IMPLEMENTATION OF PROJECT MONITORING AND EVALUATION TO IMPROVE PROJECT EFFECTIVENESS AND EFFICIENCY

Freddy Fransisko
School of Business and Management,
Institut Teknologi Bandung
Indonesia

ABSTRACT

One activity that support oil and gas production in CINTA Corpis project activity. One issue that found in project activity is lack of project monitoring and evaluation that make schedule delayed and over budget on project completion. Fishbone diagram is used to identified the root cause of the weaknesses of project monitoring and evaluation activity in CINTA.5WHY method combine with fishbone and benchmarking to same industry ware performed to understand the possibility to strengthening implementation of project monitoring and evaluation at CINTA. Earned Value Analysisis used as technical analysis to know how the effectiveness and efficiency of project performance at CINTA. The results of the research are management commitment and availability of procedure implementation monitoring and evaluation are suggested to improve the performance of project implementation in CINTA.

Keywords: Project Monitoring and Evaluation, Fishbone Diagram, 5WHY Method, Earned Value Analisis (EVA).

This research was supported by School of Business and Management Institut Teknologi Bandung awarded to Freddy Fransisko under advisor Dr. Ir. Aries Aries Firman, MSc, MBA

Name of company in this paper is disguised and some information in this paper are hidden due to confidential reason to the company

1. INTRODUCTION

CINTA Corp is an Oil and Gas Company that known as pioneer of contractor which operated at Indonesia offshore field. CINTA Corp location as shown at figure 1 was bordered by Bangka and Belitung islands in the north, Sumatra Island in the west, Pertamina Hulu Energy Offshore Northwest Java field in the east, and Java Island in the south. CINTA Corp divides its working area into three business unit. They are north area, central area and south area with total production around 39,000 barrel of crude oil per day.

In performing project, CINTA Corpfacing bellow challanges:

- PSC contract that will be over on 2018 makes no CAPEX allowed by the management.
- High turnover of employee and many employee already on retirement period makes knowledge and experience gap is still high for new employee. End of PSC contract not allow CINTA Corp to hire new employee. This makes CINTA should maximized the performance of current engineers to handle projects.
- Low oil price in upcoming year and effciency in CINTA oil production process and business process is also one challange need to be considered.

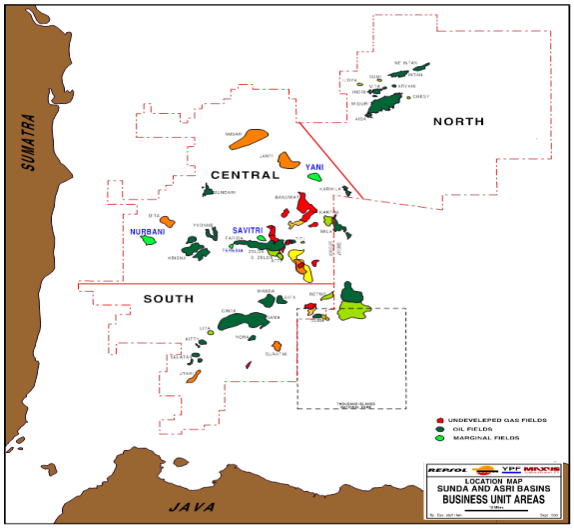

Figure 1. Operational Area of CINTA Corp

Since it is being usual that project is delayed and over budget, also realized that there is lacking implementation of project monitoring and evaluation, CINTA Corp need to identify what are the problem in implementation of project monitoring and evaluation. By doing this CINTAcan find out the solution to solve the root cause of low performance of project monitoring and evaluation in execution phase.The result can be used to prepare what kind of monitoring and evaluation can be used for ongoing project orfor the next project so CINTA can have better project performance. When CINTAperform a good project monitoring and evaluation, it will keep improving project team knowledge and experience to perform project with better project performance; in the end it will be a new competitive advantage to CINTA Corp.The research have two research questions to be solved:

- What are the root cause of project monitoring and evaluation being not well implemented in CINTA Corp?

- How CINTA Corp could improve project performance in term of schedule achievement and budget achievement by implement project monitoring and evaluation?

2. METHOD

Meeting time and budget goals are only small part of successful project. Project success should also consider: (i) Project efficiency is reflected how the project meet the schedule, meet the budget; (ii) Impact to customer/stakeholder is reflected how the project meet the requirements and specification, customer satisfactory; (iii) Impact to the project team is reflected how the project affect the team satisfaction, team morale, skill development, team member growth; (iv) Impact to Business is reflected how the project impact on profit and service quality; and (v) Future preparation reflected how well the project helps CINTA Corpto prepare its infrastructure for the future (A. Shenhar, 2007,p.27).

Table 1. Summary differences monitoring and evaluation

	Monitoring	Evaluation
Objective	To track changes from baseline condition to desire outcomes	To validate what results were achieved and how and why they were or were not achieved
Methodology	Tracks and assesses performance through analysis and comparison of indicators over time.	Evaluate achievement or outcomes by comparing indicators before and after the intervention
Characteristics	Continuous and systematic by program or Project Manager and key partners	Time bond, periodic, in-depth
Why	To observe, to check, To Record, For day to day decision, Provide information for evaluation	To judge and to value, To assess, For Major decision, Provide information for future planning
When	During implementation Continuous	Before and after a major decision make Periodic

One weakness found in doing a project is lacking of monitoring and evaluation for actual expenditure againts budgeting. There is only monitoring in schedule performance with little or even no project evaluation. Earned Value Analysis (EVA) is a technique which provides integrated schedule (time), progress and cost management information related to scope, and quality. EVA also a tools and technique applied in project management used to forecast potential outcomes based on possible variations of project or environmental variables and their relationships with other variables. In the day-to-day activities of the project manager, EVA provides "alarm" signals and facilitates decisions that keep the

project on time and on budget. The main objective of implementing EVA was to ensure that the project finished on time and on budget, also educating the project team. Schedule progress indicator could be seen in Schedule Variance (SV). If SV is greater than 10%, the project manager should began to consider immediate corrective action. PMBOK methodology dictates that a project with SV greater than 20% cannot be accomplished within the baseline constrains without major action taken.

