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Project Man. 412 Assignment 2
Group I-2

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Project Management 412 for the degree Baccalaureus in Engineering at Stellenbosch University.

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Executive Summary

This Project Plan Document details the project scope statement, baseline plan, risk plan and budget for a new product development project. The product to be developed incorporates the skill sets of all members in the multidisciplinary team. The product is a pressure vessel for industrial process oil refineries capable of sensing when the vessel is at risk of failure, thereby automatically releasing pressure to prevent catastrophic failure.

The scope statement begins by detailing the objectives for the product development project, which gives an indication of the desired end goal for the customer, and a base for the target plan. Thereafter the team developed milestones, deliverables and a work breakdown structure for the project plan, to achieve the objectives that were formulated. There are 12 milestones defined, which must be achieved by certain deadlines. These are summarised in table format, with specifications of the deadline dates and associated deliverables for each. The deliverables are expanded upon in a separate table, with their associated deadline dates and specific resource assignment. These deliverables, milestones and deadlines are represented graphically within the Gantt chart for the whole project

The team each defined the technical requirements for the product development based on their expertise within their discipline. This is a summary for the customer of what they can expect, technically, from the finished product. The team has a diverse group of engineers, covering chemical, civil, mechanical, mechatronic and electrical disciplines. Thus, each member identified the aspects of the product development that pertained to their discipline, and outlined the technical requirements to achieve a successfully developed end product.

The limits and exclusions of the project scope are identified and outlined, as well as the customer approval procedures, which will be executed during the project to ensure that the customer's requirements for the product and project plan are met.

The data developed in the project scope statement is used to develop the baseline project plan, which will be used to measure the progress of the project. The plan is analysed to determine problems and mitigation strategies for the hiring, assigning and managerial actions of the resources, to ensure each deliverable is completed in the prescribed time.

Based on the resource assignment, managerial actions and training plan, a detailed budget for the project is formulated. The budget makes provision for unforeseen events and worker inefficiencies, so that a reasonably accurate project cost estimation can be presented to the customer. A detailed cost allocation according to individual deliverables is also put together.

The team developed an appropriate technique for collaboratively identifying risks for the project plan as a whole, and utilised their multidisciplinary nature to identify potential risks associated with each member's discipline. Each risk was assigned a mitigation and response strategy as well as a level-of-risk score. A risk matrix was developed to aid in assigning the level-of-risk score, which then facilitated the ranking of all the risks according to priority. The highest priority risks are identified and discussed in further detail, for both the team and the customer to refer to in the event of the risk occurring.

Contents

Executive Summary i

List of Figures iii

List of Tables iv

1. Project Scope Statement 1
- 1.1. Introduction . . . 1
- 1.2. Objectives . . . 1
- 1.3. Deliverables . . . 1
- 1.4. Milestones . . . 2
- 1.5. Work Breakdown Structure . . . 4
- 1.6. Technical Requirements . . . 4
  - 1.6.1. Chemical Requirements . . . 4
  - 1.6.2. Civil Requirements . . . 4
  - 1.6.3. Electrical and Electronic Requirements . . . 4
  - 1.6.4. Mechanical Requirements . . . 5
  - 1.6.5. Mechatronic Requirements . . . 5
- 1.7. Limits and Exclusions . . . 5
- 1.8. Customer Review and Approval Procedures . . . 6

2. Project Baseline 7

3. Budget Breakdown 8

4. Risk Analysis 10
- 4.1. Risk Identification and Analysis . . . 10
- 4.2. Priority Risks . . . 11

A. Detailed Budget 12

B. Network Diagram 16

C. Prioritized Risk Registers 20

D. Meeting Minutes 23

List of Figures

1.1. Work Breakdown Structure 4

3.1. Status and Distribution of Task Costs 9
3.2. Status and Distribution of Resource Costs 9
3.3. Direct Cumulative Cost and Direct Cost per Month 9

A.1. Detailed Budget 12

B.1. Full Network Diagram 16

List of Tables

1.1. Deliverables with Delivery Date and Responsible Resources 2
1.2. Milestones with Associated Deliverables and Dates 3
1.3. Customer Review and Approval Meetings 6

3.1. Project Cost Breakdown 8
3.2. Managerial Actions Cost Breakdown 8

4.1. Probability Scores Used for Risk Matrix 10
4.2. Impact Scores Used for Risk Matrix 10
4.3. Risk Matrix Used for Risk Analysis 10

C.1. Prioritized Internal Risk Register 21
C.2. Prioritized External Risk Register 22

Chapter 1

Project Scope Statement

1.1. Introduction

This chapter will define the product scope and process for the design of the new product. This will then be used to develop the tasks and deliverables necessary for project completion. This collection of tasks and deadlines will be used in later chapters to develop the project baseline and budget.

1.2. Objectives

The objective of this project is to develop an industrial scale vessel for storing gaseous byproducts of petroleum refining under high pressures. subject to time and monetary constraints (specifically, 200 work days starting from 31/03/21 and $380 000,00) specified by the customer while minimizing risk and maximizing stakeholder value. The product must be designed according to the the technical requirements specified by the multi-disciplinary team of engineers assigned to this project (Sec. 1.6), the limits/exclusions detailed in Sec. 1.7, and approved by the customer per the procedures outlined in Sec. 1.8.

The process for developing this product consists of evaluating the market to develop and execute a marketing plan based on these results. Using these results with the product specifications, the high-pressure vessel is designed, testing methods are derived and a risk analysis is conducted. The design's functionality is then tested by building a prototype that is subjected to the testing methods of the previous phase. These results are also used to determine if the prototype satisfies the design requirements.

If the prototype does not yield satisfactory results, the process is repeated until the requirements are met (given that the project's cost does not overrun). Once this step is reached, the manufacturing plan is developed and the product is advertised according to the marketing plan. Once sufficient materials are sourced, the manufacturing plan and the product is launched. This is also the point at which the project concludes.

1.3. Deliverables

The project consists of various deliverables that must be completed for the project to progress. The due dates of these deliverables and the resources responsible for them are listed in Tab. 1.1 below:

Deliverable Date	Deliverable	Resources Responsible
08/04/21	Market Assessment Report	Yukio Ashida, Kurt Zollinger
03/05/21	Customer Preference Report	Yukio Ashida, Kurt Zollinger
19/05/21	Marketing Program	Yukio Ashida, Kurt Zollinger
06/01/22	Product Launch Presentation	Kurt Zollinger
10/05/21	Design and Development Plan	Junior Product Designer 1,2
25/05/21	Detailed Technical Design Schematics	Junior Product Designer 1,2
01/06/21	Product Tolerance and Liability Limits Report	Junior Product Designer 1,2
08/06/21	Risk Analysis Report	Junior Product Designer 1,2

