# A PROPOSED MODEL TO IMPROVE PROJECT COST AND SCHEDULE PREDICTABILITY

Yuli Kurniawan[1]
School of Business & Management, Bandung Institute of Technology (ITB)

**Abstract**:

PT. ABC Indonesia is facing a problem in executing the capital project. The cost and predictability of projects were found low as indicated by delay and overrun. According to the assessment conducted to projects that were executed in 2008-2012, the problem contributed to the low cost and schedule predictability are unavailability of process to develop a well-defined scope of work and process to control the schedule and cost. The methodology to find the problem to existing process is by studying a number of project management standards, among others include: Project Management institute, American Management Association and some other papers related to improving cost and schedule predictability. A new model to improve cost and schedule performance is proposed in this paper. This new model is actually a combination of techniques in controlling cost and schedule from industry best practice and customized to align with PT. ABC Indonesia's project development process. This paper proposes a model to control project cost and schedule to improve the project performance. The model starts from defining a good scope from early phase of the project. As the project move to the next phase, the development of Work Breakdown Structure is important. The WBS should breakdown the scope into a more detail task which is called as work packages. A good work packages will support the capability to control the schedule and cost more accurate. During the execution stage, the mechanism to control the project should be in cyclic. It starts with gathering the status of cost and schedule, organizing and reporting the status in a dashboard, analyzing the provided data, development of action plan to bring the cost and schedule on track and at last executing the action plan.

**Keywords**: Cost, schedule, project controls, project management, predictability

## 1. Introduction

### 1.1. Business Overview

PT. ABC Indonesia (ABC), a subsidiary of ABC Corporation, currently operates a number of oilfields in Indonesia. Most of the oilfields operated by ABC is considered as mature oilfields. In way to keep oil and gas production from this oilfield, ABC invests a significant amount of capital either to build new surface production facilities or to upgrade existing old facilities. The Capital Project Management (CPM) is responsible in managing the execution of capital project in ABC. To execute those portfolio of projects, a dedicated organization is established. There are seven groups under CPM which is assigned based on the project type and location.

The CPM group is more like an internal 'service company' that provide service to all operating unit in ABC. To ensure a proper project prioritization, an ad-hoc steering committee is established. The steering committee meets quarterly to perform review to the current performance, challenges and organization capability to execute projects. CPM organization is set as an independent organization, which is not under the operating group instead directly report to senior management at ABC.

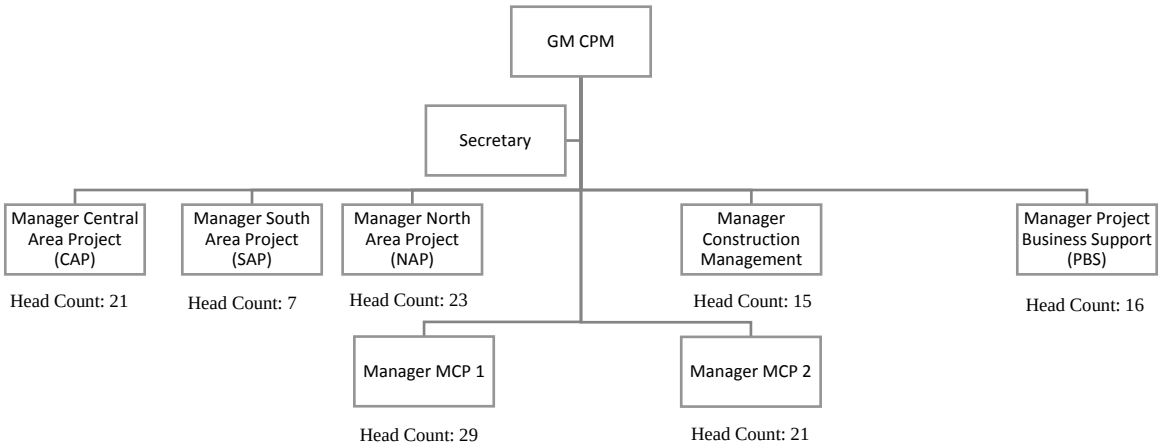


**Fig. 1:** CPM Organization Chart

The General Manager of Capital Project Manager (GM CPM) is acting similar to a portfolio manager who manage set of program and projects which among others include: MCP1 and MCP2 (program) and CAP, SAP and NAP (projects).