This research is done based on combination of quantitative and qualitative analysis. Research framework is shown in figure 2.

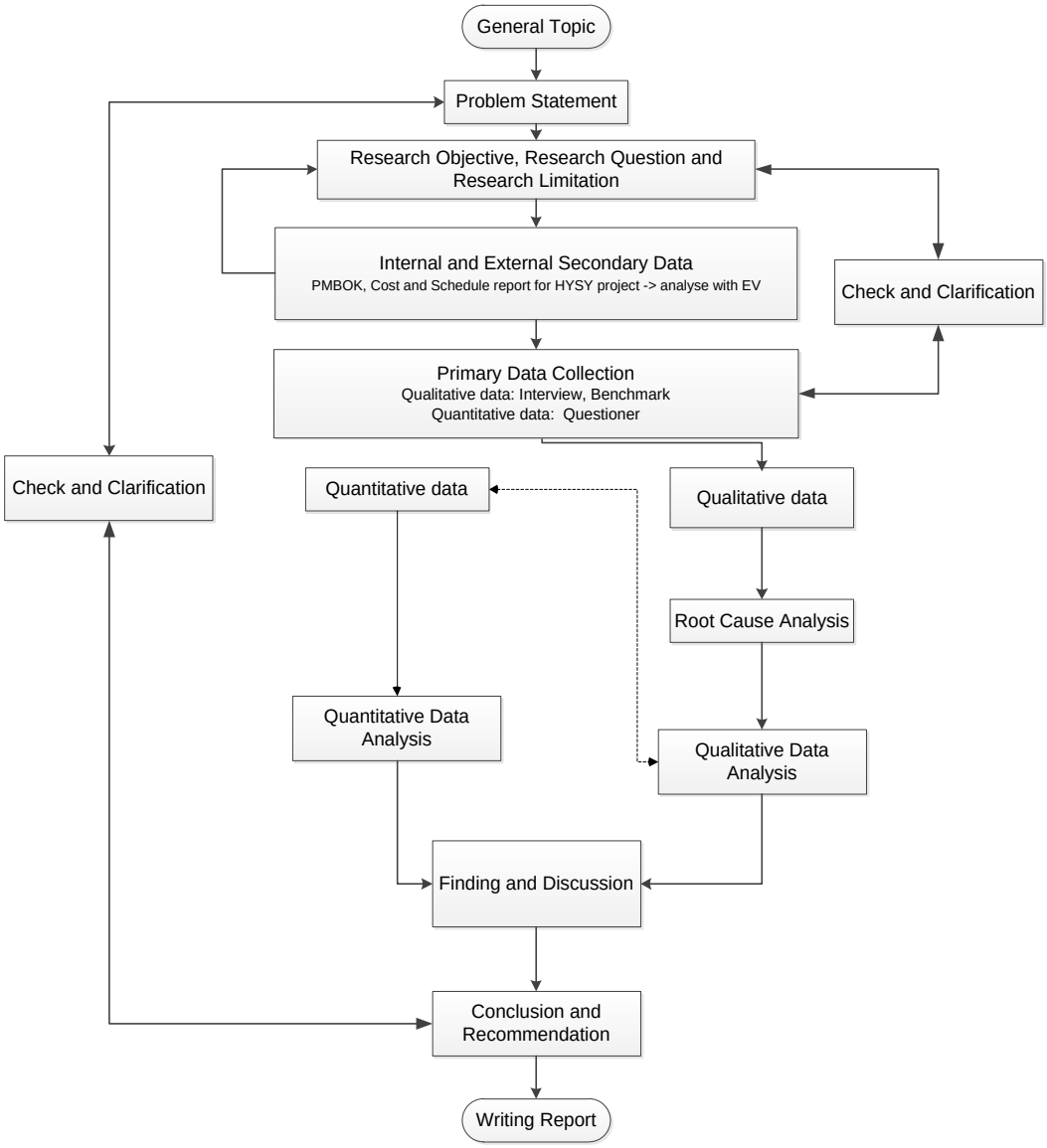

Figure 2. Research Design Framework

3. Discussion

Root Cause Analysis

Fishbone diagram shown on figure 3, where four major categories are developed to determine the root cause, they are: (i) People/Staff; (ii) System; (iii) Environment and (iv) Unforseen Condition.A factor can be categorized as root cause when it either mentioned frequently (more than once), strongly emphasized by respondents, or become root cause for more than one category (frequently contributing to the other problems). It also shall be specific, measurable, and controllable. Resume of root cause for project monitoring and project evaluation is not well implemented in CINTA Corpis described as bellow:

a. *No Standard of Procedure (SOP) for project monitoring and evaluation:* currently in CINTA no SOP or system to implement project monitoring and evaluation especially in term of project progress schedule and project budget spending. Management commitment which shown on regulation and standard procedure to practice project management process including project monitoring and project evaluation will drive project team to do monitoring and evaluation as per standard.
b. *Limited personnel:* the organization structure where each engineer not only performs one project but also several projects, are very nuisance to implemented project monitoring and project evaluation. With many responsibility need to do by each engineer, make the engineer is not focus to implement project monitoring and evaluation. Whenever CINTA perform a project, when the engineer have high experience in performing a project, the project itself is perform better; they know what activity is more critical than the other activities and everyone with their own style performing project monitoring. However, no standard of performing a project and when the engineer is changing the successor will need more time to learn about the project status; not good documentation also different type of project report will make it more difficult to understand the project status and the project problem.