Deliverable Date	Deliverable	Resources Responsible
09/07/21	Final Preliminary Design Plans	Junior Product Designer 1,2
13/07/21	Initial Engineering Templates	Tom Bechur, Darryl Sandefur
29/07/21	Final Product Design	Tom Bechur, Darryl Sandefur
05/08/21	Pre-Production Specifications	Tom Bechur, Darryl Sandefur
24/08/21	Product Prototype	Tom Bechur, Darryl Sandefur
12/10/21	Prototype Approval	Tom Bechur, Darryl Sandefur
25/08/21	Quality Assessment Report	Quality Engineer
09/09/21	Prototype Testing Protocols	Darryl Sandefur
29/09/21	Prototype Test Results	Quality Engineer
14/10/21	Prototype Test Result Evaluation	Quality Engineer
30/08/21	RFQ	Operations Specialist
06/09/21	Production Sample	Quality Engineer
15/09/21	Supplier Capability Report	Operations Specialist, Tom Bechur
27/09/21	Sample Approval	Tom Bechur
28/10/21	Supplier Notification	Quality Engineer
22/10/21	Production Plan	Operations Specialist
25/11/21	Production Control Plan	Operations Specialist
02/12/21	First-Run Product Assessment	Operations Specialist
14/12/21	Deliveries Contracts	Operations Specialist
03/01/21	Production Contract	Operations Specialist
16/04/21	Project Status Update	Tom Bechur, Darryl Sandefur
14/05/21	Project Status Update	Tom Bechur, Darryl Sandefur
03/06/21	Project Status Update	Tom Bechur, Darryl Sandefur
21/07/21	Project Status Update	Yukio Ashida
11/08/21	Project Status Update	Yukio Ashida
24/08/21	Project Status Update	Yukio Ashida
14/09/21	Project Status Update	Yukio Ashida
20/09/21	Project Status Update	Yukio Ashida
12/10/21	Project Status Update	Yukio Ashida
21/10/21	Project Status Update	Yukio Ashida
01/12/21	Project Status Update	Darryl Sandefur
21/12/21	Project Status Update	Darryl Sandefur

Table 1.1: Deliverables with Delivery Date and Responsible Resources

1.4. Milestones

The project has been divided into twelve milestones, each with associated deliverables. This division can be seen in Tab. 1.2 below:

Milestone	Deliverables	Date
1	Market Assessment Report Customer Preference Report Project Status Update	05/05/21

Milestone	Deliverables	Date
2	Design and Development Plan Detailed Technical Design Schematics Marketing Program Project Status Update	25/05/21
3	Product Tolerance and Liability Limits Report Risk Analysis Report Project Status Update	02/07/21
4	Final Preliminary Design Plans Initial Engineering Templates Project Status Update	21/07/21
5	Final Product Design Pre-Production Specifications Project Status Update	11/08/21
6	RFQ Product Prototype Quality Assessment Report Project Status Update	30/08/21
7	Production Sample Supplier Capability Report Prototype Testing Protocols	15/09/21
8	Sample Approval Prototype Test Results Trade Show Presentation Project Status Update	06/10/21
9	Prototype Approval Prototype Test Result Evaluation Project Status Update	14/10/21
10	Supplier Notification Production Plan Project Status Update	12/11/21
11	Production Control Plan First-Run Product Assessment Deliveries Contracts Project Status Update	14/12/21
12	Production Contract Product Launch Presentation Project Status Update	06/01/22

Table 1.2: Milestones with Associated Deliverables and Dates

1.5. Work Breakdown Structure

The tasks assigned to every resource is given in the work breakdown structure in Fig.1.1 below:

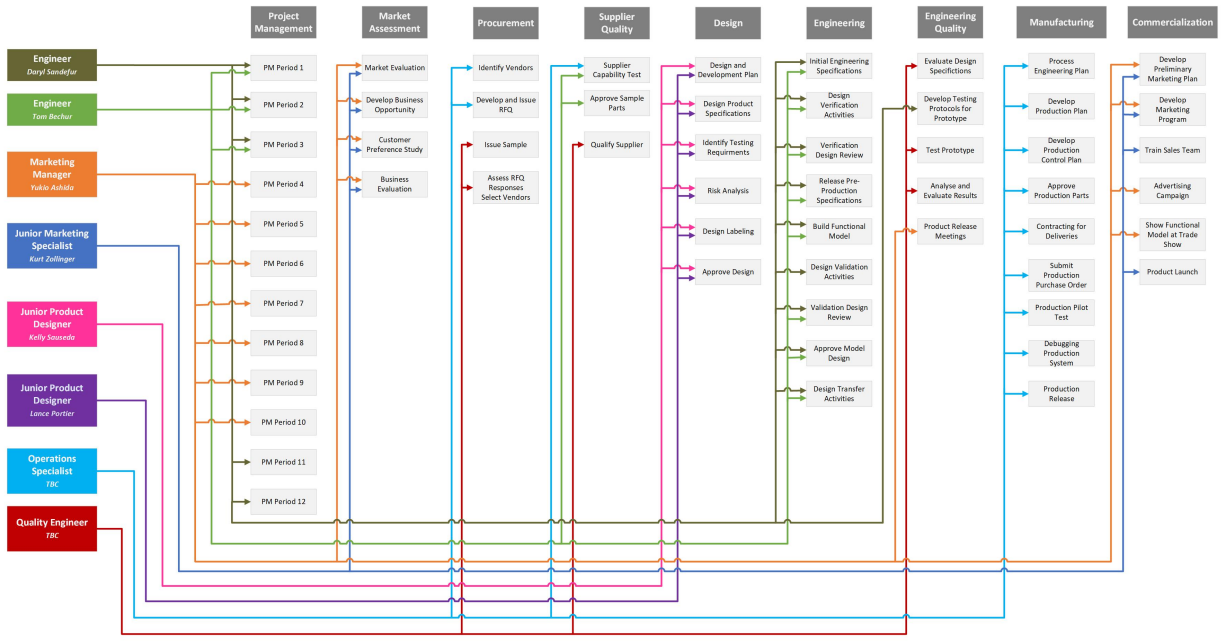


Figure 1.1: Work Breakdown Structure

1.6. Technical Requirements

This section describes the technical requirements determined by the multi-disciplinary team of engineers assigned to this project, subject to approval by the customer.

1.6.1. Chemical Requirements

The pressure within the vessel will be dependent on various factors. These factors include the physical and chemical characteristics of the fluid stored within the vessel, as well as the dependence of the pressure within the vessel on the fluid's temperature. It is a chemical engineers job to understand and account for these characteristics and fluctuations. The chemical engineer also has extensive knowledge regarding process control which would be used to develop the equipment and models that regulate pressure within the vessel within an acceptable range.

1.6.2. Civil Requirements

The pressure vessel will be a large steel construction. The design of the vessel and the structure supporting it will comprise several steel angles and sections. Sufficient foundation will be needed to support loads of the structure. The steel used for construction must be of a high grade so that it does not fail under the worst load case. Depending on the location of the vessel(inland or coastal) preventative measures must be taken to prevent corrosion causing structural failure and to ensure durability of the structure.

1.6.3. Electrical and Electronic Requirements

The high-pressure vessel must be monitored using a suite of analogue and digital sensors. This will be the purview of the electrical and electronic engineer.

This sensor suite must be designed and built using cost-effective and accurate components that can withstand the pressure inside the pressure vessel to be developed. Redundant sensors must also be included to provide reasonably accurate measurements in the event of a component failure or if the pressure vessel moves outside of its normal operating parameters.
All designs must follow industry best practice and safety standards.

1.6.4. Mechanical Requirements

The pressure vessel must be designed to have sufficient strength to resist failure under normal operating conditions. Theoretical stress and strain calculations must be performed to select the initial vessel material, dimensions and boundary conditions for the design. A finite element analysis can then be performed to refine these selections. The mechanical engineer will be charged with performing these calculations and analyses.

1.6.5. Mechatronic Requirements

The pressure vessel must be controlled properly to ensure it operates in a smooth and safe manner. Mechatronic engineers have a great understanding of control systems, and mechanical and electrical component interaction.

