

# Integrated Risk Management Frameworks ISO 9001:2015 as a Successful Parameter in Project Management: The Case of Yamal Train 3 Project

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**Keywords:** Efficiency of cost, Schedule achievable, Construction sequence, PM BOK 6<sup>th</sup> edition, ISO 9001 :2015, Integrated Risk Management.

**Abstract:** Purpose: Managing Risk has become one of main concern in application of Project management. Risk could be mitigated, eliminated or even controlled, to do so as project manager require skills based on different approach or frameworks. In this paper we propose to integrate two major frameworks of managing risk, namely ISO 9001:2015 standard clause 6.1 and Project Management Book of Knowledge 6<sup>th</sup> edition. Design/Methodology/approach – An integrated framework is developed by analysing and synchronizing contributing factors of risks, including from internal organization or external organization, and performing qualitative measurement and obtaining expert judgement. The proposed framework is then applied to a construction project called Yamal Train 3 Project consist of 23 electrical house (E-house) and tight schedule within 17 months. Findings – The integrated risk management should identify risk factors in very early stage of construction sequence, register as ISO document and perform qualitative of risk effect onto project. Practical implications - The impact of application integrated risk management is organization has contingency reserve budget, utilize various resource to mitigate and lower down risk impact. Originality/Value – from conceptual point of view, this study aims at unifying an integrated Risk Management from two frameworks PM Bok 6<sup>th</sup> edition and ISO standard approach, while from the practical point of view, it provides application of the proposed framework on construction project by showing how business organization mitigate risk to obtain efficiency of cost and schedule achievable.

## 1 INTRODUCTION

The Yamal LNG integrated project is a natural gas liquefaction plant with a capacity of 16.5 million tons per year developed based on gas reserves within the South Tambey (Tambeyskoye) Field in Russia. Yamal LNG Train 3 consists of 23 electrical house (E-house) blast resistant buildings, 3 E-House non-blast resistant buildings, and 3 transformed non-blast resistant buildings, owned by Novatek Consortium with Russia holding 50.1% of the shares, France holding 20.0%, and China holding 29.9%. Siemens Pte. Ltd., as the main contractor for the Train 3 sub-project of Yamal LNG, developed 2 fabrication yards at Batam Island, Kepulauan Riau Province, within a period of at least 17 months (Phase 1 until Phase 5). For the fabrication process, Siemens Pte. Ltd. engaged more than 30 subcontractors with different

discipline tasks: quality should comply with international codes and standards such as ASME, BS EN, NPB, and Russian Federation Regulation, employing safety measures with a goal of zero lost-time incidents, use of lean engineering, and management of the supply chain.

PT. XYZ has awarded 3 different scope of works on Yamal Train 3 Project consist of Architectural works, HVAC (Heating, Ventilation, and Air conditioning) system fabrication and installation works, and piping installation works. Due to tight and overlap schedule, PT. XYZ has problem to complete of Yamal Train 3 project and suffer of 41% cost overruns in term of manpower cost. Zhenhua Rui, Fei Peng, Kegang Ling, Hanwen Chang, Gang Chen and Xiyu Zhou (2016) mention Many oil and gas projects experienced significant cost overruns, which is a major concern for the industry. The average cost

overrun of the projects is 18% with a standard deviation of 29%.

PT. XZY has business core of integrated architectural supplier and contractor, therefore PT. XZY has stock of skill manpower, specified tools and specified equipment to perform architectural works in quality manner. Enlargement of scope works as HVAC and piping insulation contractor has contribute to negative risk occurs during construction. Variance of manpower required, tools and equipment create gap from budget cost and actual cost.

Furthermore, to avoid occurring in next phase, PT XZY should perform risk management analysis based on data primer and data secondary collected in each phase. Data primer such as key performance index taken from labour amount required per subjected activities, time to finished of activity, required tools, and scale quantity of activity. Data secondary obtain from material supply chain and availability of specified skill resources.

Project management book of knowledge 6<sup>th</sup> edition created by Project management institute, has consist of 5 process group and 11 knowledge area. One of knowledge area is Risk Management, has 2 process group which in planning and monitoring/control. Input of risk planning is Project charter which is contain project document level 1, and limited distributed only to project sponsor, main consultant and main contractor. Its create gap on producing risk planning for second layer of contractor such as PT. XZY. Tender document only limited information and sometimes information scuttered could bring false data and un-shown risk.