    In big project which use EPCI service, it was difficult to perform project monitoring and project evaluation when there is time limitation and personnel limitation in doing coordination with EPCI Company. Availability contractor representative as project control engineer will help to do project monitoring and evaluate.

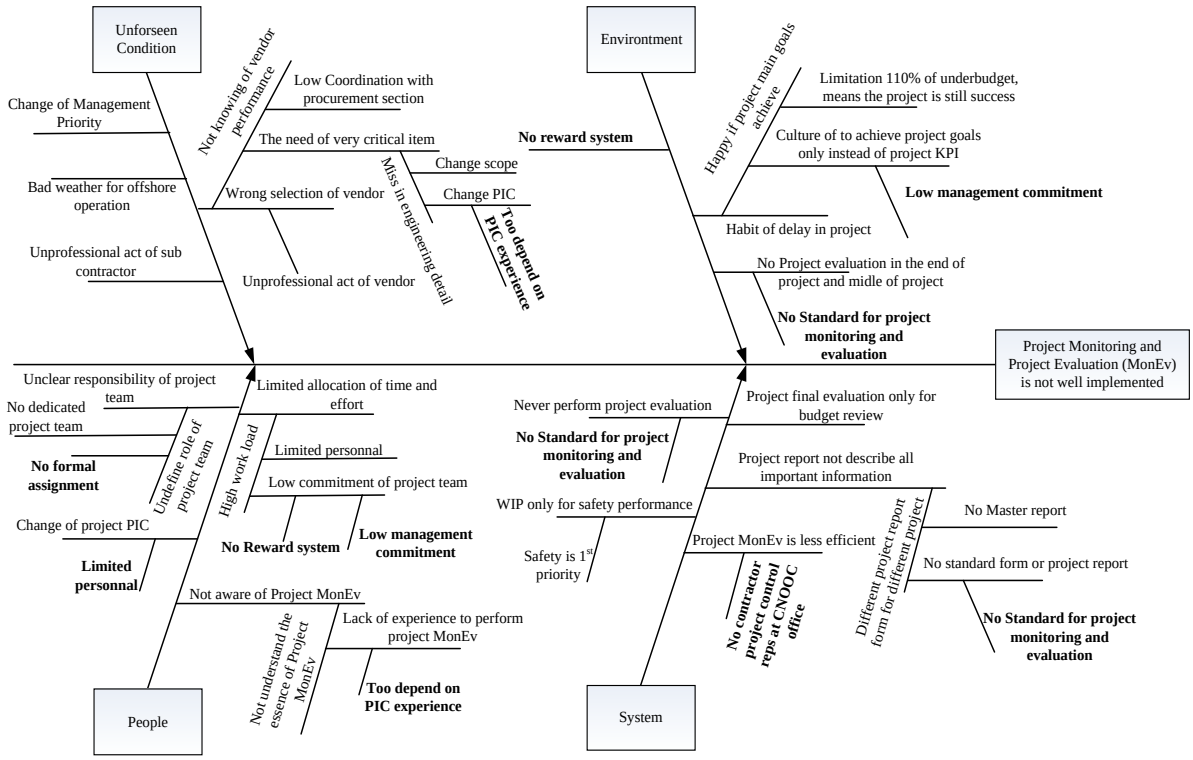

Figure 3. Fishbone Diagram - Project Monitoring and Evaluation is Not Well Implement

c. *Culture to achieve main project goals only instead of project KPI (on time and on budget):* there is KPI regarding budget spending which is not more than 110% of original budget and time schedule is not more than 110% of time work allocation. In CINTA, if the project has meet the project main goals which in this case is generator already delivered its power to CINTA system, the project team and even management are feels the project is success even though the project performance did not meet its KPI (not on time or over budget).

d. *No reward system:* a reward system can be an additional energy to project team when performing a project. No differences to the project team when project is meeting its KPI (on time and on budget) and with project which completed but not meets its KPI. Personnel, who perform a project, treat a project as same activity with their normal activity.

Quantitative analysis and qualitative analysis is shown the same result. Quantitative analysis result shown in table 2. It shown that, in CINTA Corpthe first priority to assess project success is *Project achieving its main goals*. In case of Installation generator project, project is success when generators already deliver power to CINTAsystem. This result meets with root cause analysis, where one root cause of low implementation of project monitoring and evaluation is culture to achieve project main goals only, instead of project KPI.

Table 2. Survey Summary of Project Success Criteria Priority in CINTA – with total entire population is 25 respondents

ID	Criteria	Priority Number Possibility	No. Of Respondents	Project Success Criteria Priority
(a)	Project efficiency	1	2	4
		2	1	
		3	8	
		4	**6**	
		5	3	
(b)	Impact on the customer	**3**	**10**	3
		4	5	
		5	5	
(c)	Impact on project team	3	1	5
		4	3	
		5	**10**	
		6	6	
(d)	Business and direct success	1	4	2
		2	**14**	
		3	1	
		5	1	
		6	0	
(e)	Preparation for the future	2	4	6
		4	1	
		5	1	
		6	**14**	
(f)	Achieve project main goals	**1**	**14**	1
		2	1	
		4	5	

Criteria of preparation for the future are in priority number 6 and criteria of impact on project team are in priority number 5. Both criteria are the last priority in project success criteria. It is emphasize root cause analysis, which is no or less lesson learn to improve the next project performance. This is the reason that same mistake is happened on future project. Besides that, no development of infrastructure to perform project monitoring and is one problem in performing project monitoring and evaluation.