In ABC, project is divided into two criteria based the dollar scale of the project. The Small Capital Project (SCP) consist of projects that cost less than $75 million, while the Major Capital Project (MCP) consist of projects that cost more than $75 million. The SCP is managed by 3 different team divided by the area of the project. The construction function for all SCP is manage by the construction manage team (CMT). The business support function that covering: project controls, material management and contract management. Currently CPM manages 3 number of major capital projects and 28 small capital projects. The MCP groups are autonomous where they are supported by a dedicated supporting function such as: finance, material, project controls and construction management. The SCP is different to MCP where there is no supporting function in each group. The supporting function is provided by the project business support and construction management team.

ABC has its own project development process which comprises to 5 Phases as described in Figure 2.

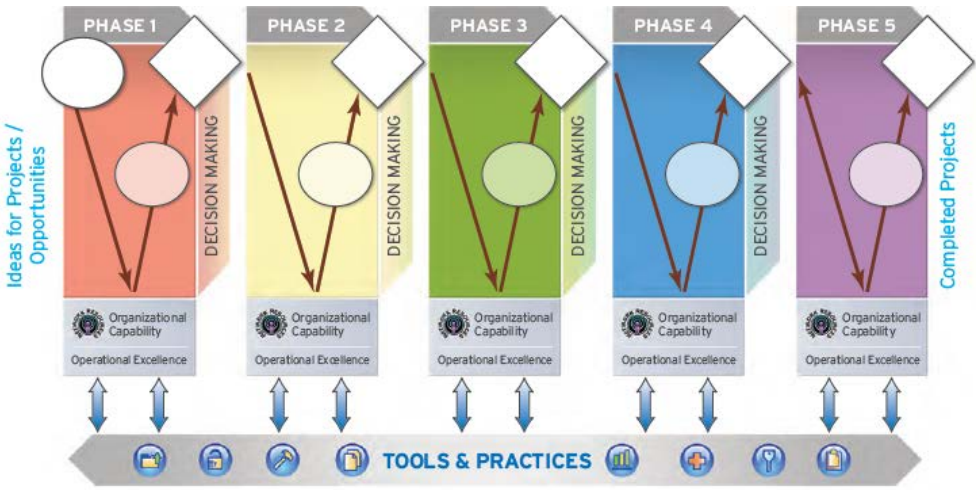


**Fig. 2** ABC Project Management Process

This process is a combination of project management procedure and decision making process. A decision gate is established between phases. The Decision Executive which own the authority in making decision, must approve the phase gate before the project can enter to the next phase. Focus for each phase are described as follow:

- Phase 1: Identify and Assess Opportunities
- Phase 2: Generate and Select Alternative
- Phase 3: Develop the Preferred Alternative
- Phase 4: Execute
- Phase 5: Operate and Evaluate

1.2. Problem Formulation

The cost and schedule performance are critical measures to indicate the success of project. ABC treats the cost and schedule predictability as critical factor is supporting the company to successfully run the business. In ABC, the cost and schedule must not exceed or lower than 10% from its estimate. The requirement is stringent because the cost and schedule predictability relates with the ability of ABC in investing capital to earn profit and to support growth. The unpredictable cost and schedule will result to: higher cost of capital, idle cash, higher execution cost and inability to provide good budgeting. Given the importance of the cost and schedule performance, ABC had included this measure as one component in the Project Performance Assessment (PPA) which is intended to assess project performance executed by ABC Corporation around the world. The latest PPA conducted for ABC found that cost and schedule performance is still below average. A project is considered as below average the schedule is delay and if the actual cost to complete the project is higher than the estimate (overrun). The following fishbone diagram shows contributed factor that negatively impact to project cost and schedule performance.