The mechatronic engineer must design, develop, and implement a control-and safety system to ensure mechanical and electrical components operates properly. The mechatronic engineer should also design a user interface. The user interface must display accurate real-time data. The client must be able to control the system through the user interface.

1.7. Limits and Exclusions

There are several limits that apply to the project. Chief among these are the limiting factors of cost (380 000,00$ and 200 workdays. The project is also limited by the customer and technical requirements (Sec. 1.6. There are also a limited amount of resources for each resource category and having idle resource is discouraged with unallocated resource penalties.

Material costs for construction and installation are excluded from this report. Lifetime costs after product handover to the customer (e.g. maintenance, improvement) are also not included.

1.8. Customer Review and Approval Procedures

Meetings with the customer is held according to Tab. 1.3 below. These meetings are held to keep the customer updated of the project progress, gain approval from the customer to continue with subsequent tasks and to ensure that the customer is invested by gathering feedback from the customer.

Meeting to be Held	Parties to Attend	Date
Design Approval	Customer Project Manager Junior Product Designer 1,2	07/07/21
Sample Parts Approval	Customer Project Manager Engineer	15/09/21
Approve Prototype Design	Customer Project Manager Engineer	08/10/21
Product Release	Customer Project Manager Engineer Marketing Manager	12/11/21
Approve production parts	Customer Project Manager Operations Specialist	25/11/21
Product Launch and Handover	Customer Project Manager	06/01/21

Table 1.3: Customer Review and Approval Meetings

Chapter 2

Project Baseline

The baseline for this project has been calculated using Microsoft Project and can be seen in A.1 and B.1.

Inspecting the network it is confirmed that the project end date is before the project deadline ($06/01/22 \leq 13/03/22$).

Analysing this network leads to several potential problem areas.

The first is that this project is sensitive to the hiring time of new resources. For example, if junior product designers are not hired by the time Phase 2 starts, the entire project will be delayed. To mitigate this potential problem, two engineers are hired that can cover a variety of specialities in the event that required resources are not obtained. The hiring strategy must also take this possibility into account, such as possibly hiring resources a period earlier than they are required.

There are also several places where tasks from the same department must be done in parallel (e.g. commercialization in Phase 3), this means that there must be at least two members of this department to finish the tasks in time, especially if one of the tasks is on the critical path.

The hiring strategy takes these concerns into account by hiring redundant resources for tasks that are on the critical path (e.g. hiring two junior designers for the design tasks on the critical path). Redundant bids are also placed on several resources in the event that a singular bid is not accepted. The loss in team longevity/cohesion is considered an acceptable sacrifice to mitigate the risk of not acquiring critical resources.

The managerial action strategy consists of regular pizza parties for all employees at the end of each phase. This is for improving team morale at a negligible cost. Furthermore, four management recognition awards are to be given at evenly spaced phase intervals to all employees to boost morale and team cohesion further. These awards are spaced evenly to ensure that once the effect of one award fades, the effect of the next award is activated.

It was decided that the benefit of training resources is not worth the associated costs (direct course costs and lost labour). Therefore, the training strategy consists of not sending any resources to training.

Chapter 3

Budget Breakdown

This chapter documents the budget that has been planned for this project. Resources that have not been hired as of Phase 1 have been assigned using generic resources and their cost has been calculated using average rates for their respective specialisation.

The cost breakdown of the project can be found in the Tab. 3.1 below:

Cost Type	Cost ($)
Direct Resource Costs	309 428,00
Training Costs	0
Managerial Action Costs	1 600,00
Contingency	6 220,56
Overhead (20%)	61 885,60
Total:	379 134,16

Table 3.1: Project Cost Breakdown

An overhead cost of 20% is added to account for unforeseen events and worker inefficiencies. A contingency fund of 2% of the direct costs is added. The use of this contingency fund is specified in the chapter regarding Resource Analysis (Ch.4).

The cost breakdown of the managerial actions planned for the project is found in Tab. 3.2 below:

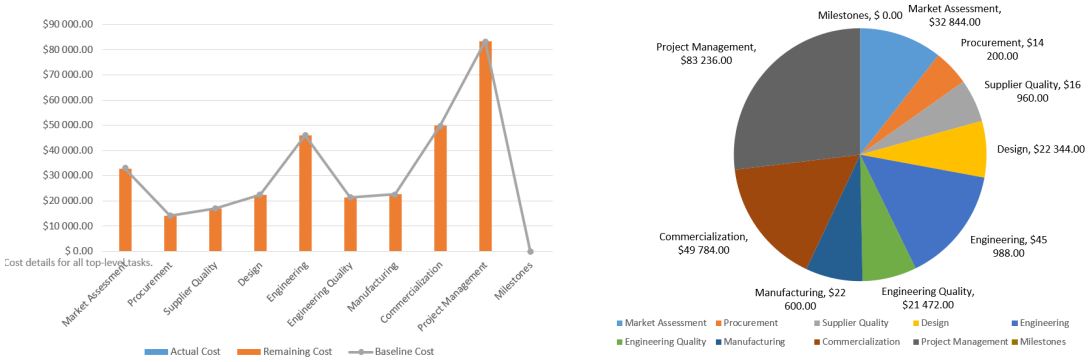
Managerial Action	Action Amount	Action Unit Cost ($)	Cost ($)
Pizza Party	12	50,00	600
Management Recognition Award	4	250,00	1000
Total:			1 600,00

Table 3.2: Managerial Actions Cost Breakdown

The managerial actions planned to be taken consist of a pizza party for all employees at every period as well as management recognition awards at regular intervals throughout the project. Further details regarding managerial action strategy can be found in Ch. 2.

It was decided that training resources was not worth the cost and lost hours for the relatively small gains in efficiency.

An overview of the cost status and distribution of the costs associated with the various tasks over the full project duration can be found in Fig. 3.1 below:



(a) Status of Task Costs

(b) Distribution of Task Costs

Figure 3.1: Status and Distribution of Task Costs

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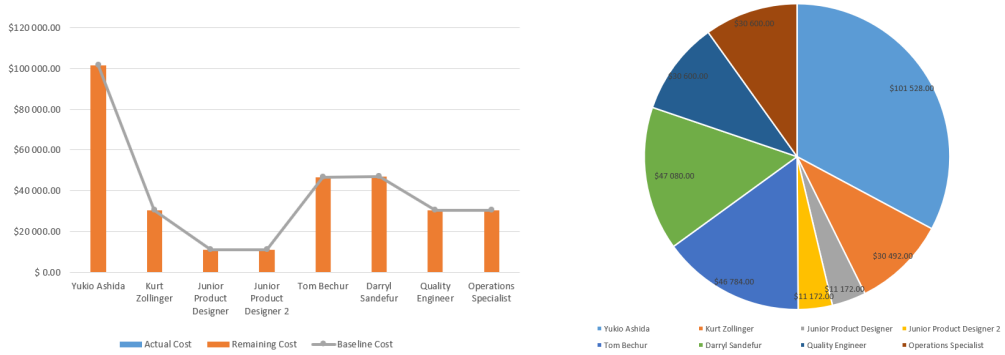
An overview of the cost status and distribution of the costs associated with the various resources over the full project duration can be found in Fig. 3.2 below:



(a) Status of Resource Costs

(b) Distribution of Resource Costs

Figure 3.2: Status and Distribution of Resource Costs

.