The use of EVA on Project Monitoring and Evaluation

EVA analysis is used to analyze HYSY 902 project performance in term of schedule performance index (SPI) and cost performance index (CPI). In this research, critical path is chosen as the baseline for EVA analysis. Critical path is the sequence of activities which add up to the longest overall duration. It is the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date (Project Management Institute, PMBOK, 2013).

EVA analysis can be used to identify risk of additional budget if there is delay. Variable that used to identify this risk is estimated to completion (ETC); estimated at completion (EAC) and variance at completion (VAC) as shown in figure 6. In CINTA Corp project KPI is stated should be completed not more than 110% planned budget and not more than 110% project schedule target. Through EVA analysis, risk of delay and risk of over budget can be described and project manager can decide whether accept or not accept the budget variance.

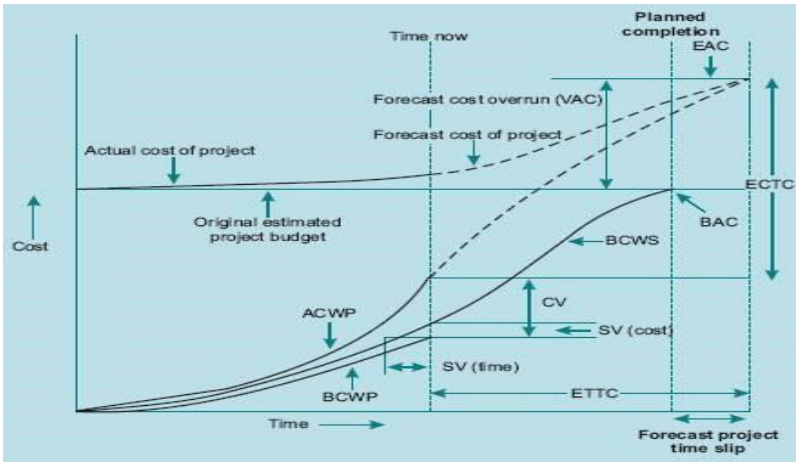

Figure 4. EVA Chart

Table 3. Baseline for HYSY 902 Ph**a**se 1 Project Performance

Date	SV	CV	SPI	CPI	Remark
18-Jan-15	(+)	(-)	0,01	0,00	HYSY 902 On hire date
23-Jan-15	(-)	(-)	0,06	0,02	Bridge Installed, deliver skid of (GTG, LV and MV switchgear)
30-Jan-15	(-)	(-)	0,13	0,05	Deliver LV PCR and G#12 enclosure
17-Feb-15	(-)	(-)	0,44	0,65	Deliver MV PCR
19-Mar-15	(-)	(-)	0,67	0,91	Plan for target completion, 2 months after on hire
10-Apr-15	(-)	(-)	0,90	0,87	Start-up and Commissioning GT#12
30-Apr-15	(-)	(-)	1,00	0,77	Project HYSYS GT#12 completed

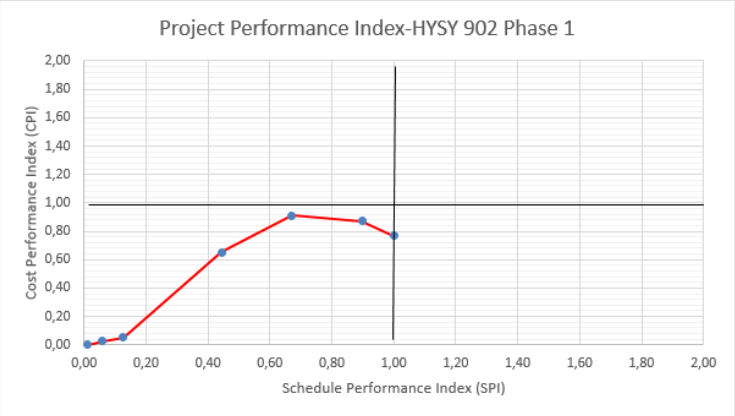

Figure 5. Project Performance Index HYSY 902 Phase-1

From figure4, can be conclude:

- Project CPI always bellow 1, means utilizing efficiency in utilizing the budget or resources allocated to the project is not good; also SPI always bellow 1, means the project team is less efficienct in utilizing the time allocated to the project.
- Cost Variance (CV) and Schedule Variance (SV) always shown negative value, this negative variance indicate the project progress are almost always behind schedule and overbudget.
- Cost Variance when the project completed is around -20%, means the project will be over budget around 20% from its plan budget. While Schedule Variance on planned completed is -33%, means the project progress is delayed for 33% from its original schedule plan.

