table 4.11 and figure 4.15 were sent back to the SB_2 and become the outcome of the SB_1 as well.

II. Updated Risk Log

Input:	Issue Log, updated stage plan, project plan, risk log, next stage plan (Plan for installation stage)
Sub-process:	PL_6
Components:	Control (Risk Log), Risk management
Techniques:	-

During project is running, changes always occur with project. PRINCE 2 is based on the assumption that whenever changes occur, it may cause new risk and modify or eliminate the existing. Therefore, project manager needs to periodically investigate change and assess risk at least at the end of each stage. After plan for preparation stage was updated as well as plan for installation stage was created, project manager could

investigate change in the project by comparing the updated plan for preparation stage with the initial plan and the plan for installation stage with the baseline project plan.

To assess risk, the project manager used the risk assessment checklist as same as in the previous stage. The result of the second risk estimation showed that project risk factor at the installation stage had decreased from 2.0 to 1.91 when comparing with project risk factor of the previous stage. Declining of risk factor indicated that the project had turn from moderate-risk project to low-risk project. In brief, project risk tended to improve when project proceeds.

The reduction of risk factor in the installation stage was supposed to be a consequence of carrying out the preventive measures which were created for each risk after the first risk assessment.

Considering risk factor of the total 26 risk items, sixteen of them had decreased, three of them had increased and seven of them were remain. For the increasing risks, they all had risk factor hat were exceed of 8, therefore all of them were forwarded to the risk evaluation process. The aim of risk evaluation process is to create action plan for making such risks become acceptable. To evaluate risk, project manger had to consider cause and effect of risk to the project, then created counter measure for each risk item.

After that project manager recorded the details, initial risk factor, counter measure and owner of the newly detected risk into the risk log for future tracking and reference. Furthermore, project manger also reviewed the status of the existing risk in the risk log and checked the result of them after implementing preventive plan. If reviewing results that risk factor was lower than 8 then project manger changed its status from 'open' to 'close'. The sample of updated risk log at the beginning of installation stage is shown in table 4.12.

Ref. No.	Date Last Update	Description	Initial Risk Factor	Latest Risk Factor	Counter Measure	Owner	Status
R01		*Initiate Date : 3/9/98* Project Manager is slightly overload because of handling three project concurrently	8.8		Assign a project management consultant to advice and support project manager during start up of project	Senior Project Manager	Open
	16/10/98	*Result: Project work is running smoothly and project manager is not too overload*		7.6			Close
R02		*Initiate Date ; 3/9/98* Insufficient co-operation between company and customer	8		Request customer to assign a person as contact interface for this project	Project Manager	Open
	16/10/98	*Result: Better co-operation between company and customer*		6.4			Close
R03		*Initiate Date : 3/9/98* Commissioning engineer has no experience in doing commissioning	10		Commissioning Supervisor provide guideline procedure for his staffs	Commis-sioning Supervisor	Open
	16/10/98	*Result: Part of the guideline is already created and it is expected to be complete in 26/10/98*		9.2			Open
R09		*Initiate Date : 16/10/98* Equipment is mess if packaging is not well managed	9		1. Record types and number of equipment contained in the box into checklist 2. Identify reference number to each box 3. Attach checklist beside each box in order to check the equipment when it reach the destination.	Installation Supervisor	Op...
R10		*Initiate Date : 16/10/98* Customer mention about change configuration	9.5		1. Study the difference of the new configuration 2. Postpone the work dealing with the new configuration 3. Request customer to make decision as soon as possible	Commis-sioning Supervisor and Project Manager	Open

Table 4.12: Sample of risk log at the beginning of installation stage

From table 4.12, R09 and R10 were newly detected risks while R01 to R03 were the old risks from the previous stage.

Having recorded all risks into the risk log assure that they will be reviewed regularly. During stage, project management team can know the latest status of risks by checking the results and the latest risk factor from the risk log. In addition, another benefit of risk log is that it provide project manager with information of all existed risk so that he can check the impact of them on project before planning. That results in more accurate and realistic plan.

Project manager had regularly updated risk log every month and at the end of each stage until project is terminated. When the project was phase out the status of all risk items become close.

2. Managing Stage Boundary (SB) process

For this case study project, the project was divided into three stages which were preparation stage, installation stage and commissioning stage, respectively. The senior project manager delegated his authority to project manager to manage project in stage-by-stage. Therefore, at the end of each stage, the project manager had to summarize status of the previous stage, create plan for the next stage, update status of project plan and submit them to the senior project manager for requesting authorisation to proceed. All mentioned documents and plans were prepared by applying the SB process. So the SB process is the core process for the project manager at the end of each stage and the outputs of the SB process are summarized as follow.

I. Next Stage Plan (Plan for installation stage) [SB_1, PL_2, PL_3, PL_4, PL_5/Figure 4.10, Table 4.11, Figure 4.15]
II. Updated Project Plan [SB_2/Figure 4.17]
III. Update Budget Plan [SB_3/Table 4.13]
IV. Updated Risk Log [SB_4, PL_6/Figure 4.18]
V. Project Highlight Report [SB_5, CS_6/Figure 4.18]

I. Updated Project Plan

Input:	Updated stage plan, next stage plan, project plan
Sub-process:	SB_2
Components:	Control (Plan and Re-plan), Plans (Project Plan)
Techniques:	-

Normally, Senior Project Manager uses project plan throughout the project for measuring progress and assessing the overall status of the project. Therefore, project plan should be constantly updated at least every end stage in order to reflect progress which have already made and any revised forecast of cost and/or duration of the project.