The cumulative direct costs and direct cost per month is given in Fig. 3.3 below:

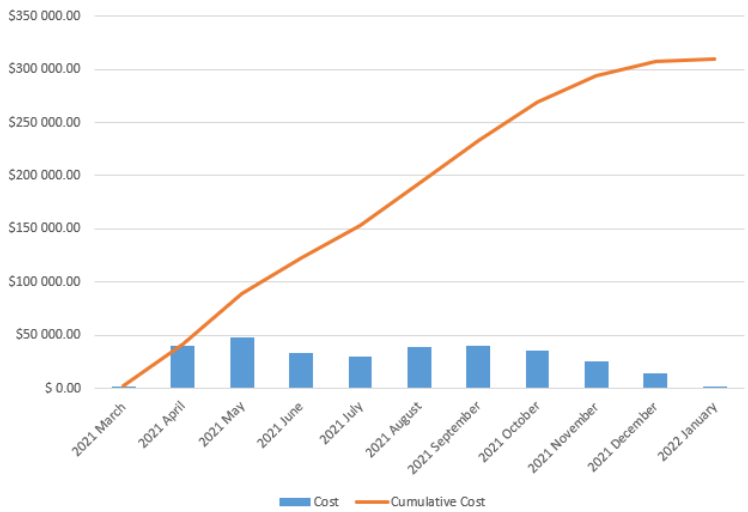


Figure 3.3: Direct Cumulative Cost and Direct Cost per Month

A detailed budget with task assignments, baseline budget and baseline duration can be found in A.1.

Chapter 4

Risk Analysis

4.1. Risk Identification and Analysis

Risks were identified at a special Risk Planning and Response meeting (ref appendix). The attendees of this meeting consisted of the multidisciplinary team of engineers assigned to this project. Using their respective areas of expertise, each of the attendees identified several possible risks (with their respective likelihood at impact) present in the project.

A qualitative risk analysis was then done on these risks using the risk matrix in Tab. 4.3 constructed with Tab. 4.1 and Tab. 4.2 below. Each of the identified risks is assigned a composite score by multiplying their equivalent probability and impact scores, creating the risk matrix. The risks were then arranged by descending score to create a prioritized risk register.

Probability	Probability Percentage	Probability Score
Very High	80-100%	5
High	60-80%	4
Medium	40-60%	3
Low	20-40%	2
Very Low	0-20%	1

Table 4.1: Probability Scores Used for Risk Matrix

Impact	Impact score
Very High	5
High	4
Medium	3
Low	2
Very Low	1

Table 4.2: Impact Scores Used for Risk Matrix

Prob.						
	Very High	5	10	15	20	25
	High	4	8	12	16	20
	Medium	3	6	9	12	15
	Low	2	4	6	8	10
	Very Low	1	2	3	4	5
		Very Low	Low	Medium	High	Very High
				Impact		

Table 4.3: Risk Matrix Used for Risk Analysis

4.2. Priority Risks

Using the risk registers in C.1, priority risks are identified as risks with a score of more than 14 for internal risks and more than 4 for external risks. These risks require greater scrutiny and review to ensure that these risks do not come to pass, due to the combination of their high likelihood of occurrence or high impact on the project.

The priority internal risks can be separated into the two areas that they impact, namely financial and resources.

The priority resource risks concern the possibility and impact that Covid-19 would have on the project. The plan for mitigating and managing these risks will be three-pronged: to develop a response strategy for resources contracting the disease, developing procedures to continue work under an imposed lockdown and preventative measures to prevent the spread of the disease. Each of these plans and procedures will have a manager assigned at project launch to monitor the risk and provide regular status updates. The assigned managers will also be responsible to execute the respective plans in the event of the risk occurring.

The priority financial risks concern the possibility and impact of not meeting the specified budget, as a result of cost overruns or budget changes, or the specified project delivery date. It is imperative that these risks are mitigated to the fullest possible extent as these risks cannot be allowed to happen. These risks are semi-mitigated by the extensive planning done in this report such as more accurate cost and time estimates (WBS in Sec. 1.5 and milestone dates in Sec. 1.4) and contingency measures as seen in Ch. 3 (additional overhead and contingency fund). However, this alone is insufficient and does not fully account for the unforeseen changes in the project environment. Therefore, a manager must also be assigned to constantly monitor and revise the models used to predict time and resource costs as well as provide regular status updates. Plans must also be made to meet with the customer and executive level in the event of these risks occurring to prevent automatic early project termination.

The priority external risks consist of events that occur after the project handover to the customer and therefore does not have an impact on product development. However, these risks must still be taken into account. As a general rule, the monitoring of these risks is left to the customer, the response strategy is delivered with the product to be implemented by the customer and mitigation steps are taken during the design of the product to minimize these risks.

Appendix A

Detailed Budget

The detailed budget can be found on the following pages. Note that the image can be zoomed in to read details of the various tasks.

ID	Task Name	Resource Names	Baseline Cost	Baseline Estimated Duration
1	**Market Assessment**		**$32 844.00**	**25.5 days**
2	Evaluate market	Kurt Zollinger,Yukio Ashida	$7 728.00	6 days
3	Develop Business opportunity	Kurt Zollinger,Yukio Ashida	$9 016.00	7 days
4	Customer preference study	Kurt Zollinger,Yukio Ashida	$13 524.00	10.5 days
5	Business evaluation (NPV, etc.)	Kurt Zollinger,Yukio Ashida	$2 576.00	2 days
6	**Procurement**		**$14 200.00**	**77.13 days**
7	Identify vendors	Operations Specialist	$2 800.00	7 days
8	Develop and Issue RFQ	Operations Specialist	$2 400.00	6 days
9	Issue sample (production equivalent)	Quality Engineer	$3 000.00	5 days
10	Assess RFQ responses and select vendors	Quality Engineer	$6 000.00	10 days
11	**Supplier Quality**		**$16 960.00**	**38 days**
12	Perform supplier process capability	Operations Specialist,Tom B	$6 608.00	7 days
13	Approve sample parts	Tom Bechur	$4 352.00	8 days
14	Qualify Supplier	Quality Engineer	$6 000.00	10 days
15	**Design**		**$22 344.00**	**46.5 days**
16	Design and development plan	Junior Product Designer,Juni	$2 352.00	3 days
17	Design specs.	Junior Product Designer,Juni	$8 624.00	11 days
18	Identify testing requirements	Junior Product Designer,Juni	$3 920.00	5 days
19	Risk analysis	Junior Product Designer,Juni	$3 920.00	5 days
20	Design labeling	Junior Product Designer,Juni	$1 960.00	2.5 days
21	Approve design	Junior Product Designer,Juni	$1 568.00	2 days
22	**Engineering**		**$45 988.00**	**87.63 days**
23	Initial engineering specs.	Tom Bechur,Darryl Sandefur	$2 460.00	2.5 days
24	Design verification activities	Tom Bechur,Darryl Sandefur	$3 444.00	3.5 days
25	Verification design review	Tom Bechur,Darryl Sandefur	$1 968.00	2 days
26	Release pre-production specifications	Tom Bechur,Darryl Sandefur	$4 920.00	5 days
27	Build functional model	Tom Bechur,Darryl Sandefur	$8 856.00	9 days
28	Design validation activities	Darryl Sandefur	$2 200.00	5 days
29	Validation design review	Tom Bechur,Darryl Sandefur	$1 968.00	2 days
30	Approve model design	Tom Bechur,Darryl Sandefur	$1 968.00	2 days
31	Design transfer activities	Tom Bechur,Darryl Sandefur	$18 204.00	18.5 days