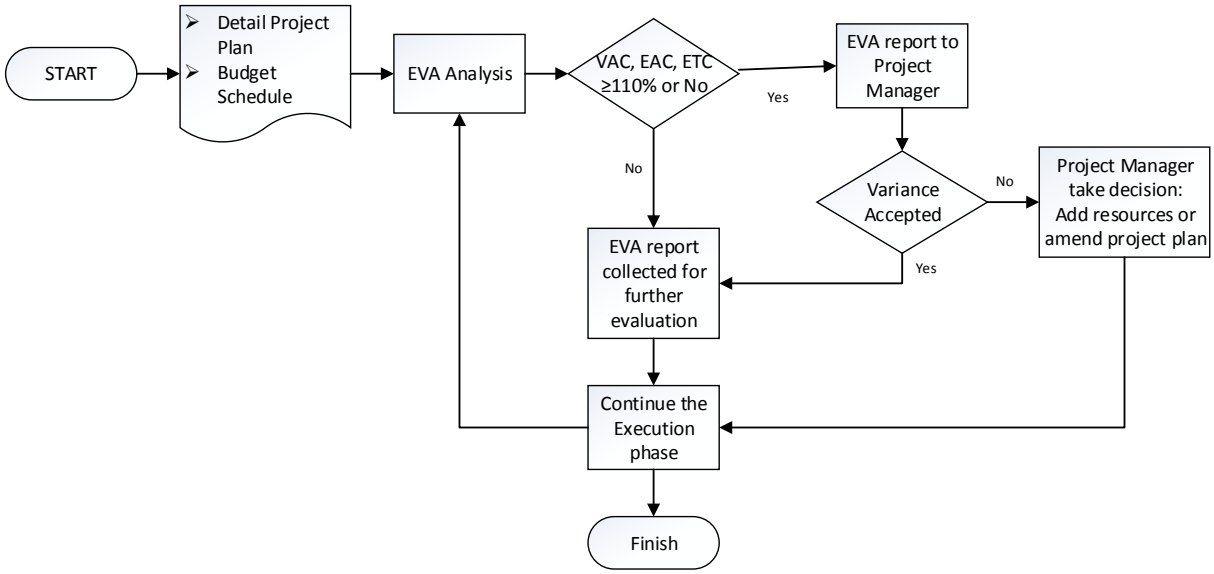

Figure 6. Implementation of EVA Analysis on Project Monitoring and Evaluation

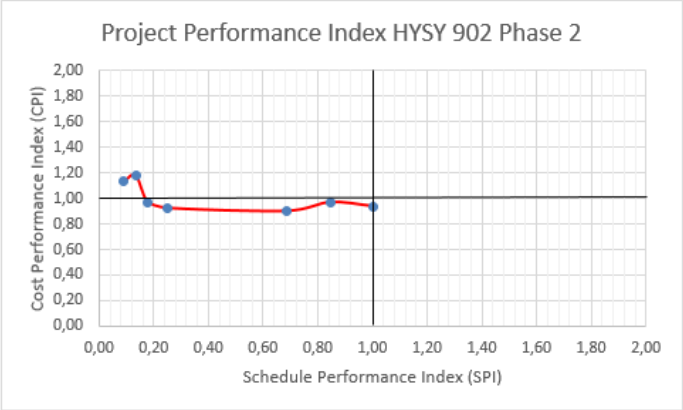

Figure 7. Project Performance Index HYSY 902 Phase-2

Figure 6and 7 shown how implementation of EVA analysis affects the project performance. Using EVA report for integration project cost and project schedule not only provide complete review of project condition, but also provide signal alarm for project manager to make a decision.From figure 7, can be concluded:

- Phase 2 project, generally SPI always bellow 1, means the project team is less efficient in utilizing the time allocated to the project. While for CPI is near 1 which means efficiency in utilizing the resources allocated to the project is quite good.
- Cost Variance when the project completed is around -7%, means the project will be over budget around 7%. This is still acceptable for project success criteria not more than 110% of budget plan.

Benchmarking

In this research, PEP and CTI are chosen as benchmarking target. PEP is chosen because it still works in a project and also used EPCI services for its current project. Beside that PEP also work at the same industry with CINTA and operated also in Indonesia. CTI is chosen since it has well performed project management including project monitoring and project evaluation since project management is the core business of this company. The scoring for performance and procedure availability of project monitoring and evaluation are:

- Level 0 :Implementation or procedure not available
- Level 1 :Implementation or procedure is available separately
- Level 2 :Implementation or procedure is available in semi-integrated system
- Level 3 :Implementation or procedure is available and fully integrated

Benchmarking factor in this research are refer to PMBOK 5th edition, where project monitoring and evaluation are involves: (i) Monitoring and evaluation of project scope; (ii) Monitoring and evaluation of project schedule; (iii) Monitoring and evalution of project cost; (iv) Monitoring and evalution of project quality; (v) Monitoring and evaluation of project risk (including HSE); (vi) Monitoring and evalution of procurement; and (vii) Monitoring and evaluation of stakeholder comunication engagement.

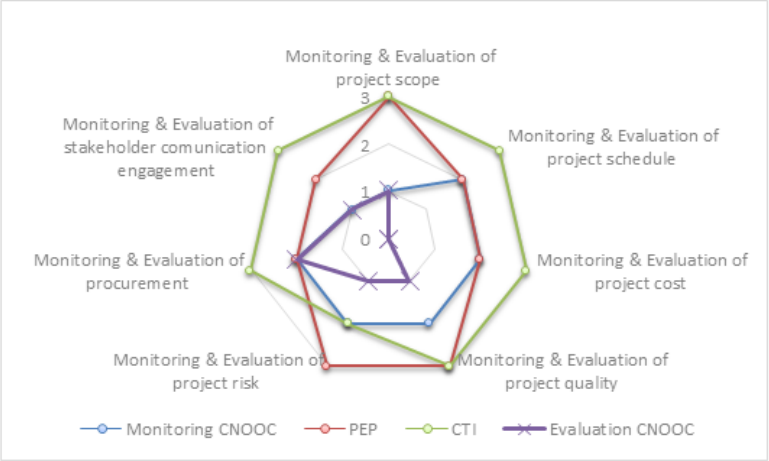

Figure 8. Benchmarking Implementation of Project Monitoring and Evaluation at CINTA, CTI and PEP

All project perform by CTI is comply with ISO 9001:2000. Commitment of management to always perform monitoring and evalution makes for most categories of project monitoring and evaluation is in level 3. CTI is specialize in its project management office (PMO) and project management practices including project monitoring and evaluation. For project monitoring and evaluation purpose, CTI use some computerize tools such as microsoft project which integrater cost, schedule and resources. CTI also uses scrum application (taiga) to track the progress. Each member of project team has their own account in taiga, so everyday they can see what's their pending items. Open database makes all project member easily to update the progress; and with all the data, project manager will review and together with its project team will makes preventive or mitigation plan to avoid any issue spread out. For project evaluation, CTI uses a standard weekly report. Every project manager in a field reporting to the PMO at the end of the week (every Friday/Saturday). PMO will make a report every Sunday to the management. In the report, PMO always show the work summaries, targets and obstacles in the field for each projects. Except for monitoring and evaluation of project risk in CTI is score as level 2 for it is semi integrated to stakeholder regulation.

