TEAM 4 Project Report

Risk Response Plan for Precision Castparts Corp Project

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Abstract

This paper describes efforts put forth to define a Risk Response Plan for a US Government(USG) development project currently being developed by Precision Castparts Corp Inc (PCC) within the state of Oregon. The project is being managed by PCC team of engineers and a USG team. The PCC engineer team has informal project management processes and the use of these processes is generally left to the discretion of the designated project manager. A Risk Response Plan (RRP) is not generally addressed in a strict manner. Typically, risks are not formally identified and documented, nor is proper consideration given to the appropriate management actions that should be applied when risks become realities. The historic approach to risk is one of reaction to risks rather than identification, anticipation, monitoring and pro-active responses.

This template was completed as a course project in the EMGT 546 Project Management Tools class at Portland State University during the winter 2009 term. One of this project team members work for PCC Inc and as provided much of the data contained within the report. The data is accurate except for selected portions of sensitive cost and budget data which have been slightly modified so as to comply with agency regulatory requirements. The objective of the report is to show effective utilization and proficiency in the use of several formal project management tools as learned in the class in order to develop a Risk Response Plan for the project.

The tools used in this paper are Work Breakdown Structure, Network Diagram showing Critical Path, Probability/Impact Matrix, and Monte Carlo Analysis.

Introduction

Precision Castparts Corporation (PCP: NYSE) is a leading supplier of high performance investment casting, forged parts and fasteners. These are specifically designed and sold for aerospace, energy, and other demanding industries. Therefore a Risk Response Plan can help ensure the on-time, within-budget, and as specified completion of these products.

A fair portion of these components are for U.S. Department of Defense (DoD) projects. As a result, the entire program will be required to follow DoD 5000.2-R[4] in some fashion. This document does not describe in detail these specific risk planning guidelines but will highlight the following specific references:

- "Whenever applicable, risk reduction through use of mature processes shall be a significant factor in source selection."
- Section 2.5 calls out specifically a risk management must be in place.
- "DoD oversight activities …. shall consider all relevant and credible information that might mitigate risk and reduce the need for DoD oversight…"

As a leader in aircraft related components a substantial portion of these DoD contracts are with the Air Force. Similar to the requirements listed above they have their own procurement requirements. These are defined in AFI-63-101. This requirement requires active risk management to proactively plan for and respond to risks to ensure successful procurement.

PCC may not be directly managing the whole platform; they are required though to have visible practices with a level of risk planning in place. On-site representatives on behalf of the project's stakeholders may be involved depending on the level of involvement required by the project. In the case of US Air Force projects this will most likely be required according to AFI-63-101 section 2.5.[6]

The following Risk Response Plan (RPP) will be based on existing US Government recommendations from the Department of Defense, Department of Energy and the US Air Force. As well incorporating best practices and existing processes within PCC.

Risk Management History

Risk Management within PCC has traditionally been a mix of mostly business and marketing centered efforts. This has had good/bad results in previous projects. With the current economic outlook and the importance of Air Force projects this template RRP may be used. As a result this is a preliminary risk plan to help initiate risk planning at the project development level. This will attempt to both qualitatively and quantitatively

assess the perceived risks of a new project and allow the Monte Carlo simulation of those risks in terms of schedule and cost.

Purpose and Scope

As mentioned above, the purpose of this plan is to assess the risks at the outset of a new project. This process will incorporate the roles and responsibilities of all relevant parties to define and assess risks. The result will be the ability to track and proactively respond to changes in the projects plan in an organized fashion. The ultimate goal is to have the project complete in an efficient manner without undue waste (of time and/or money) or project cancellation.

Risk Response Plan

The outcome of this process will be the following:

1. Project Organization: WBS, Roles & Responsibilities, Reporting
2. Risk Identification: WBS, Areas of Concern
3. Qualitative Risk Assessment: Risk Impact on Schedule
4. Quantitative Risk Assessment: Top 10 Risks, Monte Carlo
5. Response: RRP

Project Information

The Work Breakdown Structure (WBS) for the type of projects which PCC is undertaking follows a 4 level structure. The average project has 28-45 work units which are estimated for cost and schedule estimating.