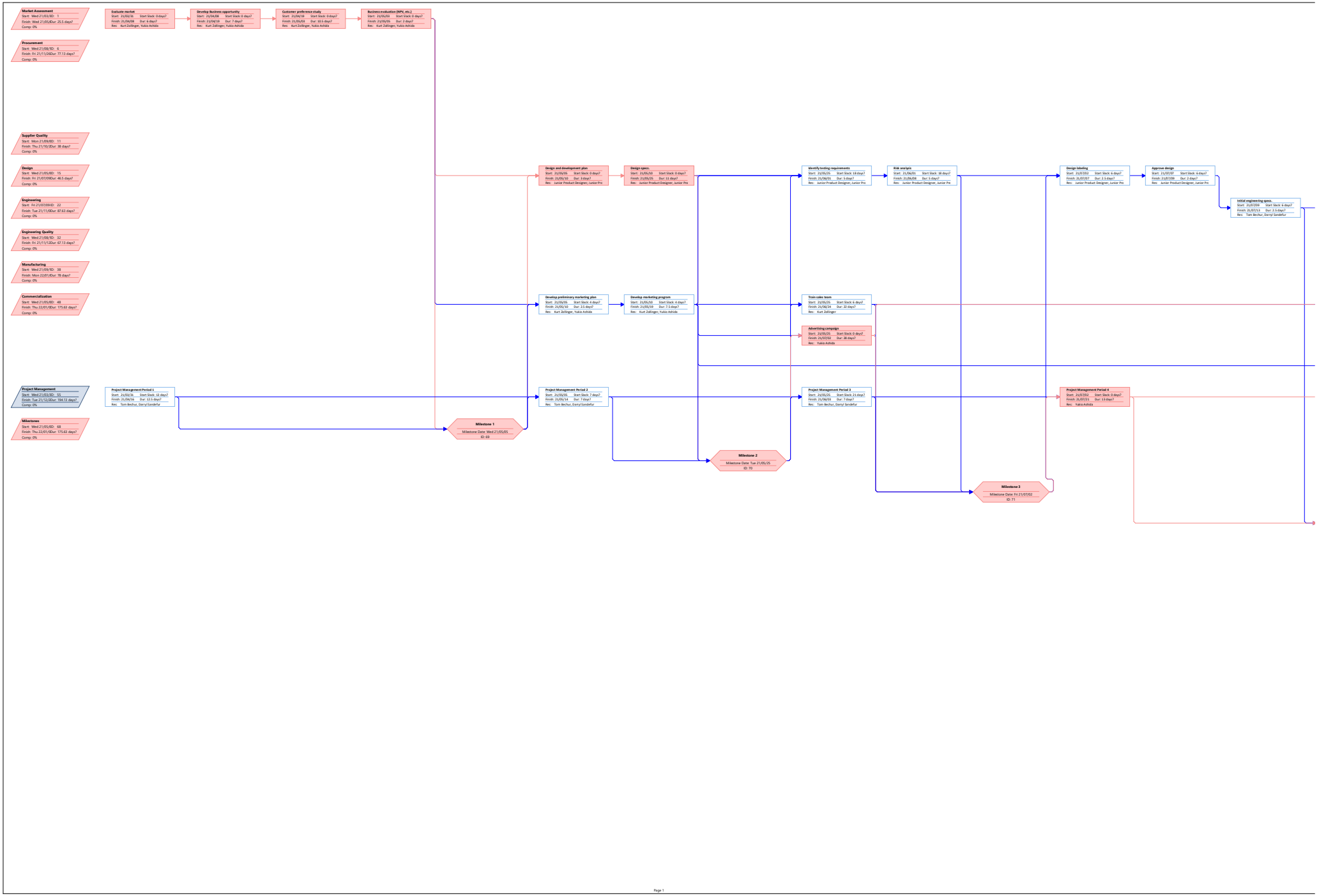
ID	Task Name	Resource Names	Baseline Cost	Baseline Estimated Duration
32	**Engineering Quality**		**$21 472.00**	**67.13 days**
33	Evaluate design specifications	Quality Engineer	$6 000.00	10 days
34	Develop testing protocol for prototype	Darryl Sandefur	$3 520.00	8 days
35	Test prototype	Quality Engineer	$6 000.00	10 days
36	Evaluate results of tests and identify weaknesses	Quality Engineer	$3 600.00	6 days
37	Product release meetings	Yukio Ashida	$2 352.00	3 days
38	**Manufacturing**		**$22 600.00**	**78 days**
39	Process engineering plan	Operations Specialist	$6 000.00	15 days
40	Develop production plan	Operations Specialist	$2 400.00	6 days
41	Develop production control plan	Operations Specialist	$3 400.00	8.5 days
42	Approve production parts	Operations Specialist	$2 000.00	5 days
43	Contracting for deliveries	Operations Specialist	$3 200.00	8 days
44	Submit production purchase order	Operations Specialist	$800.00	2 days
45	Production pilot test	Operations Specialist	$2 000.00	5 days
46	Debugging production system	Operations Specialist	$1 600.00	4 days
47	Production release	Operations Specialist	$1 200.00	3 days
48	**Commercialization**		**$49 784.00**	**175.63 days**
49	Develop preliminary marketing plan	Kurt Zollinger,Yukio Ashida	$3 220.00	2.5 days
50	Develop marketing program	Kurt Zollinger,Yukio Ashida	$9 660.00	7.5 days
51	Train sales team	Kurt Zollinger	$11 088.00	22 days
52	Advertising campaign	Yukio Ashida	$21 952.00	28 days
53	Show functional model at trade show	Yukio Ashida	$2 352.00	3 days
54	Product launch	Kurt Zollinger	$1 512.00	3 days
55	**Project Management**		**$83 236.00**	**194.13 days**
56	Project Management Period 1	Tom Bechur,Darryl Sandefur	$12 300.00	12.5 days
57	Project Management Period 2	Tom Bechur,Darryl Sandefur	$6 888.00	7 days
58	Project Management Period 3	Tom Bechur,Darryl Sandefur	$6 888.00	7 days
59	Project Management Period 4	Yukio Ashida	$10 192.00	13 days
60	Project Management Period 5	Yukio Ashida	$11 760.00	15 days
61	Project Management Period 6	Yukio Ashida	$7 056.00	9 days
62	Project Management Period 7	Yukio Ashida	$8 624.00	11 days