PEP also has its own project management office, but most of project management activities are performed by its EPCI contractor. All project that perform in PEP is comply to ISO 9001:2001. Regarding with project monitoring and evaluation practices, PEP have Project Quality Program (PQP) and quality audit. This is in line with the scope that already desing by their engineering team and QHSE team in HAZOP and HAZID. This three criteria are integrated in a Integrated Document Management System (IDMS). Thus for criteria monitoring and evaluation of project scope, project quality and project risk that already integrated with all criteria is in level 3. In performing of project evaluation, PEP also implemented evalution before start the project, in the middle of project and after the project completed.In PEP, construction team prepared Construction Requred Date (CRD) as a guide and monitoring and evaluation tools for procurement to provided required equipment or material in project execution date beside SAP system. Project control also developed Project Master Schedule (PMS) that integrated with project cost spending and used this as tools for project monitoring and evaluation.

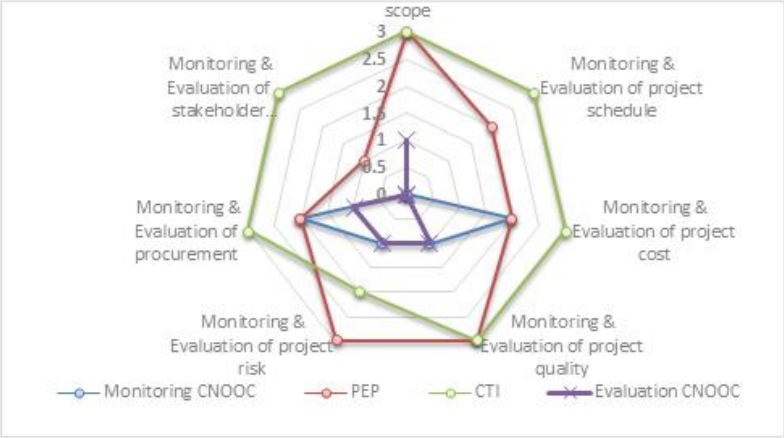

Figure 9. Benchmarking Procedure Availability of Project Monitoring and Evaluation at CINTA, CTI and PEP

In CINTA, Project evaluation implementation level 2 was exist on evaluation of procurement. During project execution phase, evaluation related to project procurement always perform and integrated with evaluation of project cost as per regulation of PTK 007. However for categories evaluation of project scope, evaluation of project cost, evaluation for project risk, evaluation for project quality and evaluation of stakeholder communication and engagement during project execution phase is limited performed but still not integrated with other aspect. One problem that also describe in root cause analysis in CINTA during project execution phase, evaluation of project schedule and evaluation of project cost are never been performed, thus in both aspect is score as level 0. This is different in phase of project closing, implementation of project evaluation of project quality, project scope, project cost and stakeholder communication engagement is score as level 2 for this is already semi integrated in a PIS and closing AFE meeting with SKK Migas.

CTI have integration system for most criteria in project monitoring and evalution and it makes for most criteria are put at level 3. In Quality Management System (QMS) CTI not only describe about performing project monitoring and evaluation but also for a whole project management process like in planning phase, executing phase and closing phase. The aim of implementation of quality system priciples is to provide quality to the product and services in an effective, systematic and controlled manner complying with requirements of ISO 9001.

Same as CTI, PEP also has a procedure for implementation of project management and evaluation. Project management already esthablish organization for controlling and managing quality assurance activities, where QA Coordinator (QAC) is assigned for a project. All the record is standardize as per internal regulation. There is Integrated Document Management System (IDMS) for all document which each project team can update and easily find documents. Procedure for monitoring and evaluation of quality, risk and scope is fully integrated with all project monitoring and evaluation that not only refer to PMS but also refer to HAZID and HAZOP result.

4. RESULT

Based on qualitative and quantitative research methodology, bellow solutions are the most possible sollution to be implemented to solve problem that project monitoring and evaluation is not well

implemented in CINTA Corp. Thus by implemented project monitoring and evaluation will increase project performance in CINTA Corp:

1. Develop/improve procedure for project monitoring and evaluation and put it in project cycle.
   Integration between monitoring and evaluation of project cost and monitoring and evaluation of project schedule is also needed to have clear information about project status and make preventive or mitigation plan. EVA method could be used as monitoring tools for that integration. Figure 7 and figure 8 shown propose procedure for implemented project monitoring and evaluation.