ISO Standard 9001:2015, shown Plan Do Check and Act process, has identify risk as business process. Risk factors input from organization and it context, customer requirement, and need/expectation of revelant stakeholder. However, ISO standard clause 6.1 stated , the organization shall plan actions to address risks but there is no formal method for risk management.

Frameworks of ISO 9001:2015 can be as early input for organization to determine of potential risk will be occurs in on coming project. Registered as risk register on ISO format and more comprehensive analysis should be using Frameworks of PM BOK 6<sup>th</sup> edition in planning of project, during project and controlling process of project.

This research uses two approaches, ISO 9001:2015 and Project Management Book of Knowledge 6th edition. These approaches aim to analyze the risks that occur during project implementation. The project held in identified high-risk levels were opportunities that are also very high. ISO 9001:2015 appears as a variable that affects the

conditions and risks as the probability that exists in the project. Thus, this research appeared to see how ISO 9001:2015 can be a treatment that affects risk management in a project. So that, ISO 9001:2015 can be a parameter of the success of a project.

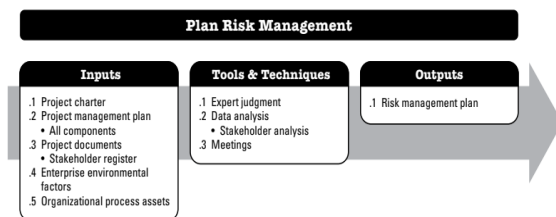
Then, the Project Management Book of Knowledge 6th edition is a reference in identifying the risk management of a project. These two approaches are used simultaneously to show the difference in probability and consequence level of a project.

## 2 LITERATURE REVIEW

### 2.1 Risk Management based on PM BOK ® 6th Edition

PT. XYZ realize a project (Architectural works) has risks factor to be identify and analysed, even when simultaneously another project (Piping Insulation and HVAC Fabrication & Installation works) awarded to PT. XYZ, risks factor become more complex and wider with varying degrees of risk matrix. When unmanaged, these risks have the potential to cause deviation cost of plan budget and at the end effect to overruns budget, in this case shown 41% manpower cost has negative deviation (plan budget vs total deviation cost). To undertaking of those risks, Plan Risk Management become important issues to solve in early stage.

Plan risk management is one of process in project risk management overview to defining how to conduct risk management activities for a project (s). this process is performed in planning process group start by inputs, tools and techniques and outputs as describe flow below:



### 2.2 Risk Management based on ISO 9001:2015

The author underlines important items on planning stage as on clause 6 Planning item 6.1 Action to address risks and opportunities (SNI ISO 9001:2015, page 8) and Annex A.4 Risk based thinking (SNI ISO 9001:2015, page 39) as stated below:

1. Determine the risks and opportunities that need to be addressed to:
  - a. Give assurance that the QMS (quality management systems) can achieve its intended result (s).
  - b. Enhance desirable effects
  - c. Prevent or reduce undesired effects
  - d. Achieve improvement
2. The risk-based thinking applied in this SNI ISO 9001:2015 standard has performance-based requirements
3. Based on clause 6.1 of the SNI ISO 9001:2015 standard, the organization shall plan actions to address risks but there is no formal method for risk management. The Organization can adopt a more extensive risk management methodology through the application of other guidance or standards.

The authors propose to extensive risk management methodology by adopting PM BOK ® 6th Edition guidance, in coherence by using risk matrix 5 x 5 complete with 3 level of risk start from low risk (green color), medium risk (purple color) and high risk (red color) matrix below :

Table 1: Matriks

PROBABILITY					5	4	3	2	1	C
5	4	3	2	1						
25	20	15	10	5	5	O	N	S	E	Q
20	16	12	8	4						
15	12	9	6	3						
10	8	6	4	2						
5	4	3	2	1						
					1					E

	High-risk
	Medium-Risk
	Low-Risk

The matrix table above shows the levels of probability and sense consequence. Probability is the possibility that it will occur / the chance of risk occurred due to a job or activities that make it possible to do something. Consequences are the result of the risk that will occur. So, a job can cause an impact that can be adjusting according to the matrix above.

Referring to the table above, there are 3 levels in the risk matrix: the high-risk level in the red zone, the purple medium risk level, and the green low-risk level.

High-risk describes that the higher probability, then the higher the consequence, at this level represented in numbers 12-25. Next, medium-risk, probability, and consequence in normal conditions, at this level represented in numbers 5-9. then low-risk, the lower the probability, the lower the consequence, at this level represented in numbers 1-5.