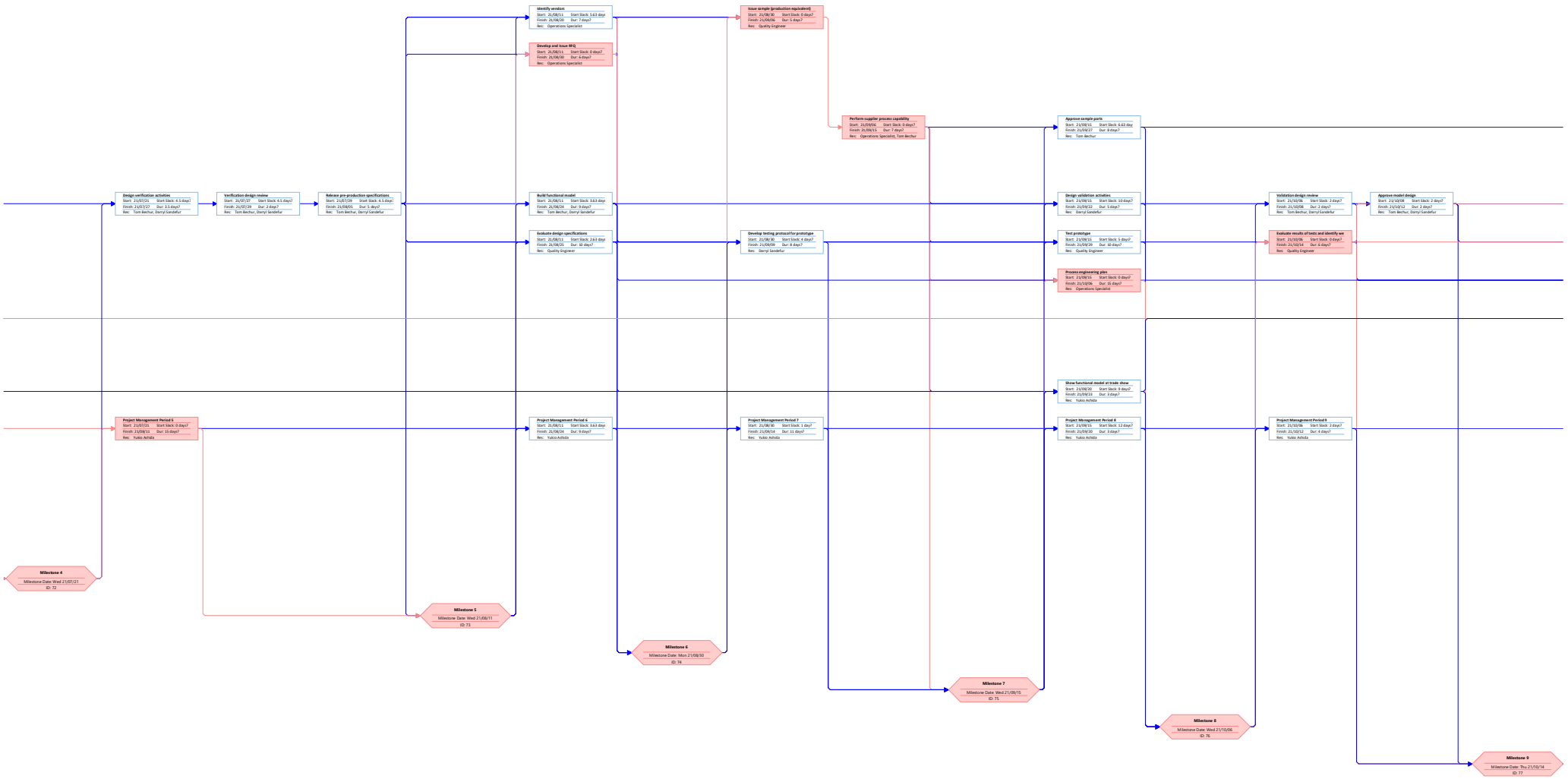
ID	Task Name	Resource Names	Baseline Cost	Baseline Estimated Duration
63	Project Management Period 8	Yukio Ashida	$2 352.00	3 days
64	Project Management Period 9	Yukio Ashida	$3 136.00	4 days
65	Project Management Period 10	Yukio Ashida	$3 920.00	5 days
66	Project Management Period 11	Darryl Sandefur	$5 720.00	13 days
67	Project Management Period 12	Darryl Sandefur	$4 400.00	10 days
68	**Milestones**		**$0.00**	**175.63 days**

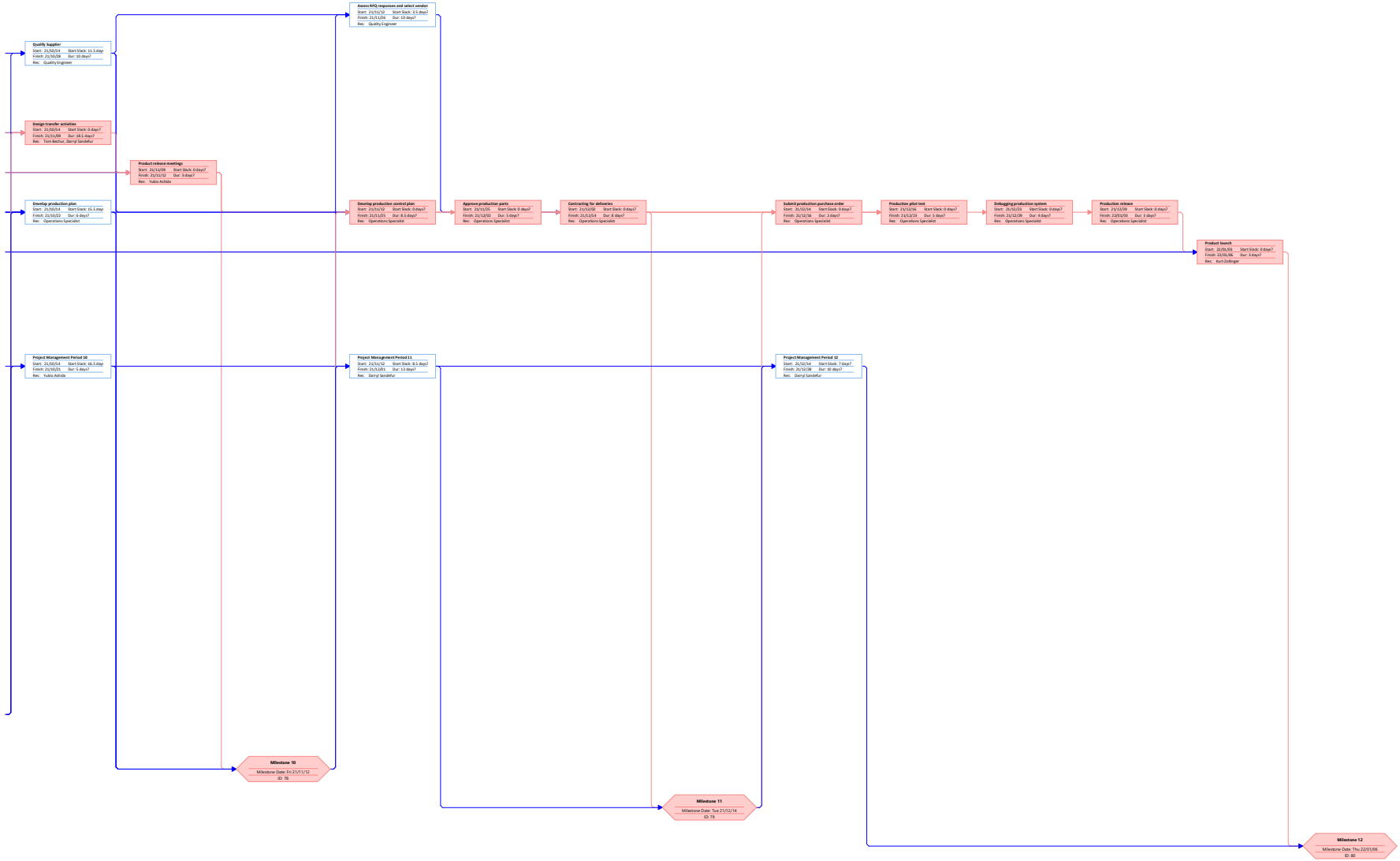
Appendix B

Network Diagram

The network diagram can be found on the following three pages. Note that the diagram is read left to right, the pages are contiguous and the images can be zoomed in to read details of the various tasks.