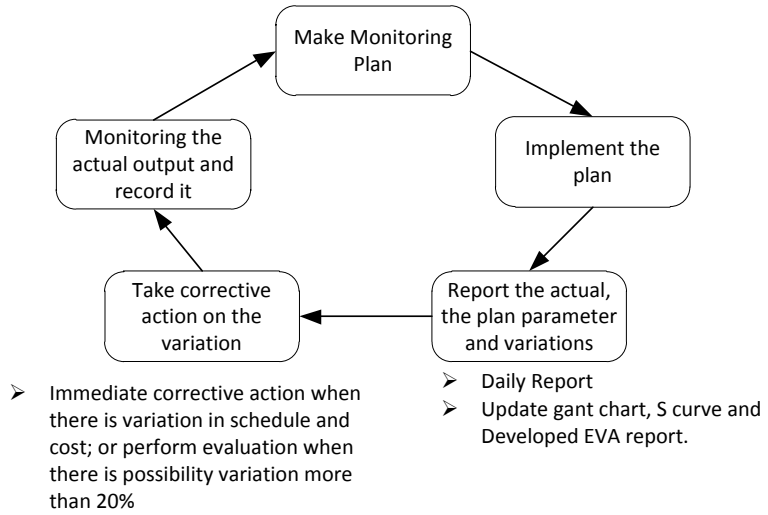

Figure 10. Propose Project Monitoring Procedure

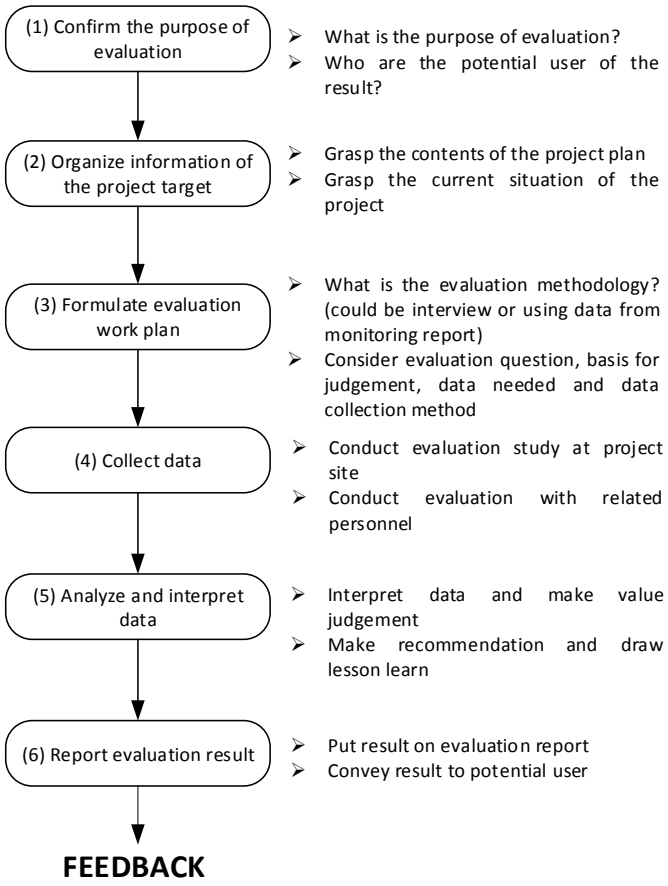

Figure 11. Propose Procedure for Project Evaluation

2. Create a database for monitoring and evaluation.

In benchmarking analysis, PEP have a databasing system which called IDMS, while CTI has scrum application which each project team to track the progress. Each member of project team has their own account in the database. Everyday project team can see what's the pending items and project leader can decide which activity will be more important than others.

Currently Powersystem section already have a project database but this is used only for internal powersys. Creating a new database specialize for project where project report can be updated by each related project team and by updating the report will automatically update the project progress.

The new database should inform:

- Project name
- Project S Curve
- Integration of project schedule and project cost, use EVA report from MS Project
- Pending item for each section
- Update progress from each section
- Progress summary from each section and problem facing by each section

3. Create a ballance project base organization with mix project team between experience personnel and new personnel, also mix organization structure between functional and matrix organization.
   CTI and PEP have its own project management office for they have enough resources to develop project body organization. To have fully dedicated project body organization in CINTA Corpis difficult, for in CINTAthere are employee limitation issue and almost all senior level engineer have dedicated job description. It is propose to use modified balance matrix structure for this type of project as shown on figure 9. Modification of this organization structure is done by add project engineer from related EPCI company. With this organization structure Project leader can focus on decision making and by using integrated document system; while team member can be more focus to project execution.