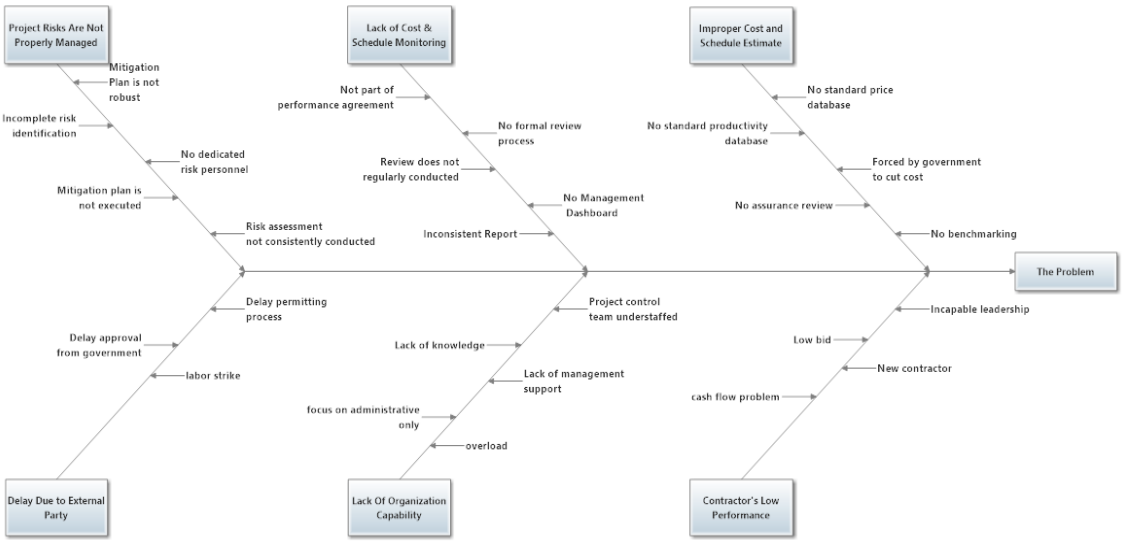


**Fig. 3** Contributed Factors to Delay

The above fishbone diagram describes many factors contributed to low performance on cost and predictability in executing projects. This discussion in this paper will be limited to two root causes only which are: lack of cost and schedule monitoring and improper cost and schedule estimate.

Currently there is no standard process implemented in ABC to ensure that schedule and cost is well-controlled and monitored. The schedule and cost developed by project engineer does not have a good Work Breakdown Structure. The schedule is not breakdown into a detailed work packages while the cost is not assigned into a cost breakdown structure. In some cases the schedule is even not executable because it does not have the correct networks and sequences. This situation leads to difficulties in controlling and monitoring the project schedule and cost because the basis is not accurate.

Another issue contributed to the delay of project and overrun the budget is incapability to manage the scope. In most of the cases project suffered to a scope creep. There are many additional scope identified in the execution phase that greatly impact to the schedule and cost. This scope creep is a result of incomplete definition on project scope during development stage so that in the execution stage, there are some additional works identified just to ensure the project can meet the requirement.

## 2. Conceptual Framework

### 2.1. Theoretical Foundation

A portfolio is defined as a component collection of programs projects, or operations managed as a group to achieve strategic objective (Project Management Institute, 2013). In high level the hierarchy of portfolio can be described in the following diagram:

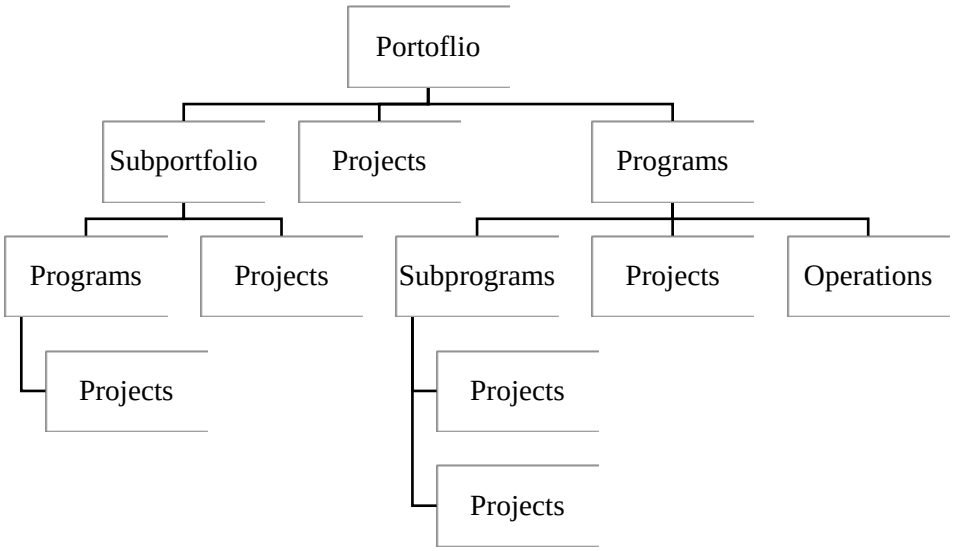


**Fig. 4** Portfolios, Programs and Projects – High Level View

The PPM cycle is a repeating cycle. It starts with selecting and prioritizing the portfolio, manage the portfolio and delivering a successful portfolio result.

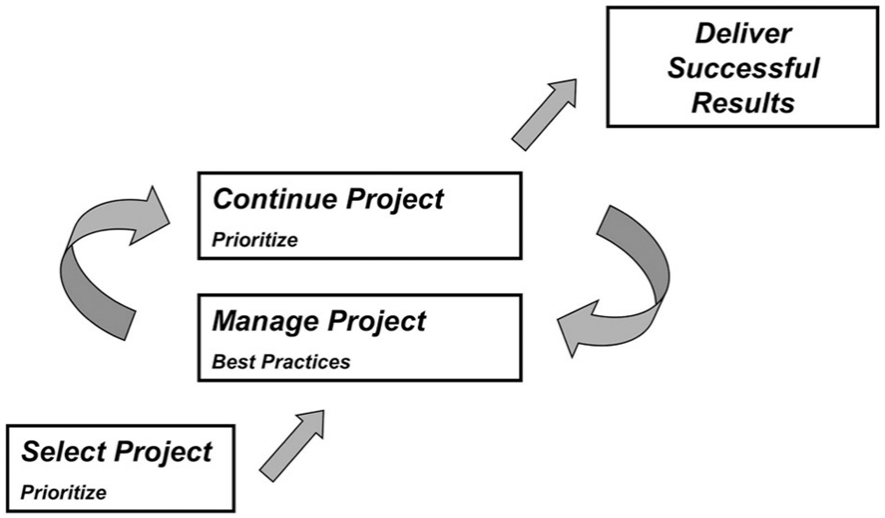


**Fig. 5** Portfolio Management Cycle (Parviz and Ginger, 2006)

In order to manage the project, the organization should establish a process to monitor and control project work. Monitor and control project work is the process of tracking, reviewing, and reporting the progress to meet the performance objectives defined in the project management plan. The intent of this process is to provide up-to-date and accurate information on current state of the project, budget and schedule to be able to take necessary steps to the success of project execution.