WBS Levels:

1) Project
2) Functional Group
3) Deliverable
4) Activities (Work Units)

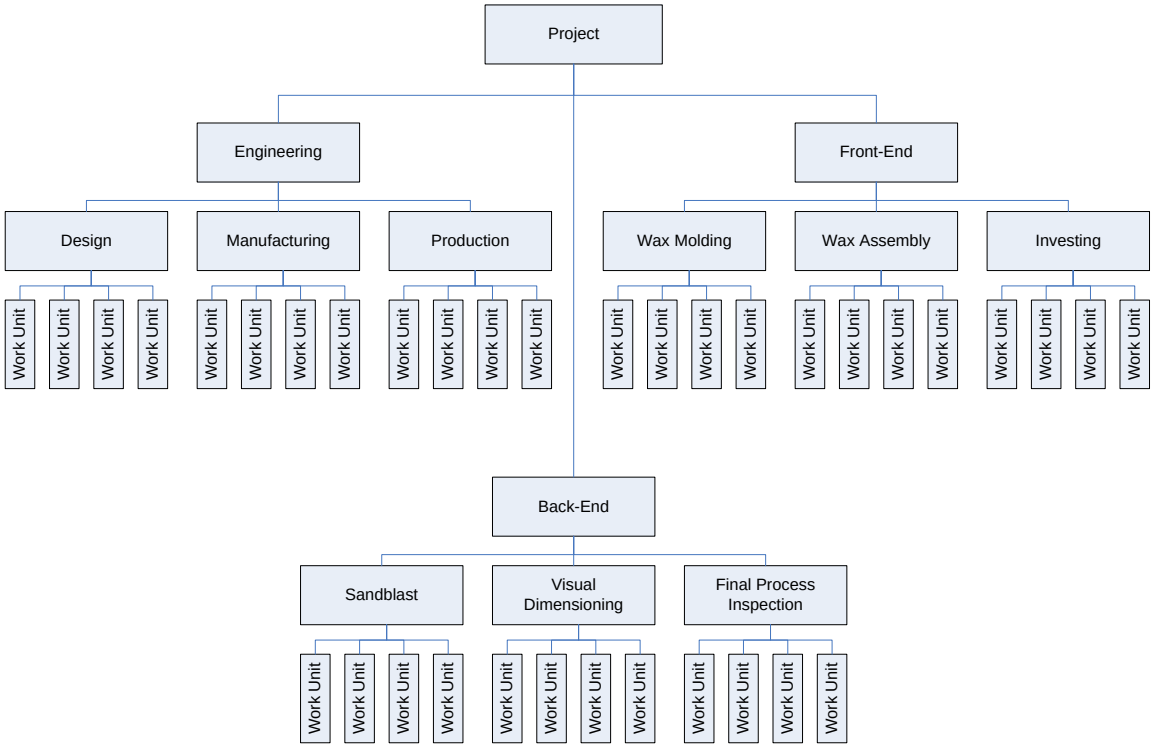
Project
Engineering
Front-End
Design
Manufacturing
Production
Wax Molding
Wax Assembly
Investing
Work Unit
Back-End
Sandblast
Visual Dimensioning
Final Process Inspection

Figure 1WBS

A typical reporting structure would look as follows:

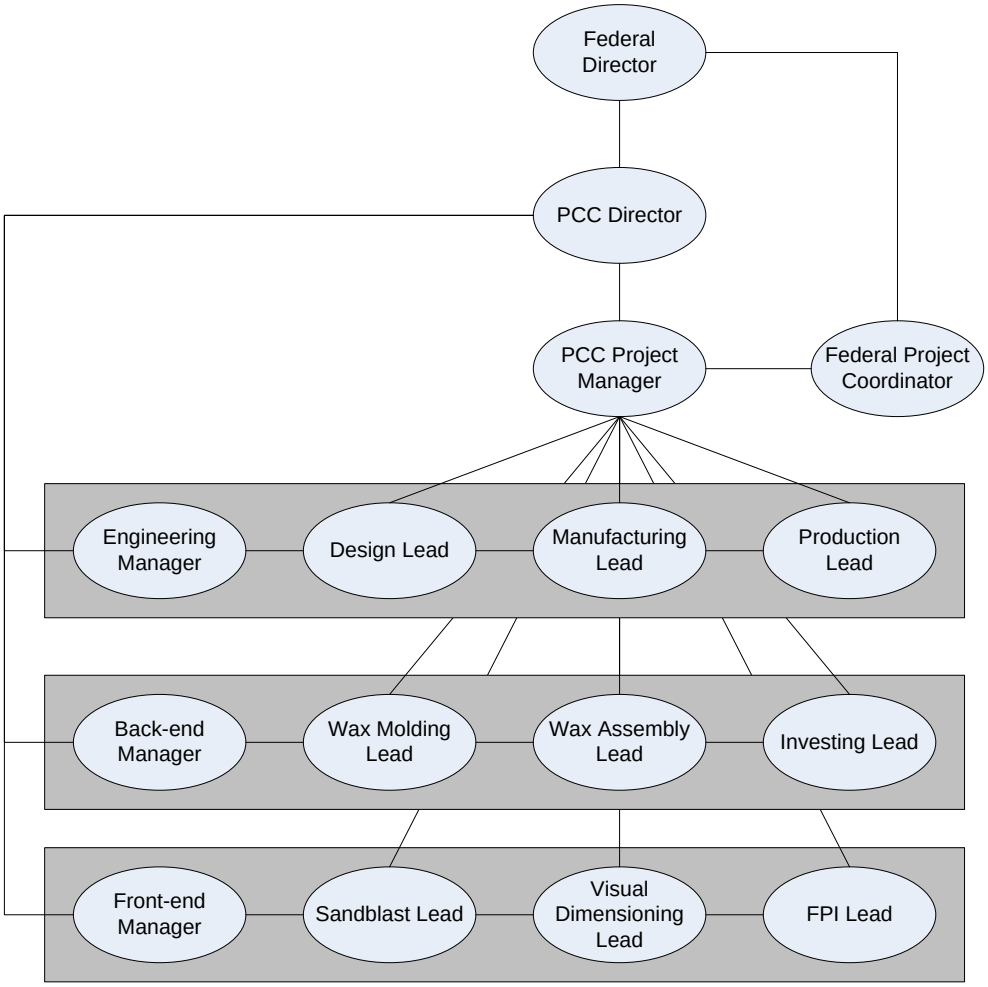

Figure 2 Reporting Network

Risk Identification

For each of the work units in the WBS the project manager and personnel responsible are required to assess the risks. The attached worksheet, Appendix A, is a checklist of items to consider when assessing risk. This is based on a DoE project so will require refinements. This would be where past risk occurrences can now be captured over time as more projects make use of this template. Appendix B has the Risk Log template for each work unit's risk breakdown.

Qualitative Risk Assessment

Once the risks have been identified they can be entered into the P-I Matrix. Table 1 shows the risks as to how they relate to the stake-holder (Federal Project Director). For the case of PCP Table 2 shows the Qualitative risks for a Contractor [3].

Table 1 Qualitative Risk Analysis Matrix for the Federal Project Director

Consequence						
Probability	Federal Matrix	Negligible	Marginal	Significant	Critical	Crisis
	Cost	Minimal or no consequence. No impact to Project cost.	Small increase in meeting strategic objectives. Marginally increases costs.	Significant degradation in meeting strategic objectives. Significantly increases cost.	Strategic goals and objectives are not achievable. Additional funding may be required.	Program cannot be completed with current resources. Catastrophic threat to mission need.
	Schedule	Minimal or no consequence. No impact to Project schedule.	Small increase in meeting strategic objectives. Marginally impacts schedule.	Significant degradation in meeting strategic objectives. Significantly impacts schedule.	Strategic goals and objectives are not achievable. Additional time may need to be allocated.	Program cannot be completed. Catastrophic threat to mission need.
	Very High >90%	Low	Moderate	High	High	High
	High 75% to 90%	Low	Moderate	Moderate	High	High
	Moderate 26% to 74%	Low	Low	Moderate	Moderate	High
	Low 10% to 25%	Low	Low	Low	Moderate	Moderate
	Very Low <10%	Low	Low	Low	Low	Moderate