According to the "Updating a Project Plan (SB_2) process, as preparation stage was completed and installation stage was being planned in detailed, then project manager would update the project plan in order to reflect the latest understanding of the project by following these three steps.

- Updated the project plan according to the actual status of the finishing stage (Preparation Stage)
- Updated the project plan by summarizing the schedule from the next stage plan (Installation Stage)
- Updated the rest of project plan by forecasting the schedule of the other stages (Commissioning Stage)

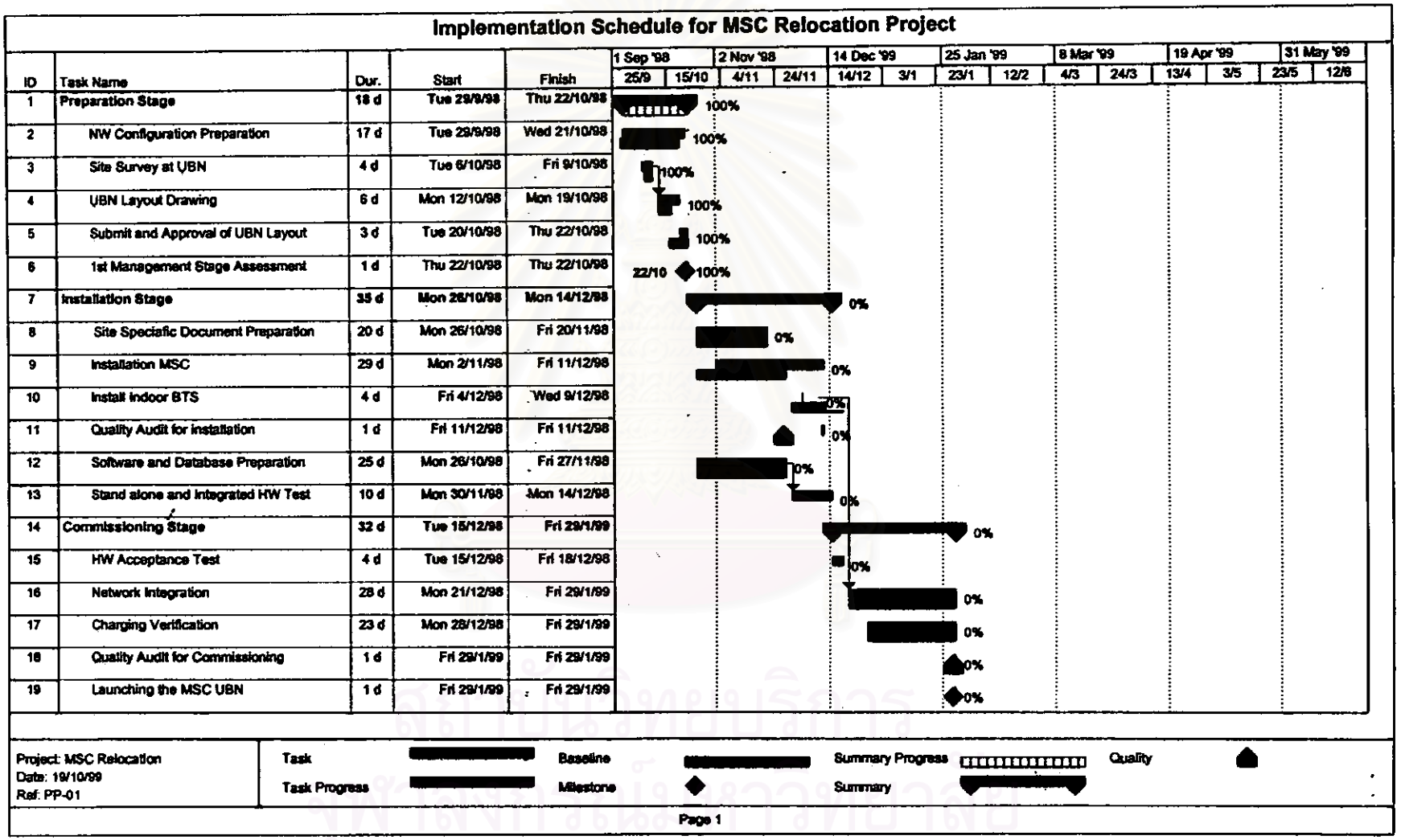


Figure 4.16: Updated project plan at the beginning of installation stage

Figure 4.16 shows the updated project plan at the beginning of installation stage. The lower bar of each task represents baseline plan. The upper and dark bar shows the actual progress while the lighter one shows the revised plan. The updated project plan presents baseline plan, project progress and revised plan in the same sheet, so project manager can obviously see the actual progress, duration of project schedule and forecasted schedule of project at the same time. The updated project plan reveal, how far the project is deviating from its original size and scope.

The significant information gained from the updated project plan in figure 4.16 are following.