Monitoring is an aspect of project management performed throughout the project. Monitoring includes collecting, measuring, and distributing performance information, and assessing measurements and trends to effect process improvements. Continuous monitoring gives the project management team insight into the health of the project and identifies any areas that may require special attention. Control includes determining corrective or preventive actions or re-planning and following up on action plans to determine whether the actions taken resolved the performance issue. The Monitor and Control Project Work process is concerned with:

- Comparing actual project performance against the project management plan;
- Assessing performance to determine whether any corrective or preventive actions are indicated, and then recommending those actions as necessary;
- Identifying new risks and analyzing, tracking, and monitoring existing project risks to make sure the risks are identified, their status is reported, and that appropriate risk response plans are being executed;
- Maintaining an accurate, timely information base concerning the project's product(s) and their associated documentation through project completion;
- Providing information to support status reporting, progress measurement, and forecasting;
- Providing forecasts to update current cost and current schedule information;
- Monitoring implementation of approved changes as they occur; and
- Providing appropriate reporting on project progress and status to program management when the project is part of an overall program

Cost Control

Cost control "is the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline. The critical aspect in controlling cost is to have the baseline because we will know the cost performance by comparing with the baseline. Without the baseline it will be very difficult to control cost. Controlling cost will involve the following activities:

- Gather
  This set of activities is associated with collecting project actual performance information. However, before undertaking the data collection process, a cost control "system" should be established to provide guidance on how data will be collected on your project. In establishing the cost control system, all relevant project documentation should be reviewed, including the existing project management plan, the cost performance baseline, project funding information, and work performance guidelines, organizational standards and procedures. Once the system is established, gathering is the process of collecting the defined data in accordance with the system.

- Organize
  In this step, the team assembles and prepares the data for analysis according to organizational guidelines and personal preferences in assembling project performance data in a way that enables effective analysis. The key considerations are who will be reviewing and analyzing the data, and what format lends itself to effective analysis? Organizations will often use the "Dashboard" features available on most popular software programs to help organize data. A dashboard is a display similar to those you might see in a cockpit or an automobile that has key information relating to cost (or time or resources) structured in an easy-to-read graphical format.

- Analyze
  Once the data have been organized, they need to be effectively analyzed to understand their current status and implications for the future. As a general rule, look at data for one cycle back and three cycles forward. It is important to not become too fascinated with past data for the same reason one cannot drive a car forward looking through the rearview mirror. In addition, a key problem in analysis is to review data for what it is telling us rather than to confirm what we already believe. Data analysis may be carried out by the project team, the Project Management Office, or the Leadership Oversight team. It is also important that data are analyzed against the area of order used to establish the project: the baseline. The analysis team should be trying to assess how much the project has varied from the baseline, what that means in future terms, and what are the causes? In the analysis phase the team may also formulate potential courses of action to remedy variance.

- Decide
  Analysis of data will reveal information that may require action. The goal at this point, in accordance with organizational guidance and effective project practice, is to take appropriate action(s) to keep the project on track. The two big failures of project teams are to act when they shouldn't and to not act when they should. This usually happens when the fundamentals are not in place. As a result, team members do not know the real status of the project and, thus, do not act appropriately. Any action taken should be appropriate for the variation detected

### 2.2. Diagram Model

Based on the ABC project management standard as well as theoretical foundation described in Section 2.1 above, to better monitor the project cost and schedule in ABC, the following model will be introduced:

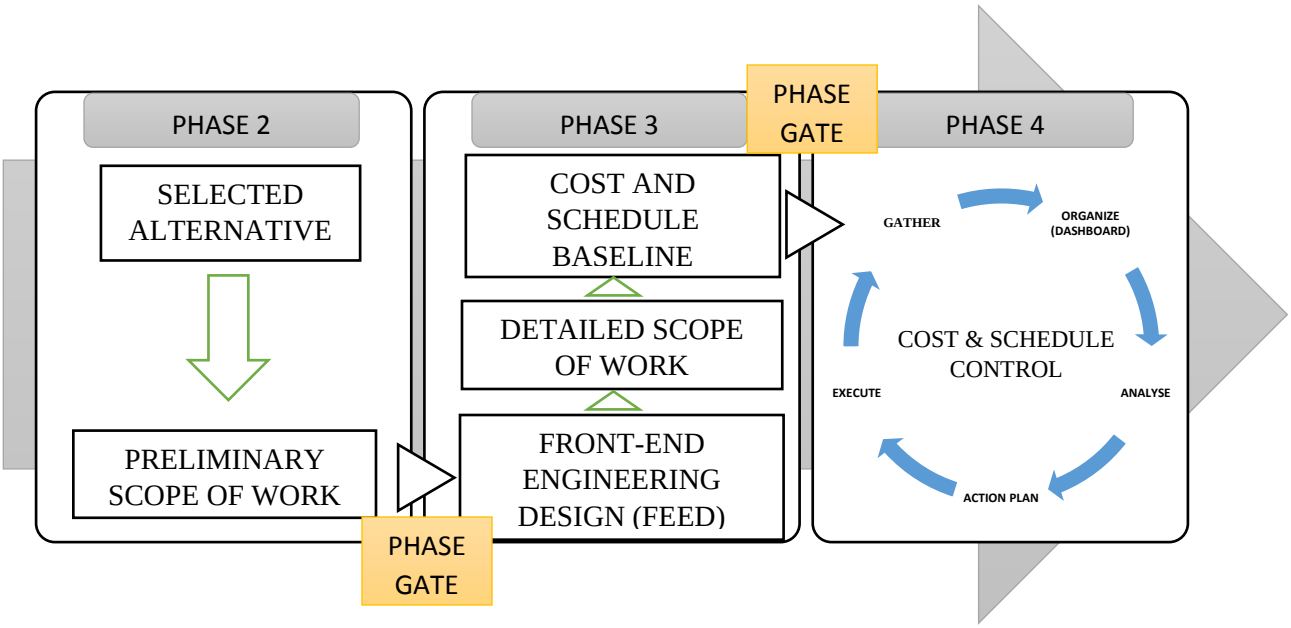


**Fig. 6** Proposed Model of Cost and Schedule Controlling

As described in the earlier Section, the ABC project development process consists of 5 stages. The cost and schedule control starts from Phase 2 where the alternative is selected. By deciding what alternative to be pursued, then the project scope of work can be defined. Upon the Phase Gate 2-3 is approved by the Decision Executive, the project scope of work will be developed into more detail by conducting a Front End Engineering Design (FEED). FEED is a set of engineering works to perform calculations, develop drawings, specification and datasheets to be the basis for executing the project. Once the FEED completed the Scope of Work can be freeze and the cost and schedule can be developed and baseline. After the Phase Gate 3 to 4 approved by the Decision Executive, then the project can be executed and the cost and schedule controlling is began.

Scope of Work

The development of scope of work is one of the key in supporting the cost and schedule predictability. The scope of work is the input to develop the Work Breakdown Structure and Cost Breakdown Structure that are the basis in estimating the project cost and schedule. The scope of work produced in Phase 3 should consist of 2 types: project scope and product scope. Project scope is related to what will be delivered by project while product scope is related to specification of such deliverables. A good scope of work should be complete, consistent, traceable, concise, design free, prioritized and rationale. The project scope of work shall be documented and all changes to this scope of work shall be tracked and managed.

Cost and Schedule Baseline

To be able to baseline the cost and schedule, the first step is to have a good work breakdown structure (WBS). WBS is essentially the scope statement reduced in individual pieces of work (Taylor, 2008). It is a structured way of breaking down the project into work package. The WBS developed for a specific project must be capable for the basis of assigning the required resources, project costing, network analysis, and scheduling and project control. The WBS can be structured as Figure 7.