Market Assessment
Start: Wed 21/03/3ID: 1
Finish: Wed 21/05/3Dur: 25.5 days?
Comp: 0%
Procurement
Start: Wed 21/08/3ID: 6
Finish: Fri 21/11/26Dur: 77.13 days?
Comp: 0%
Supplier Quality
Start: Mon 21/09/0ID: 11
Finish: Thu 21/10/2Dur: 38 days?
Comp: 0%
Design
Start: Wed 21/05/3ID: 15
Finish: Fri 21/07/09Dur: 46.5 days?
Comp: 0%
Engineering
Start: Fri 21/07/09ID: 22
Finish: Tue 21/11/0Dur: 87.63 days?
Comp: 0%
Engineering Quality
Start: Wed 21/08/3ID: 32
Finish: Fri 21/11/1Dur: 67.13 days?
Comp: 0%
Manufacturing
Start: Wed 21/09/3ID: 38
Finish: Mon 22/01/3Dur: 78 days?
Comp: 0%
Commercialization
Start: Wed 21/05/3ID: 48
Finish: Thu 22/01/3Dur: 175.63 days?
Comp: 0%
Project Management
Start: Wed 21/03/3ID: 55
Finish: Tue 21/12/2Dur: 194.13 days?
Comp: 0%
Milestones
Start: Wed 21/05/3ID: 68
Finish: Thu 22/01/3Dur: 175.63 days?
Comp: 0%
Evaluate market
Start: 21/03/31 Start Slack: 0 days?
Finish: 21/04/08 Dur: 6 days?
Res: Kurt Zollinger, Yukio Ashida
Develop Business opportunity
Start: 21/04/08 Start Slack: 0 days?
Finish: 21/04/19 Dur: 7 days?
Res: Kurt Zollinger, Yukio Ashida
Customer preference study
Start: 21/04/19 Start Slack: 0 days?
Finish: 21/05/03 Dur: 10.5 days?
Res: Kurt Zollinger, Yukio Ashida
Business evaluation [NPV, etc.]
Start: 21/05/03 Start Slack: 0 days?
Finish: 21/05/05 Dur: 2 days?
Res: Kurt Zollinger, Yukio Ashida
Project Management Period 1
Start: 21/03/31 Start Slack: 13 days?
Finish: 21/04/14 Dur: 12.5 days?
Res: Tom Bechur, DarrylSanderfur
Milestone 1
Milestone Date: Wed 21/05/05
ID: 69
Design and development plan
Start: 21/05/05 Start Slack: 0 days?
Finish: 21/05/10 Dur: 3 days?
Res: Junior Product Designer, Junior Pro
Design specs
Start: 21/05/10 Start Slack: 0 days?
Finish: 21/05/25 Dur: 11 days?
Res: Junior Product Designer, Junior Pro
Develop preliminary marketing plan
Start: 21/05/05 Start Slack: 4 days?
Finish: 21/05/18 Dur: 2.5 days?
Res: Kurt Zollinger, Yukio Ashida
Develop marketing program
Start: 21/05/10 Start Slack: 4 days?
Finish: 21/05/19 Dur: 7.5 days?
Res: Kurt Zollinger, Yukio Ashida
Project Management Period 2
Start: 21/05/05 Start Slack: 7 days?
Finish: 21/05/14 Dur: 7 days?
Res: Tom Bechur, DarrylSanderfur
Milestone 2
Milestone Date: Tue 21/05/25
ID: 70
Identify testing requirements
Start: 21/05/24 Start Slack: 18 days?
Finish: 21/06/01 Dur: 5 days?
Res: Junior Product Designer, Junior Pro
Train sales team
Start: 21/05/25 Start Slack: 6 days?
Finish: 21/06/24 Dur: 22 days?
Res: Kurt Zollinger
Advertising campaign
Start: 21/05/25 Start Slack: 0 days?
Finish: 21/07/02 Dur: 28 days?
Res: Yukio Ashida
Project Management Period 3
Start: 21/05/25 Start Slack: 21 days?
Finish: 21/06/03 Dur: 7 days?
Res: Tom Bechur, DarrylSanderfur
Risk analysis
Start: 21/06/01 Start Slack: 18 days?
Finish: 21/06/08 Dur: 5 days?
Res: Junior Product Designer, Junior Pro
Milestone 3
Milestone Date: Fri 21/07/02
ID: 71
Design labeling
Start: 21/07/02 Start Slack: 6 days?
Finish: 21/07/07 Dur: 2.5 days?
Res: Junior Product Designer, Junior Pro
Approve design
Start: 21/07/07 Start Slack: 6 days?
Finish: 21/07/09 Dur: 2 days?
Res: Junior Product Designer, Junior Pro
Initial engineering specs.
Start: 21/07/09 Start Slack: 6 days?
Finish: 21/07/13 Dur: 2.5 days?
Res: Tom Bechur, DarrylSanderfur
Project Management Period 4
Start: 21/07/02 Start Slack: 0 days?
Finish: 21/07/21 Dur: 13 days?
Res: Yukio Ashida