- it showed the actual status of the finished stage (preparation stage)
- it illustrated how much the next two stages, installation stage and commissioning stage would deviate from their original size and scope.
- the revised plan confirmed the senior project manager that project would be able to achieve according to the project time frame
- the updated project plan would be used for evaluating effectiveness of project manager at the end of the next stage (installation stage)

II. Updated budget plan

Input:	Updated project plan, updated stage plan, next stage plan
Sub-process:	SB_3
Components:	Control (Plan and Re-plan)
Techniques:	-

According to the SB_3 sub-process, apart from schedule of the project plan, project expenditure is another concerning area of the senior project manager. In general, when there is something happens to the schedule of the project, it affects to the project cost as well. So the senior project manager needs to check cost of project consistently in particular after updating project plan to ensure that it will not exceed the allocated budget. Before start-up of installation stage, project manager updated project budget in the similar way as updating schedule of project plan as earlier mentioned.

- Calculated the actual cost of the finishing stage (preparation stage)
- Calculated the planned budget for the next stage (Installation stage)
- Calculated the forecasted budget for the other stages (Commissioning stage)

The updated budget plan before start-up of installation stage is shown in table 4.13

Resources	Stage 1		Stage 2		Stage 3	
	Plan	Actual	Plan	Actual	Plan	Actual
Labor Cost & Allowance						
Project Management						
- Project Manager	144,704.00	144,704.00	266,560.00		243,712.00	
- Installation Supervisor	122,208.00	122,208.00	411,648.00		-	
- Commissioning Supervisor	122,208.00	122,208.00	225,120.00		205,824.00	
- Team Assistance	50,540.00	50,540.00	93,100.00		85,120.00	
Draftsman	24,110.00	28,932.00	-		-	
Installation						
- Installer	-		638,232.00		-	
Commissioning						
- Commissioning Engineer	-		450,240.00		411,648.00	
Overnight Allowance	-		335,160.00		85,120.00	
Total Labor & Allowance Cost	463,770.00	468,592.00	2,420,060.00		1,031,424.00	
Tools & Test Equipment						
Installation						
- Installation tool kit	-		14,790.00		-	
- Mobile Rental	1,710.00	1,710.00	5,760.00		-	
- Mobile Call	2,850.00	2,850.00	9,600.00		-	
Commissioning						
- Commissioning tool kit	-		300.00		960.00	
- Note book	-		3,315.00		10,608.00	
- Mobile Rental	1,710.00	1,710.00	4,950.00		8,640.00	
- Mobile Call	2,850.00	2,850.00	8,250.00		14,400.00	
Data Set	-		536.00		1,715.20	
K1103	-		36,000.00		115,200.00	
Transportation						
- Car Rental	-		119,000.00		56,000.00	
- Gasoline	-		34,000.00		16,000.00	
Total Equipment & Transportation Cost	9,120.00	9,120.00	236,501.00		223,523.20	
Baseline Estimate	472,890.00	477,712.00	2,656,561.00		1,254,947.20	
Total Estimate						4,389,220.20
Contingency (15%)	70,933.50	71,656.80	398,484.15		188,242.08	
Budget	543,823.50	549,368.80	3,055,045.10		1,443,189.20	
Total Budget						5,591,426.60

Table 4.13: Updated budget plan before start-up of installation stage

The updated budget plan shown the actual cost and cost deviation of the finishing stage (preparation stage). It also presented the revised budget for the two

remaining stages (installation stage and commissioning stage). The senior project manager could realize how much the budget deviation of each stage is by comparing the updated budget plan with the baseline.

By summing up the actual cost of preparation stage with the planned budget of installation stage and commissioning stage, project manager could forecast the cost at completion of this project. From table 4.13, the forecasted cost at completion was equal to 4,389,220 baht which was lower than the initial budget of 4,572,342 baht. This ensured the senior project manager that project would complete with under budget.

III. Project Highlight Report

Input:	Updated stage plan, risk log, project issue log
Sub-process:	SB_5, CS_6
Components:	Control (End stage assessment, project highlight report, tolerance, project issue)
Techniques:	-

During project implementation, project manager has to conclude stage status and created summary report called 'Project Highlight Report' for the senior project manager every month and at the end of each stage. The project highlight report which is created every month is initiated by the CS_6 sub-process and aim to just inform stage status to the senior project manager. While the purpose of creating the project highlight report at the end of each stage is to request authorization for proceeding to the next stage and this report is initiated by the SB_5 sub-process. However, both of them had the same format. A sample of the project highlight report is shown in figure 4.17.