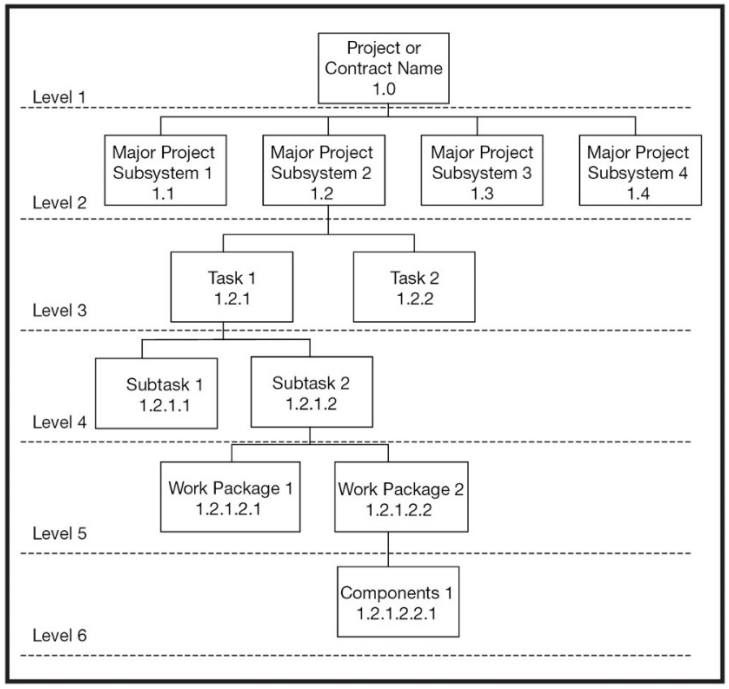


**Fig. 7** Work Breakdown Structure

Cost and Schedule Control

The proposed process in controlling cost and schedule comprises 5 activities which include:

- Gather

  Gather information on cost and schedule performance by using Earn Value Analysis (EVA). Depending on the situation, in minimum the EVA must be conducted in weekly basis.

- Organize (Dashboard)

  The result from EVA for each project should be publish in a IT based dashboard so that the project manager and other involved stakeholders capable to access, analyze and develop action plan in response to an issue to bring the project back on track. It is proposed to leverage the SharePoint platform that current utilized by ABC.

- Analyze

  The detail analysis must be conducted by project manager. Project manager shall develop action plan from the analysis activities and discuss this with Team Manager and CPM Manager for endorsement prior implementation.

- Execute

  Upon obtaining endorsement, project manager shall be responsible to execute the action plan to bring the project back on track by mitigating, eliminating some issues related to schedule and cost.