### 3 METHODOLOGY

#### 3.1 Framework Building

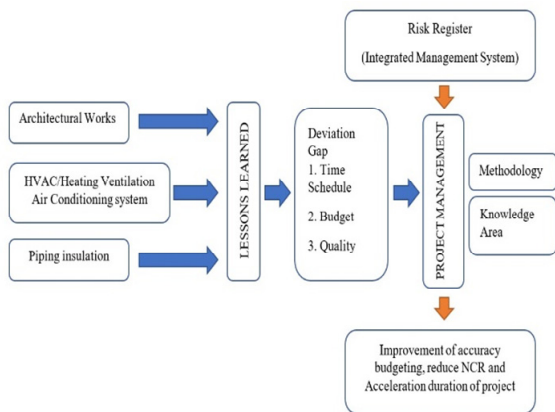
To build a new framework integrating ISO standard 9001:2015 and PM BOK 6<sup>th</sup> edition, this study employed literature review and project case lesson learn. The literature review contributed of risk management matrix, risk register form and impact on project objectives analysis.

Data input of literature review shown the risk matrix and impact as below:

Scale	Value of Risk Matrix	+ / - Impact on Project Objectives		
		Time	Cost	Quality
Very High	20, 25	> 5 months	> IDR 1 Billion	Very significant impact on overall project
High	12, 15, 16	3 – 5 months	IDR 500 million to IDR 1 Billion	Significant impact on overall project
Medium	8, 9, 10	1 – 3 months	IDR 250 million to 500 Million	Some Impact in functional areas
Low	4, 5, 6	1 – 4 weeks	IDR 100 million to IDR 250 million	Minor impact on overall project
Very Low	3, 2, 1	1 weeks	< IDR 100 million	Minor impact on specific task
Nil	0	No change	No change	No change

#### 3.2 Integrated Risk Management

This paper proposes a new risk management framework; Integrated Risk Management of ISO standard and PM BOK. The conceptual frameworks below shown collect data from lesson learn register of each job scope which is captured during construction of project. The Lesson learned register analysis of each job scope, to determine if any deviation gap reference to time schedule, budget and quality. Risk register as ISO 9001:2015 document raised up due to Management Meeting which is brainstorming session from Director level into Head of department to consider if any VUCA (Volatility, Uncertainty, Complexity and ambiguity) factor has potential to disrupt company process.



There are 3 step of risk management to analyse risk

1. Risk management Stage 1
  - Conduct in tender stage
  - Items to analyse: Tender document such as specification, country of origin, approved vendors list, scope of works, etc.
  - Participant: Procurement team, project manager, Managing Director
  - Objectives:
    - To identify preliminary risk occurred based on past project experience
    - To categories risk based on document tender
2. Risk Management Stage 2
  - Conduct in Kick of Meeting (once awarded to PT. XYZ)
  - Item to analyse: Project charter, past experiences, lesson learned of other progress, etc.
  - Participant: Project manager, Project Engineer, Construction Manager, Client Person in charge, Consultant, Etc.
  - Objectives:
    - To breakdown risk items based on work breakdown structure
    - To set parameter of risk percentage allowed
    - To generate 5x5 risk matrix.
    - Elaborate risk items in IMS (Integrated Management System) ISO 9001:2015 and ISO 45001 :2018 form no: IMS-CSK-MR-FM-10-Rev.02
3. Risk Management Stage 3
  - Conduct in Internal Meeting (Scheduled on monthly meeting)
  - Item to analyse: daily report, progress report, lesson learned update report, etc.
  - Participant: Project manager, Project Engineer, Construction Manager, Supervisor, Foremen, etc.

- Objectives:
  - To update regularly risk occurred during construction period into IMS (Integrated Management System) ISO 9001:2015 and ISO 45001: 2018 form no: IMS-CSK-MR-FM-10-Rev.02
  - To Monitor and control action plan to decrease risk level based on IMS (Integrated Management System) ISO 9001:2015 and ISO 45001: 2018 form no: IMS-CSK-MR-FM-10-Rev.02

## 4 RESULTS

The author summarize data's above and create risk management plan based on PM BOK ® 6th Edition page 405 as shown table below:

Table 2.