PROJECT HIGHLIGHT REPORT

Ref: PHR - 03

Project: MSC Relocation Project Phase 4.0

Date: 30/11/98

Reporting Period: **From:** 1/11/98 **To:** 30/11/98

Section 1 - Variance Analysis

BCWS	BCWP	ACWP	SV	CV	SV(%)	CV(%)	CPI	BAC	EAC
1,888,919.10	1,872,970.50	1,892,419.10	- 15,949.10	- 19,449.10	-1%	-1%	0.99	2,656,561.00	2,684,146.84

Section 2 - Comment on Variation

% Cost Variance because

% Schedule Variance because

Section 3 - Risk Status

Ref. No.	Initiate Date	Description	Initial Risk Factor	Latest Risk Factor	Status
R03	3/9/98	Commissioning Engineer has no experience	10	9.2	Open
R04	3/9/98	Unpredictable technical problem	8.4	8.4	Open
R05	3/9/98	Facilities are outside the control of project team	12	11.2	Open
R07	3/9/98	Customer's site is far from office	9	8.4	Open
R08	16/10/98	Unavailability of installation team	10.5	3.5	Close
R09	16/10/98	Equipment is mess if package is not well managed	9	1.5	Close
R10	16/10/98	Customer mention about change configuration	9.5	9.5	Open

Section 4 - Potential Issue

PI No.	Initiate Date	Description	Impact Analysis	Decision	Status
PI - 3	23/11/98	4 week late delivery of BSC	Project is 4 weeks delay from schedule	Borrow BSC from TAC or Customer's training center	Open

Figure 4.17: Project Highlight Report

Figure 4.17 show one sample of project highlight report during installation stage. The first and second section of the project highlight report is dedicated for reporting stage status. The earned value analysis is used in presenting stage status because of three reasons:

- it can show schedule status, cost status and their relationships at the same time.
- the percentage of schedule variance and cost variance from the earned value analysis can support the concept of 'management by exception'.
- it can be used to forecast the cost at completion.

The senior project manager would check whether the percentage of schedule variance and cost variance were higher than the pre-defined tolerance of 15%. That was to ensure that stage remained under control. If either schedule or cost deviated was higher than the tolerance, then the senior project manager could find the cause of problem in section two of the report.

The third section was used to report latest status of risks existed in the risk log. Because the senior project manager needed to ensure that all risks were regularly reviewed and the appropriate actions had been done to response to the detected risks.

The last section was used for escalating project issues to the senior project manager in case that the impact of the issue or solution for the issue was beyond the project manager's authority. For each issue raised to the senior project manager, project manager had to provide the senior project manager with information related to the issue like the description, potential impact and solution for the issue from his point of view.

3. Controlling a Stage (CS) process

During each stage, project manager focuses on delivery of products, to their stated quality criteria, within the approved time scales and budget, within the stated tolerances. To achieve such objectives, the following products of the CS process are created for helping project manager in control stage status.

I. Work Package Authorization [CS_1/Figure 4.15]

II. Team Plan [CS_1/Figure 4.19]

III. Updated Stage Plan [CS_2, CS_5, CS_7,/Figure 4.16, Table 4.14, Figure 4.21]

IV. Project Issue Log [CS_3, CS_4, CS_8/Table 4.15]

V. Updated Risk Log [CS_6/Table 4.12]

VI. Project Highlight Report [CS_6/Figure 4.18]

I. Work Package Authorization

Input: Stage plan
Sub-process: CS_1
Components: -
Techniques: -

'Work Package Authorization' is produced to allow responsibility to pass to the supervisor or staff for the production of the product. Figure 4.18 shows the 'Work Package Authorization' for the installation work package. It contains work-related information like authorized person, objectives, product description, stage plan extract and reporting requirement.

WORK PACKAGE	**WPA - 01**
Project: MSC Relocation Project	
Author: Project Manager	**Date:** 19/10/98

Purpose:

This document has been produced to allow responsibility to pass formally to the Installation Supervisor for performing installation detailed in the Product Description attached.

Team Manager/Team/Person Authorised:

Installation Supervisor

Objectives:

Finishing MSC Installation by 3/12/98
Finishing BTS Installation by 9/12/98
Passing the identified quality criteria

Product Description(s):

<See the product description in the attachment>

Stage Plan Extract

Duration of Installation Work Package is 2/11/98 to 11/12/98
<See detailed in the attached team plan>

Reporting Requirements & Arrangements:

Weekly Report

- Checkpoint Report <See the template of Checkpoint Report in the Attachment>
- Updated Team Plan

Fortnightly Report

- Timesheet

Figure 4.18: Work Package Authorization for the Installation Work Package

From figure 4.18, the document identified the installation supervisor as the authorized person of the work package. The significant and measurable milestones like 'finishing MSC installation by 3/12/98' were identified as objectives of the installation work package. It also pointed staff to refer to some other important document such as product description and team plan. In addition, the 'Work Package Authorization' also told staffs what and how often the project manager needed feed back from them. From figure 4.15, the installation supervisor was asked to send project manager the checkpoint report and updated team plan every week, and timesheet every two week.

Before authorizing start of installation work package, project manager discussed and handed over the work package authorization and other related documents such as product description and team plan to the installation supervisor. This was to ensure that the installation team would have enough information to do their work. In addition the project manager had to make sure that staff really understood and accepted with what was mentioned in the work package authorization especially the identified schedule and the quality criteria. Because the project manager expected to gain commitment from installation team when they accepted and agreed with the documents and plans.

During installation stage, the installation team used the work package authorization as reference and guide in performing their work. While the project manager would use it again at the end of installation stage for checking the completeness of the installation work.