## 3. Methodology

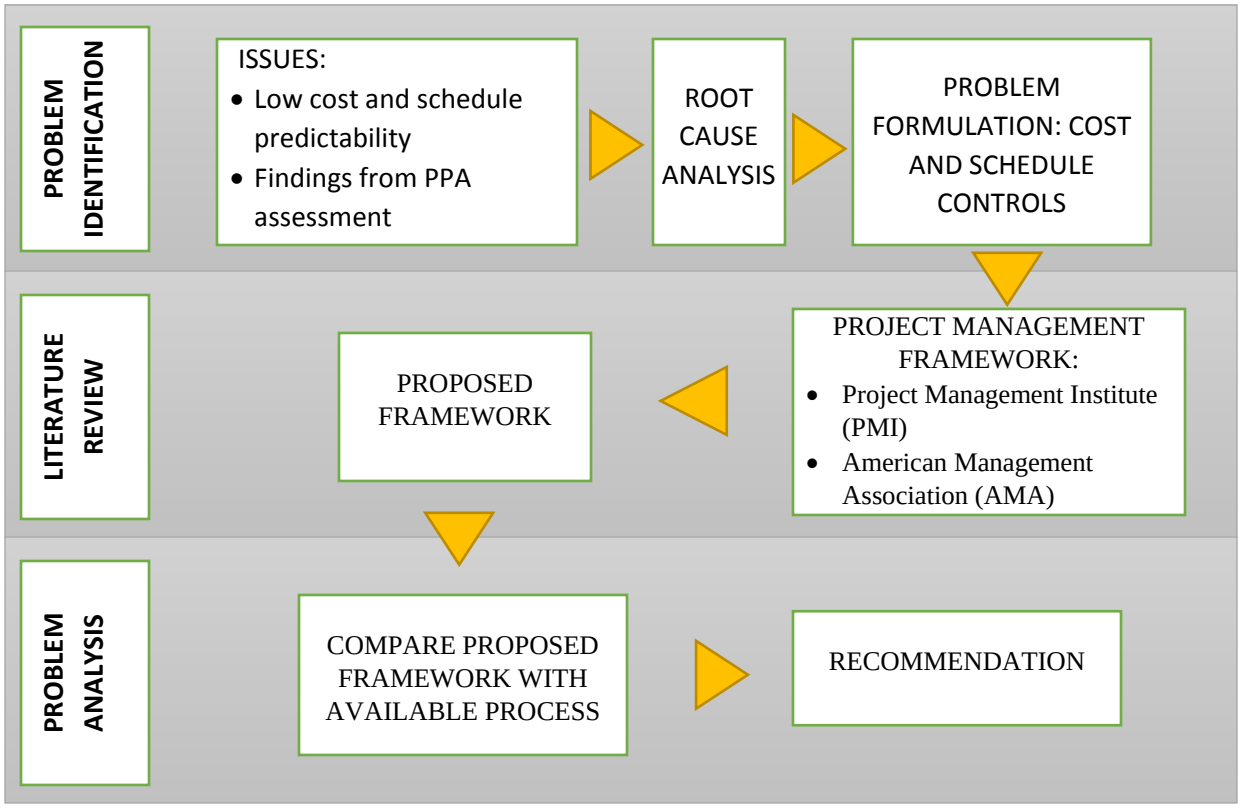


**Fig. 8** Research Methodology

## 4. Research Finding

This research reveals that to be able to control and monitor project cost and schedule, a project should have a well-defined scope upfront. The scope of work should meet the qualification of both project scope and product scope. Once a project has a well-defined scope, the next step is to develop the WBS. The WBS should be capable to breakdown the scope into a more detail work packages. This work packages is very critical because the controlling of cost and schedule will be in this work packages level. The well-defined scope and WBS are the first step to control and monitor the project. The next step is to control the project during the execution which involve gathering data, organizing report into dashboard, analyze the report, develop action plan and execute the action plan. This controlling mechanism is a cyclic process. It should be done in regular basis to ensure the project remains on track until all scope is completed.

The proposed model in cost and schedule control provides a more structured approach compare to the existing practice in ABC. This model also addressing the needs to have a well-defined scope which become the first step to manage cost and schedule.

## 5. Discussion and Recommendation

This paper has described the process in improving the cost and schedule predictability through a process that started from the defining scope until controlling during execution. The proposed model in controlling cost and schedule will help ABC improving the overall project performance especially in the aspect of cost and schedule. The proposed model in this paper also developed in accordance to

ABC project management process to ensure alignment with the existing process. Alignment with the existing process is key in implementing this model.

Before it is implemented it is recommended to study on how to properly use the Earn Value Analysis (EVA) in managing cost and schedule. The dashboard that will be part of this process is also need further study. There are some existing infrastructure that currently available in ABC that can be used for this dashboard. This infrastructure includes: intranet portal and SharePoint©.

## 6. References

1. Taylor, James C. (2008), Project Scheduling and Cost Control: Planning, Monitoring and Controlling the Baseline, J. Ross Publishing, U.S.A.
2. Dinsmore, Paul C. and Cabanis-Brewin, Jeannette (2006), The AMA Handbook of Project Management, AMACOM, Chicago
3. Institute, Project Management (2013), A Guide to Project Management Body of Knowledge (PMBOK® Guide), Project Management Institute, Inc. Pennsylvania
4. Institute, Project Management (2013), The Standard for Portfolio Management, third edition, Project Management Institute, Inc. Pennsylvania
5. Moustafaev, Jamal (2011), Delivering Exceptional Project Results – A Practical Guide to Project Selection, Scoping, Estimation and Management, J. Ross Publishing, U.S.A
6. Rad, Parviz F., and Ginger Levin (2006), Project Portfolio Management Tools and Techniques, IIL Publishing
7. Ford, David N., Lyneis James M., and Taylor Timothy R.B., Project Controls to Minimize Cost and Schedule Overruns: A Model, Research Agenda, and Initial Results