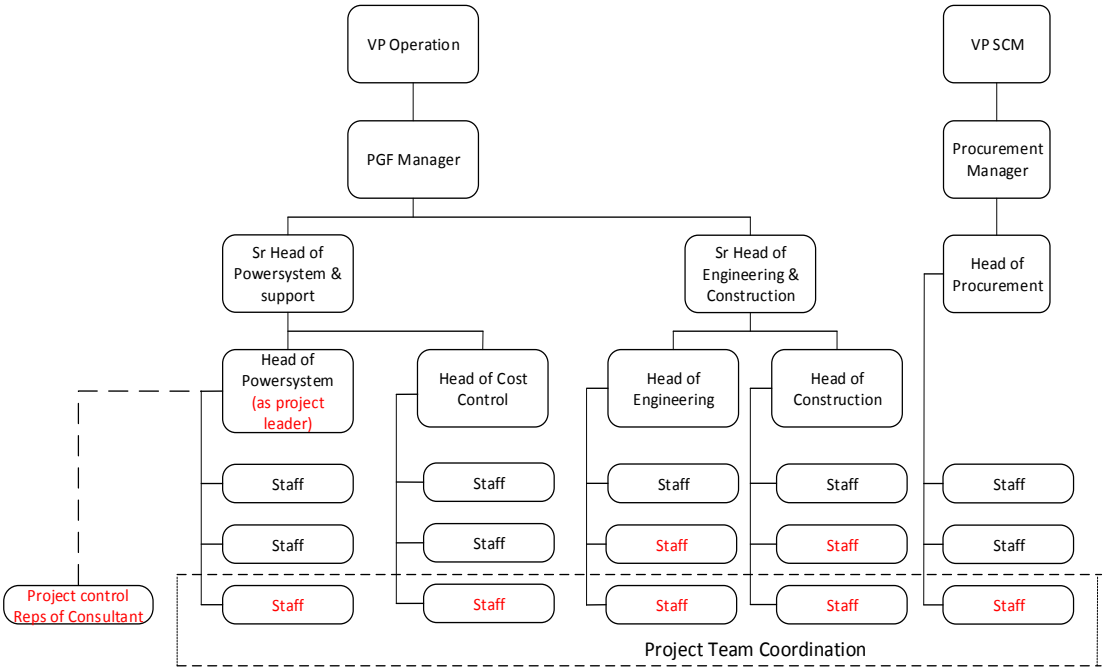

Figure 12. Propose Project Organization Structure

4. Knowledge sharing for how to performing project monitoring and evaluation.
   CINTA Corphas a program for knowledge sharing program which called STARC program. This is a new program related to knowledge sharing. Put sharing knowledge program about how to implemented project monitoring and evaluation will help to develop junior engineer capability to perform project monitoring and evaluation.
5. Assign additional personal using a contract base.

   Availability of project control consultant representative at CINTA Corphead office during project execution to do project monitoring and evaluation have benefit as bellow:

   - Communication with project consultant/EPCI will easier, for CINTA used service of EPCI employee in the same project.
   - Capability of the personnel is suitable with project requirement and easier to find for EPCI will also provide the project engineer.

- CINTA engineer can focus to project execution and learn many things from EPCI for how to perform project monitoring and evaluation.

6. Reward system for achieving project KPI.

A reward system need management comitment to be implemented. A reward system for a project that meet its KPI is not only give benefit to project team in direct financial benefit.The reward could be:

- Point to project leader and project team in Personal Management System (PMS) when the project meet its KPI. PMS is a system in CINTA Corpto grading each employee performance in a year. The result of PMS is related to employee performance bonusess and promotion recommendation.
- Point to employee who perform sharing knowledge or being a lecturer in inhouse training for STARC program related to sharing knowledge about how to perform project management including project monitoring and project evaluation

REFERENCE

[1]. Ansah, Samuel K.,& Emmanuel Bamfo, n.d. Effectiveness of Monitoring Systems for Controlling Project Cost in the Construction Industry. 85- 96. Retrieved October 25, 2015 from: http://www.ppml.url.tw

[2]. Brown, Norm.(1998). *Earned Value Management (EVM) and Software Development*. Retrieved October 25, 2015fromhttp://www.oocities.org

[3]. Cleland, D.,& Ireland, L. (2007), *Project Management: Strategic Design and Implementation* (5th ed.). New York: McGraw-Hill.

[4]. Creswell, John W. (2003).*Research Design Qualitative, Quantitative and Mixed Method Approaches* (2nd ed.). London: SAGE Publication.

[5]. Dwivedi, Umesh.(2010).*Earned Value Management Explained*. Retrieved August 13, 2015 from Projectsmart.co.uk

[6]. Educational-business-articles.com. (2015). Retrieved November 5, 2015 fromhttp://www.educational-business-articles.com/fishbone-diagram.html

[7]. Evaluationtoolbox.net.(2010).*Developing a Monitoring & Implementation Plan*. Retrieved November 6, 2015 fromhttp://evaluationtoolbox.net.au

[8]. Higher Educating Innovating Fund University of Oxford. (January, 2014). *A step by step guide to Monitoring and Evaluation:Project Monitoring and Evaluation for Sustainable Communities*. Retrieved October 25, 2015from http://www.geog.ox.ac.uk/research/technologies/ projects/ monitoring and evaluatin. Html

[9]. JICA Guideline for Project Evaluation.(2004). Practical Methods for Project Evaluation, Planning and Coordination Department Japan International Cooperation Agency (JICA), *Office of Evaluation and Post Project Monitoring, Planning and Evaluation Department*, September: 1-25.

[10]. Johnston, D. (1994). *International Petroleum Fiscal Systems and Production Sharing Contract*.Oklahoma: Pennwell Publishing Company.

[11]. Ointotwenty.com. (2014).*PERT/CPM Scheduling for Time/Cost Management*.Retrieved October25, 2015 fromhttp://www.ointotwenty.com/services.htm

[12]. PMWEB module.(2006).*Project cost planning and control*.Retrieved August 13, 2015 fromhttp://home.cogeco.ca.

[13]. Project Management Institute. (2005). *Practices Standard for Earned Value Management.*Pennsylvania: Project Management Institute, Inc.

[14]. Project Management Institute. (2013), *A Guide to the Project Management Body of Knowledge* (5th ed.), Pennsylvania: Project Management Institute, Inc.

[15]. Shenhar, Aaron J., &DvirDov. 2007, Reinventing *Project Management: the Diamond Approach to Successful Growth and Innovation*, Boston: Harvard Business School Press.

[16]. Smith, J. Greg.(2011). *The Practice Standard for Earned Value Management*. Retrieved November 6, 2015 fromhttp://www.mycpm.org/what-is-evm/evm-best-practices/.

[17]. Tache, Florin.Developing the New Dimension of Monitoring and Evaluation Processes within Project Management, *Faculty of Management the Bucharest of Economic Studies*, 398-407.

[18]. Wordpress.com.(2012).*Implementation of the Earned Value Management Process for Housing Project: The Process Step 3 – Organization and Responsibility Assignment.* Retrieved November 5, 2015 from https://aacecasablanca.wordpress.com