II. Team Plan

Input: Stage plan
Sub-process: CS_1
Components: Plan (Team Plan) Stage (Technical stage)
Techniques: -

Since the team plan for installation work package was initially created for estimation purpose at the planning phase but that plan identified only task description and effort required for each task. Hence, before starting up the installation stage, the project manager applied the CS_1 sub-process to re-created team plan by identifying

starting date and finishing date for each activity based on the original team plan and the stage plan for installation stage. The team plan for installation work package is shown in figure 4.15.

Installation Team Plan

Project: MSC Relocation PLK to UBN

Date: November 16, 1998

ID	*Activity*	*Planned Schedule*			*Actual Schedule*			*Target Schedule*			*Remark*
		Start	*Finish*	*Dur.*	*Start*	*Finish*	*Dur.*	*Start*	*Finish*	*Dur.*	
1	Deliver Equipment to UBN	Mo2/11/98	Mo2/11/98	1d							
2	Install at MSC-UBN	Tu3/11/98	Fr11/12/98	29d							
2.1	Install Rack and Cable Ladder	Tu3/11/98	We11/11/98	7d							
2.2	Wiring Internal Cable	Th12/11/98	Tu24/11/98	9d							
2.3	Wiring DC Power Cable	We25/11/98	Th26/11/98	2d							
2.4	Wiring DDF Cable	Fr27/11/98	Fr4/12/98	6d							
2.5	Install Indoor BTS	Tu8/12/98	Th10/12/98	3d							
2.6	Quality Audit	Fr11/12/98	Fr11/12/98	1d							

Figure 4.19: Team plan for installation work package.

From figure 4.19, the team plan identifies starting date, finishing date and duration of each activity. Project manager would use it for control progress of works assigned to the installation supervisor. Likewise the work package authorization, team plan required agreement and commitment from installation team as well so the project manager had discussed with the installation supervisor about team plan until he agreed and committed with the schedule of the plan.

The strength of team plan was that it consisted of detail activities and was weekly updated by the supervisor therefore the project manger was able to monitor and control work progress effectively.

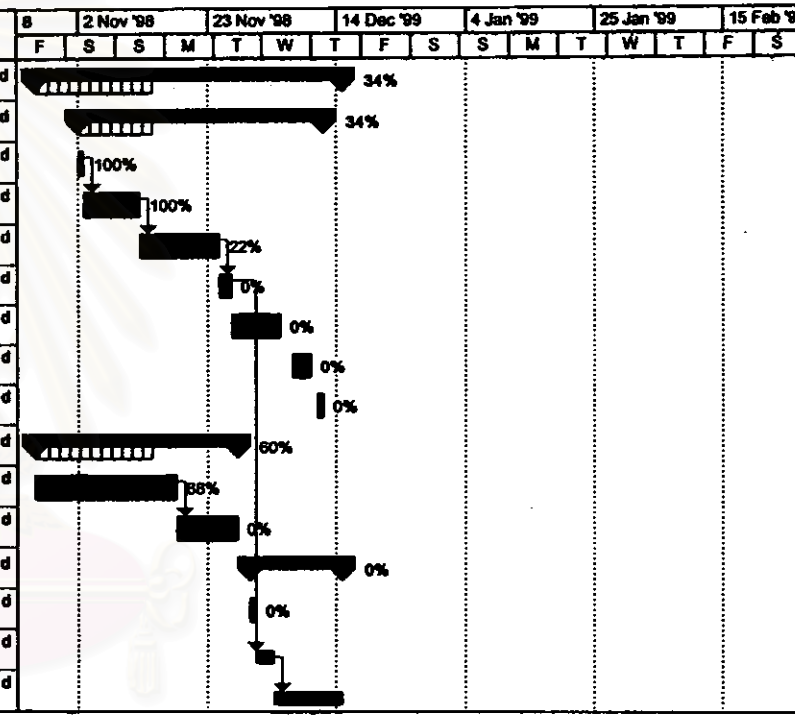
III. Updated Stage Plan

Input:	Checkpoint report, updated Team plan
Sub-process:	CS_2, CS_5, CS_7
Components:	Control (Checkpoint report, tolerance, plan and re-plan)
	Change control
Techniques:	-

During installation stage, the project manager received updated team plan from the installation supervisor every week according to the MP_2 sub-process, then he applied the CS_2 sub-process in order to update stage plan. This was to gain an accurate and current picture of progress on the work being carried out. Figure 4.16 shows one sample of the updated stage plan during the installation stage.

Implementation Schedule for MSC Relocation Project (Installation Stage)

ID	Task Name	Act. Start	Act. Finish	Act. Dur.	Rem. Dur.
1	Installation Stage	Mon 26/10/98	NA	11.89 d	23.11 d
2	Installation at UBN	Mon 2/11/98	NA	10 d	19 d
3	Delivery Equipment to UBN	Mon 2/11/98	Mon 2/11/98	1 d	0 d
4	Install Rock and Calbe	Tue 3/11/98	Wed 11/11/98	7 d	0 d
5	Wiring Internal Cable	Thu 12/11/98	NA	2 d	7 d
6	Wiring DC Power Cable	NA	NA	0 d	2 d
7	Wiring DDF Cable	NA	NA	0 d	6 d
8	Install Indoor BTS	NA	NA	0 d	3 d
9	Quality Review	NA	NA	0 d	1 d
10	Prepare for Commissioning	Mon 26/10/98	NA	15 d	10 d
11	Database & SW Preparation	Mon 26/10/98	NA	15 d	2 d
12	Database Conversion	NA	NA	0 d	8 d
13	Commissioning (I)	NA	NA	0 d	10 d
14	Travel to UBN	NA	NA	0 d	1 d
15	Stand alone Test	NA	NA	0 d	3 d
16	Integrated HW Test	NA	NA	0 d	6 d