Table 2 Qualitative Risk Analysis Matrix for the Contractor Project Manager

Consequence						
Probability	Federal Matrix	Negligible	Marginal	Significant	Critical	Crisis
	Cost	Minimal or no consequence. No impact to Project cost.	Small increase in meeting strategic objectives. Marginally increases costs.	Significant degradation in meeting objectives. Significantly increases cost; fee is at risk.	Goals and objectives are not achievable. Additional funding may be required; loss of fee and/or fines and penalties imposed.	Project stopped. Funding withdrawal; withdrawal of scope, or severe contractor cost performance issues.
	Schedule	Minimal or no consequence. No impact to Project schedule.	Small increase in meeting strategic objectives. Marginally impacts schedule.	Significant degradation in meeting objectives. Significantly impacts schedule.	Goals and objectives are not achievable. Additional time may need to be allocated. Missed incentivized and/or regulatory milestones.	Project stopped. Withdrawal of scope, or severe contractor schedule performance issues.
	Very High >90%	Low	Moderate	High	High	High
	High 75%	Low	Moderate	Moderate	High	High

	to 90%					
	Moderate 26% to 74%	Low	Low	Moderate	Moderate	High
	Low 10% to 25%	Low	Low	Low	Moderate	Moderate
	Very Low <10%	Low	Low	Low	Low	Moderate

Once the risks have been accounted for with their assessed values the High risk items will need to be addressed immediately. Moderate risk items will need watch points defined to allow for early warning and detection. Low risk items may also have an early warning defined if the project's risk tolerance is very low. These results will be factored in the Quantitative Risk Assessment and Response Action.

Quantitative Risk Assessment

With the qualitative assessments ranked they can be ordered and further details added. For the Work items of high risk the quantitative risk can be broken down as follows. For ease of use a simple triangular distribution may be used.

Table 3 Distribution Parameter

Cost ($)	**Schedule (Hours)**
Minimum Expected Cost	Minimum Completion Time
Average Expected Cost	Average Completion Time
Maximum Expected Cost	Maximum Completion Time

This can be added into the cost estimates and schedule for Monte Carlo Analysis to determine expected outcomes and sensitivities.

Response

Each risk needs an action plan, owner and trigger. The action plan is the set of actions needs to mitigate the risk. This is the responsibility of the owner to undertake. The owner will be notified that action is needed when the trigger(s) has been asserted. This should be recording in the Risk Register/Log.

Each response requires a strategy. Please review the following list to help classify the response required.[5]

These responses and owners will be captured in the final risk log and managed by the project manager.

Table 4 Risk Response Strategies & Techniques

TECHNIQUE	DESCRIPTION
ACCEPTANCE	This technique recognizes the risk and its uncontrollability. Acceptance is a "passive" technique that focuses on allowing whatever outcome to occur without trying to prevent that outcome. This technique is normally used for "low" or "very low" risks where a scope efficient means of reducing the risk is not apparent.
AVOIDANCE	This technique uses an approach that avoids the possibility of risk occurrence. Avoidance can be thought of as nullifying the risk by changing the contract parameters established between the Customer and Integrator. The following items represent ways of avoiding risks: 1. Work Scope Reduction 2. Changing the requirements and/or specifications 3. Changing the Statement of Work (SOW) 4. Changing the Technical Baseline 5. Developing and submitting Waivers and Deviations
CONTROL	This technique is made up of actions that are to be taken that reduce the risk likelihood or impact. Control-based actions occur at all points throughout the program's lifecycle and are typically the most common response. They typically identify an action or product that becomes part of the work plans, and which are monitored and reported as par of the regular performance analysis and progress reporting of the Program.
INVESTIGATION	This technique defers all actions until more work is done and/or facts are known. Investigation-based responses do not define any mitigation for reducing an individual risk. They are responses to risks where no clear solution is identified, and further research is required. Investigation may include root cause analysis. Investigative responses immediately and directly lead to a greater aggregated Program risk. This is because the probability quantifier for each risk includes the effect of the applied response, for which there is none, and the level of control quantifier indicates the level of influence to apply that response, which is low.
REDUCTION	Reduction is the active lowering of risk by a planned series of activities. Techniques include: • Rapid Prototyping • Early multi-discipline involvement • Consultant and/or specialist reviews • Simulation • Modeling • Trade Studies • Team Workshops • Advance design models • Reduce Dependencies • Customer involvement • Joint Applications development groups
TRANSFERENCE	Transference is the process of moving something from one place to another or from one party to another. In this, the risk can be transferred to the customer or to the contractor. Typically, transference includes the sub-contracting to specialist suppliers who are able to reduce the overall risk exposure. This technique is best utilized during the proposal process. Transfer can also include the use of third party guaranties, such as insurance backed performance bonds.

Risk Communication

In projects that have stakeholder presence regular updates on risk will be beneficial. This can allow for better visibility into the project and if any corrective measures need tobe taken. Therefore, as part of this process a Risk Status update should be prepared. Appendix C shows an example template.