Risk Management Plan			
Date of Approval	DD/MM/YYYY	Date of Revision	DD/MM/YYYY
Name of Project	Proposed Engineering, Procurement, Construction and Commissioning Project of Architectural Works, Piping Insulation and HVAC Fabrication & Installation works at Siemens Fabrication Yard Batam Island.		
Approved by	Director PT XYZ	Prepared by	Head of Department PT. XYZ
Risk Strategy	Integrated Management System (IMS) ISO 9001:2015 PMBOK ® Guidance 6th Edition		
Roles and Responsibilities	IMS-CSK-HRD-FC-01 Rev. 01 IMS-CSK-HRD-FM-22-Rev. 02		
Funding	Maximum 3% - 5% from Project Value to perform activities related to establish protocols for the application of contingency plan and management reserves. (based on Contract practice usually company should allocate 5% of contract price as warranty / guarantee value. This funding considers as Risk value to allow Project team utilize it in case of risk occurred)		
Time	Risk Management Stage 1 conduct on tender stage Risk Management Stage 2 conduct on Kick of meeting (Awarded PO) Risk Management Stage 3 conduct on monthly basis (project on progress)		
Risk Categories	Risk categories 1. External such as Government Act and regulations, environmental, market condition and Political condition 2. Internal such as Workman ship, customer satisfaction, ISO 3. Technical such as new equipment related to working activities, imposed of digital technology to construction process. 4. Unforeseeable such as other risks occurred (around 9% to 10% can be unforeseeable risks)		
Risk Appetite Categories	Risk Appetite Categories 1. Very High: Very significant impact on overall project 2. High: Significant impact on overall project 3. Medium: Some Impact in functional areas 4. Low: Minor impact on overall project 5. Very Low: Minor impact on specific task 6. Nil: No Change		
Reporting format	IMS-CSK-MR-FM-10-Rev. 02		
Tracking	Daily Report Monthly Progress Report Lesson Learned report		

Furthermore PT. XYZ enlargement risk analysis onto reporting format based on Integrated Management System (IMS) ISO 9001:2015 ISO 45001:2018 document number IMS-CSK-MR-FM-10-Rev. 02, as per data on project chapter and inputs of project risk management plan.

The potential risk due the change of organizational structure due to enlargement of business scope into integrated of 3 major scope for Engineering, Procurement, Construction and Commissioning project at Siemens Fabrication Yard Batam Island has data shown below:

- Consequence value = 5
- Probability value = 4
- Risk Priority number =20
- Table 3.5 Risk management matrix value = Red colour (high Risk)
- Table 3.7 Definition for value of risk matrix and impacts = Time to consumption > 5 month with Cost more than IDR 1 billion and affected to very significant to overall project.

After taking risk treatment or mitigation process in purpose to decrease level of consequence and level of probability such as:

- Preparation for new infrastructure to support new scope of works by joint venture with existing company which is has experience of new scope (to decrease level of probability)
- Create integrate project chapter for 3 major scopes (to decrease level of consequence)
- Engage professional team (to decrease level of consequence)

Risk data decrease as shown below:

- Consequence value = 3
- Probability value = 3
- Risk Priority number =9
- Table 3.5 Risk management matrix value = Purple colour (medium Risk)
- Table 3.7 Definition for value of risk matrix and impacts = Time to consumption 1 - 3 month with Cost within IDR 250 million to IDR 500 million and affected to certain of functional areas.

Table 3.

Description	Before	After
Consequence Value	5	3
Probability Value	4	3
Risk Priority Number	20	9
Matrix Table 3.5	High Risk	Medium Risk
Matrix Table 3.7	Time to consumption > 5 month with Cost more than IDR 1 billion and affected to very significant to overall project.	Time to consumption 1 - 3 month with Cost within IDR 250 million to IDR 500 million and affected to certain of functional areas.

## 5 CONCLUSIONS

Each Project has a unique factors and different complexity. Risk factors has contributed to failed of project due poor management and overlook risk factor in initiation, planning and execution process. To avoid this, integrated as opposed to have more views risk source and create performance management during project execution.

Responding to this need, this study proposes a new model for risk management that integrated risk framework of ISO 9001:2015 approach and Project Management Book of Knowledge (PM BOK) 6<sup>th</sup> edition approach.

To access the suitability of the frameworks, is was applied to the Yamal Train 3 Project of PT. XYZ. By applying of integrated frameworks, the company was able to identify potential risk in early stage as business issues and register to ISO form which is perform on management review yearly. Furthermore, on tender stage by using project charter, the company perform qualitative analysis and create Risk Management Plan as per PM BOK guidance.

Decreasing of potential risk level has contributes to efficiency of project cost, schedule achievable and sufficient amount of professional manpower. PT XZY has suffered 41% cost overruns in term manpower cost, and after new integrated risk management cost simulation cost overruns become lower. Mitigation, eliminate and control of risk pre

project, during and post project has main key to successful application of integrated risk management.

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