Project: MSC Relocation roject
Date: 13/11/98
Ref:ST2_02

Task
Task Progress
Baseline
Summary Progress
Summary

Page 1

Figure 4.20: The updated stage plan during installation stage

For each activity, the percentage of completion written at the end of each bar was calculated based on the following formula.

$$\%\text{complete} = \frac{\text{actual duration}}{\text{actual duration + remaining duration}} \times 100$$

For example, the actual duration of task ID5 is two days because it has started for two days already. In addition the project manager thought that it require seven more days to complete this task so the remaining duration of this task is seven days. Thus the percentage of completion can be calculated as follow

$$\% \text{ complete} = \frac{2}{2+7} \times 100 = 22\%$$

From the figure 4.20 the lower bar of each task represented baseline plan while the upper bar represented the revised plan. Furthermore, the dark color of the upper bar illustrated the amount of work having already completed while the light color or the rest of the upper bar represented the remaining work of the activity. In summary, this format of the updated stage plan as shown in figure 4.20 can apparently show status of the stage at glance.

Furthermore, in this case study project, the 'Earned Value Analysis' was applied in measuring performance of each stage. Since the Microsoft Project program can serve the function of earned value analysis, the three key factors of the earned value analysis, which are BCWS, ACWP and BCWP, could be extracted from the update stage plan by using the Microsoft Project program. After that these three factors are used as basic information in calculate other parameters related to the 'Earned Value Analysis' using the following formula.

Cost Variance (CV)	=	BCWP – ACWP
Schedule Variance (SV)	=	BCWP – BCWS
Cost Performance Index (CPI)	=	BCWP/ACWP
Cost Variance Percent (CV%)	=	CV/BCWP
Schedule Variance Percent (SV%)	=	SV/BCWP

$$\text{Estimated at Completion (EAC)} = \frac{(BAC - BCWP)}{CPI} + ACWP$$

Project manager performed earned value analysis every fifteen days and the result of them are shown in table 4.14 and figure 4.21.

Date	BCWS	BCWP	ACWP	SV	CV	SV%	CV%	CPI	EAC
30/10/98	182,420.00	171,456.00	185,920.00	- 10,964.00	- 14,464.00	-6%	-8%	0.92	2,880,668.05
15/11/98	990,560.00	952,466.80	994,060.00	- 38,093.20	- 41,593.20	-4%	-4%	0.96	2,772,570.16
30/11/98	1,888,919.10	1,872,970.50	1,892,419.10	- 15,948.60	- 19,449.60	-1%	-1%	0.99	2,634,146.84
14/12/98	2,656,561.00	2,656,561.00	2,700,891.00	-	- 44,330.00	0%	-2%	0.98	2,700,891.00

Table 4.14: Result of earned value analysis during installation stage

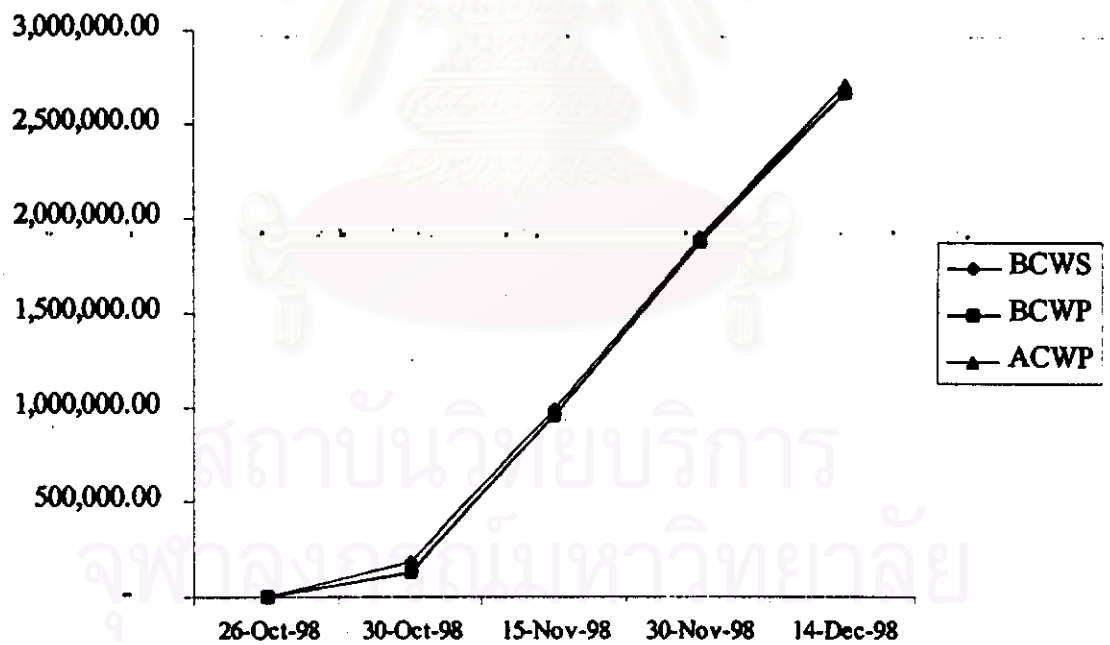


Figure 4.21: Graph of earned value analysis during installation stage

In summary, the outcomes of updating stage plan consist of the updated schedule plan as shown in figure 4.16 and the result of earned value analysis as shown in

table 4.14 and figure 4.21. They were very useful for monitoring and control stage status and would be used in three categories.