Project Completion

At the completion of the project the RPP should be reviewed. As this is a living document incorporating new benefits and possible shortcomings will benefit future projects. Ultimately, if PCC grows and/or takes on much more DoD work, a proper project management working group may oversee the maintenance and proper use of the Risk Response Template.

Appendix A: Risk Check List

Note: This list is not all-inclusive, but provides an initial checklist of risk categories.[]

TECHNICAL CATEGORIES

Design
Undefined, Incomplete, Unclear Functions or Requirements
Complex Design Features
Numerous or Unclear Assumptions or Bases
Reliability
Inspectability
Maintainability
Safety Class
Availability
Errors and Omissions in Design

Construction Strategy
Turnover/Start-up Strategy
Direct Hire/Subcontract
Construction/Maintenance Testing
Design Change Package Issues

Regulatory and Environmental
Environmental Impact Statement required
Additional Releases
Undefined Disposal Methods
Permitting
State Inspections
Order Compliance
Regulatory Oversight

Technology
New Technology
Existing Technology Modified
New Application of Existing Technology
Unknown or Unclear Technology

Testing
Construction
Maintenance
Operability
Facility Start-up
System Start-up (Subcontractor or PE&CD)

Safety
Criticality Potential
Fire Watch
Exposure Contamination Potential
Authorization Basis Impact
Hazardous Material Involved
Emergency Preparedness
Safeguards and Security
Category I Nuclear Materials
Classified Process/Information
Confinement Strategies

Interfaces
Multiple Agencies, Contractors
Special Work Control/Work Authorization Procedures
Operating SSCs Including Testing
Multiple Customers
Co-Occupancy
Outage Requirements
Multiple Systems
Multiple Projects
Proximity to Safety Class Systems

PROGRAMMATIC CATEGORIES

Programmatic
Funding Uncertainties
Stakeholders Program Strategy Changes
Fast Track/Critical Need
Infrastructure Influence
Schedule Deferrals
Schedule Acceleration
Management acceptance of risk w/o mitigation

Procurement
Procurement Strategy
First-Use Subcontractor/Vendor
Vendor Support

Resource/Conditions
Material/Equipment Availability
Specialty Resources Required
Existing Utilities Above and Underground
Support Services Availability
Geological conditions
Temporary Resources (Power, Lights, Water, etc.)
Resources Not Available
Construction Complexities
Transportation
Critical Lifts
Population Density
Escorts
Personnel Training and Qualifications
Tools, Equipment Controls, and Availability
Experience with System/Component (Design, Operations, Maintenance)
Work Force Logistics
OPC Resources
Operations Support
Health Physics
Facility Support
Facility Maintenance Centralized Maintenance
Construction Support Post Modifications
Research and Development Support

Unique Working Conditions
Personnel Injury
Personnel Protection
Vehicular
Ergonomics
Weather/Climate Conditions

Other
Schedule
Cost
Errors and Omissions in Estimates
Scope Change
Security

Appendix B: Risk Register/Log

Project Name/ Number:	Prepared by:	Date:
Customer/ End user Group	**Contact Name:**	**Project Type (S/M/L):**
Business Unit:	**Project Manager:**	**Project Sponsor:**

WBS Number	Risk Event	Proba-bility	Cost Impact SH	Cost Impact PCC	Schedule Impact SH	Schedule Impact PCC	Overall Risk	Trigger	Risk Response	Risk Owner

[1]

Appendix C: Risk Status Update Template

Item		Number	Comments
1	Risks Open		
2	Risks Closed		
3	Monitoring Trigger Pending Within Three Months		
4	Residual Risk Handling Response enacted		
5	Residual Risk moved toPrimary		
6	Secondary Risk Moved to Primary		

[3]

References

[1] IIL “Risk Response Plan and Register”
[2] “*Risk Management Plan*” US Department of Energy National Nucloean Security Administration Nevada Operation Office Office of Environmental Management, Las Vegas, Nevada, NNSA/NV-781 Rev. 0
[3] “*Risk Management Guide*” DOE, DOW G 413.3-7 9-16-08
[4] “*Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs*” Department of Defense, DoD 5000.2-R, April 5th, 2002
[5] “*Risk Management Plan: EL Toolkit*” Department of Defense, Version 2.0, November 2003
[6] “*Air Force Instruction 63-101*”, Department of the Air Force, 29 July 2005