i) Reviewing Stage Status
ii) Reporting Highlight
iii) Preparing Next Stage Plan

IV. Project Issue Log

Input:	Checkpoint report
Sub-process:	CS_3, CS_4, CS_8
Components:	Control (Project Issues, Tolerance)
	Change control
Techniques:	Change control

Project issue is used by anyone who raises any issues relating to project to the project manager. Project issue can be problem, change in requirement, idea or suggestion. During installation stage, most of the project issues were problems raised by supervisors through checkpoint report.

All project issues were firstly handled by the CS_3 process. They were recorded into the project issue log and also defined with reference number, date when issue had been raised, initiator and current status. Then the recorded issue was passed to the 'Examining project issue (CS_4)' process where the issue was examined by the project manager and possibly with the initiator. They had to check the impact of project issue on various aspects like time, cost, and risk before making decision to such issue.

However, Project Manager must always realise that, if his proposed action caused change to the project within tolerance, then Project Manager could start taking the proposed action immediately. In contrast, if the impact of the proposed action was beyond the tolerance, then Project Manager had to pass that project issue as well as the recommended action to the Escalating Project Issue (CS_8) process where the senior project manager will consider how to carry on such project issue by himself.

One example of project issue during installation stage was that customer asked the installation team to assembled a number of connectors with the jumper cables. This request from customer caused additional work which was not include in the plan, so the Installation Supervisor passed the decision for this request to the Project Manager by raising up project issue in the 'Checkpoint Report'.

Project Manager performed impact analysis for this issue then concluded the result of impact analysis as follow

Concern Area	Impact of Project
Time scales	The overall schedule of the project would not change since other works are still be able to start as plan, except the installation work package, which may extend one more day.
Cost	49,022 Baht
Benefit Achievement	Company may gain favor from the customer
Risks	Risk could happen by the involvement of the third party, since the customer needs to hire subcontractor to install the cables before the installation team could start their work.
Contingency Plan	Project Manager should negotiate with the customer that if they cannot finish cable installation according to plan, then company will cancel the responsibility on those extra work and customer has to ask the subcontractor to assemble it or do it by themselves.

For this project issue, the decision for response to the issue could be made at Project Manager level because the impact analysis revealed that the effect of the issue does not exceed the allocated tolerance. Consequently project manager decided to let the installation team perform additional work as customer requests because the project still be able to achieve in the project time frame and project cost just slightly deviated from budget but remain within tolerance.

After that any actions or events relating to the project issues would be recorded into the project issue log until status of the issue was changed to 'close'. The sample of project issue log is shown in table 4.15.

Initiator	Issue Number	Description of Issue	Impact Analysis
Project Manager	PI03	*Date: 24/11/98* 4 week-delay delivery of the Base Station Controller (BSC). Delivery date change from 26/11/98 to 24/12/98 ***Decision*** *Date: 24/11/98* • Senior Project Manager proposes 2 alternative solutions which are to borrow BSC either from Technical Assistant Center (TAC department or from Customer's training Center *Date: 26/11/98* • TAC department reject the senior project manager's request, so he will try another choice *Date 1/12/98* • Customer accepts the project manager's request and they ask for the schedule plan of the project *Date: 11/12/98* • Commissioning engineer connect the BSC at training center with the MSC at site	*Time Scale:* project will be about 3 weeks delay from schedule, but still within project's objective *Cost:* about 460,153.5 Baht over budget *Risk:* impact to booked resource in the third stage

Table 4.15: Sample of the Project Issue Log

Some benefits were found after applying project issue log in the case study project:

- All project issues occurring in the project were acknowledged by the project manger.
- All information and events relating to the project issues were trackable.

- Decision made to response to the issue to more appropriate because project manager had to perform impact analysis before making decision.
- Plan for next stage was more accurate since project manager had to check impact of the project issue before planning.
- Change in project could be controlled because authorizing for change was defined for each level of management.

4. Managing Product Delivery (MP) process

This process is designed especially for product creation work. It is interface process between product creation and management work. The MP process is one of partner processes with the CS process. During product creation, project manager needs to know status of the assigned work package therefore some products are created and feedback to the project manger through the MP process. The outputs of the MP process are summarized as follow

I. Checkpoint Report [MP_2/Figure 4.22]

II. Updated Team plan [MP_2/Figure 4.23]

I. Checkpoint Report

Input: Work Package Authorization, Team plan
Sub-process: MP_2
Components: Control (Project Issue, Checkpoint Report)
Techniques: -

Checkpoint report is a significant progress report which supervisor has to prepared for project manager every week. The project manager will use it for evaluating status of stage and take corrective action if necessary.

To created 'Checkpoint Report', first, installation supervisor assessed the overall status of installation work package so far and identified whether it was on schedule,

behind plan, ahead of plan or complete. Then installation supervisor listed all activities, which had been completed in previous period and also what he planned to do in next period. In addition, if the installation supervisor had any suggestion or detected any problems, he would raise them to project manager in the area of event report. However, for any issues he raised to the project manager he needed to analyzed the impact and recommended response action as well. The sample of 'Checkpoint Report' is presented in figure 4.22.

Checkpoint Report

Ref: CR-I02

Project: MSC Relocation Project

Author: Mr. Pakorn Salemee | **Date:** 16/11/98

Checkpoint Report Period: | **From:** 9/11/98 | **To:** 13/11/98

MSC Relocation PLK to UBN : On Plan		Ahead of Plan		Behind Plan	X	Complete		

Significant Accomplishments:

1) Install Equipment Rack in the second row

Planned Activity for next period:

1) Install cable ladder

2) Wiring internal cable

Current Problem	Potential Impact	Corrective Action
1) Customer request installation team to assemble connectors with jumper cables	Schedule of installation work will expand one day from plan	Require decision making from project manager

Note:

Figure 4.22: Checkpoint Report

The benefits of Checkpoint Report to the project manager were that

- project manager can see the overall work package status at glance.
- project manager is able to check progress of work package by comparing the planned activities of the previous checkpoint report with the significant accomplishment of the current one.
- project manager can realize the planned activities of his staffs for the next period and gain commitment from them too.
- project manager get inform about detail, impact and status of newly detected issue including reaction to the issues from the point of view of supervisor.

II. Updated Team Plan

Input:	Work package authorization, Team plan
Sub-process:	MP_2
Components:	Control (Plan and Re-plan)
Techniques:	-

According to the MP_2 sub-process, the installation supervisor used team plan as reference in updating plan. First, the installation supervisor updated all tasks that had already started or finished in the actual schedule field. Then he forecasted the expected starting date and finishing date of the rest activities and entered them into the target schedule field. So the target schedule was like a new commitment from installation supervisor to project manager. The sample of the updated team plan for installation work package is shown in figure 4.23.

Installation Team Plan

Project: MSC Relocation PLK to UBN

Date: November 16, 1998

ID	*Activity*	*Planned Schedule*			*Actual Schedule*			*Target Schedule*			*Remark*
		Start	*Finish*	*Dur.*	*Start*	*Finish*	*Dur.*	*Start*	*Finish*	*Dur.*	
1	Deliver Equipment to UBN	Mo2/11/98	Mo2/11/98	1d	Mo2/11/98	Mo2/11/98	1d	Mo2/11/98	Mo2/11/98	1d	
2	Install at MSC-UBN	Tu3/11/98	Fr11/12/98	29d	Tu3/11/98			Tu3/11/98	Fr11/12/98	29d	
2.1	Install Rack and Cable Ladder	Tu3/11/98	We11/11/98	7d	Tu3/11/98			Tu3/11/98	Mo16/11/9	10d	
2.2	Wiring Internal Cable	Th12/11/98	Tu24/11/98	9d				Tu17/11/98	Fr27/11/98	9d	
2.3	Wiring DC Power Cable	We25/11/98	Th26/11/98	2d				Th26/11/98	Fr27/11/98	2d	
2.4	Wiring DDF Cable	Fr27/11/98	Fr4/12/98	6d				Mo30/11/9	Fr4/12/98	5d	
2.5	Install Indoor BTS	Tu8/12/98	Th10/12/98	3d				Tu8/12/98	Th10/12/98	3d	
2.6	Quality Audit	Fr11/12/98	Fr11/12/98	1d				Fr11/12/98	Fr11/12/98	1d	

Figure 4.23: Updated Team Plan

The installation supervisor submitted the updated team plan together with the checkpoint report to project manager every week. This report and plan were used for reporting actual status of the installation work package and presented the revised plan to project manager. On the other hand, project manager used the updated team plan in assessing progress of work package by comparing actual schedule with planned schedule. He also used information from the updated team plan for updating stage plan stage as well.

5. Directing a Project (DP) process

In this Project, the concept of 'Management by Exception' was applied by the senior project manager in managing project. During Installation Stage, the senior project manager delegated his authority in managing project to the project manager, so it was not necessary for him to daily monitor and control progress, but he can leave those works to the Project Manager. That freed the Senior Project Manager to do other important works. Thus, the main function of the Senior Project Manager during Installation Stage was to check the status of installation stage from the 'Project Highlight Report' and make sure that

- Project remains focus on the project objectives
- Stage is progress according to plan or slightly deviate from plan but not exceed the allocated tolerance.
- All detected risks are regularly reviewed and there are appropriate actions have already done to response to them.
- Decision for the escalated project issue are properly made.

All processes which were mentioned in control during stage were continuous processes, so project management team had to carry on those processes until the end of installation stage. Installation was finished when the mobile phone exchange was completely installed and approved by the quality audit team. Finally, termination of Installation Stage triggers start-up of the last stage, Commissioning Stage