Identify vendors
Start: 21/08/11 Start Slack: 5.63 days
Finish: 21/08/20 Dur: 7 days?
Res: Operations Specialist
Develop and issue RFQ
Start: 21/08/11 Start Slack: 0 days?
Finish: 21/08/30 Dur: 6 days?
Res: Operations Specialist
Issue sample (production equivalent)
Start: 21/08/30 Start Slack: 0 days?
Finish: 21/09/06 Dur: 5 days?
Res: Quality Engineer
Perform supplier process capability
Start: 21/09/06 Start Slack: 0 days?
Finish: 21/09/15 Dur: 7 days?
Res: Operations Specialist, Tom Ilechur
Approve sample parts
Start: 21/09/15 Start Slack: 6.43 day
Finish: 21/09/27 Dur: 8 days?
Res: Tom Ilechur
Design verification activities
Start: 21/07/21 Start Slack: 4.5 days
Finish: 21/07/27 Dur: 3.5 days?
Res: Tom Ilechur, Darryl Sanderlur
Verification design review
Start: 21/07/29 Start Slack: 4.5 days?
Finish: 21/07/29 Dur: 2 days?
Res: Tom Ilechur, Darryl Sanderlur
Release pre-production specifications
Start: 21/07/29 Start Slack: 4.5 days
Finish: 21/08/05 Dur: 5 days?
Res: Tom Ilechur, Darryl Sanderlur
Build functional model
Start: 21/08/13 Start Slack: 3.63 days
Finish: 21/08/24 Dur: 9 days?
Res: Tom Ilechur, Darryl Sanderlur
Evaluate design specifications
Start: 21/08/11 Start Slack: 2.63 days
Finish: 21/08/25 Dur: 10 days?
Res: Quality Engineer
Develop testing protocol for prototype
Start: 21/08/30 Start Slack: 4 days?
Finish: 21/09/09 Dur: 8 days?
Res: Darryl Sanderlur
Design validation activities
Start: 21/09/15 Start Slack: 10 days?
Finish: 21/09/22 Dur: 5 days?
Res: Darryl Sanderlur
Test prototype
Start: 21/09/15 Start Slack: 5 days?
Finish: 21/09/29 Dur: 10 days?
Res: Quality Engineer
Process engineering plan
Start: 21/09/15 Start Slack: 0 days?
Finish: 21/10/06 Dur: 15 days?
Res: Operations Specialist
Validation design review
Start: 21/10/06 Start Slack: 2 days?
Finish: 21/10/08 Dur: 2 days?
Res: Tom Ilechur, Darryl Sanderlur
Evaluate results of tests and identify we
Start: 21/10/06 Start Slack: 0 days?
Finish: 21/10/14 Dur: 6 days?
Res: Quality Engineer
Approve model design
Start: 21/10/08 Start Slack: 2 days?
Finish: 21/10/12 Dur: 2 days?
Res: Tom Ilechur, Darryl Sanderlur
Show functional model at trade show
Start: 21/09/20 Start Slack: 9 days?
Finish: 21/09/23 Dur: 3 days?
Res: Yukio Ashida
Project Management Period 5
Start: 21/07/21 Start Slack: 0 days?
Finish: 21/08/11 Dur: 15 days?
Res: Yukio Ashida
Project Management Period 6
Start: 21/08/11 Start Slack: 3.63 days
Finish: 21/08/24 Dur: 9 days?
Res: Yukio Ashida
Project Management Period 7
Start: 21/08/30 Start Slack: 1 day?
Finish: 21/09/14 Dur: 11 days?
Res: Yukio Ashida
Project Management Period 8
Start: 21/09/15 Start Slack: 12 day?
Finish: 21/09/20 Dur: 3 days?
Res: Yukio Ashida
Project Management Period 9
Start: 21/10/06 Start Slack: 2 days?
Finish: 21/10/12 Dur: 4 days?
Res: Yukio Ashida
Milestone 4
Milestone Date: Wed 21/07/21
ID: 72
Milestone 5
Milestone Date: Wed 21/08/11
ID: 73
Milestone 6
Milestone Date: Mon 21/08/30
ID: 74
Milestone 7
Milestone Date: Wed 21/09/15
ID: 75
Milestone 8
Milestone Date: Wed 21/10/06
ID: 76
Milestone 9
Milestone Date: Thu 21/10/14
ID: 77


Qualify Supplier
Start: 21/10/14 Start Slack: 11.5 day
Finish: 21/10/28 Dur: 10 days?
Res: Quality Engineer
Design transfer activities
Start: 21/10/14 Start Slack: 0 days?
Finish: 21/11/09 Dur: 18.5 days?
Res: Tom Bechar, Darryl Sandefur
Develop production plan
Start: 21/10/14 Start Slack: 15.5 day
Finish: 21/10/22 Dur: 6 days?
Res: Operations Specialist
Project Management Period 10
Start: 21/10/14 Start Slack: 16.5 day
Finish: 21/10/21 Dur: 5 days?
Res: Yukio Ashida
Assess RFQ responses and select vendor
Start: 21/11/12 Start Slack: 3.5 days?
Finish: 21/11/26 Dur: 10 days?
Res: Quality Engineer
Product release meetings
Start: 21/11/09 Start Slack: 0 days?
Finish: 21/11/12 Dur: 3 days?
Res: Yukio Ashida
Milestone 10
Milestone Date: Fri 21/11/12
ID: 78
Develop production control plan
Start: 21/11/12 Start Slack: 0 days?
Finish: 21/11/25 Dur: 8.5 days?
Res: Operations Specialist
Approve production parts
Start: 21/11/26 Start Slack: 0 days?
Finish: 21/12/10 Dur: 5 days?
Res: Operations Specialist
Contracting for deliveries
Start: 21/12/02 Start Slack: 0 days?
Finish: 21/12/14 Dur: 8 days?
Res: Operations Specialist
Project Management Period 11
Start: 21/11/12 Start Slack: 8.5 days?
Finish: 21/12/01 Dur: 13 days?
Res: Darryl Sandefur
Milestone 11
Milestone Date: Tue 21/12/14
ID: 79
Submit production purchase order
Start: 21/12/14 Start Slack: 0 days?
Finish: 21/12/16 Dur: 2 days?
Res: Operations Specialist
Production pilot test
Start: 21/12/16 Start Slack: 0 days?
Finish: 21/12/23 Dur: 5 days?
Res: Operations Specialist
Debugging production system
Start: 21/12/23 Start Slack: 0 days?
Finish: 21/12/29 Dur: 4 days?
Res: Operations Specialist
Production release
Start: 21/12/29 Start Slack: 0 days?
Finish: 22/01/03 Dur: 3 days?
Res: Operations Specialist
Project Management Period 12
Start: 21/12/14 Start Slack: 7 days?
Finish: 21/12/28 Dur: 10 days?
Res: Darryl Sandefur
Product launch
Start: 22/01/03 Start Slack: 0 days?
Finish: 22/01/06 Dur: 3 days?
Res: Kurt Zollinger
Milestone 12
Milestone Date: Thu 22/01/06
ID: 80

Appendix C

Prioritized Risk Registers

The Prioritized Risk Registers can be found on the following pages. Note that the tables can be zoomed in to read details of the various tasks.

Risk	Area Impacted	Impact	Prob	Score	Consequences	Mitigation	Response
Budget cuts	Financial	High	High	16	Project cost may overrun	Add contingency, ensure adequate overhead	Cut costs, review hiring strategy
Going over budget	Financial	Very high	Medium	15	Project may be terminated	Proper planning	Cut costs
Going over time	Financial	Very High	Medium	15	Project may be terminated	Proper planning	Assign more resources
Covid-19 lockdown restrictions	Resources	Medium	Very High	15	Project tasks may be delayed	Define contingency for operating under lockdown conditions	Operate as far as possible under lockdown conditions
Resources contracting Covid-19	Resources	High	Medium	12	Project may be delayed or risk the health of employees	Ensure correct Covid-19 measures are followed.	Infected or exposed individuals must self-isolate
Project purpose not well defined	Financial	Very High	Low	10	Project may be delayed or terminated	Define proper project objectives	Revise project objectives
Scope creep	Financial	Very High	Low	10	Project may be delayed or going over budget	Proper definition of scope	Deviate as little as possible from baseline plan
Cost estimating errors	Financial	Medium	Medium	9	Project may be delayed. Project may go over budget.	Ensure estimations are done properly, use more accurate methods	Revise and recalculate estimations
Task duration estimate errors	Financial	Medium	Medium	9	Project may be delayed.	Ensure correct project planning.	Redefine project schedule
Bid unsuccessful	Resources	Medium	medium	9	Project delays	Redundant and reasonable bids	Reassign resources
Design errors	Technical	Medium	Medium	9	Project may be delayed	Add contingency (on time and money)	Assign more designers
Manufacturing errors	Technical	Medium	Medium	9	Project may be delayed or go over budget	Add contingency (on time and money)	Assign more operations specialists
Material supply delays	Procurement	High	Low	8	Project may be delayed	Vet suppliers	Consider alternative supplier
Resource resignation	Resources	High	Low	8	Project may be delayed	Ensure resources receive an appropriate offer	Offer a better package, hire replacement resource
Resources on critical path unavailable	Resources	High	Low	8	Project Delays, Bench cost for other resources	Redundant resources on critical path	Assign another resource to path, review hiring strategy
Ineffective resource assignment	Resources	Low	High	8	Resource not functional to fullest potential	Hire effective resources for each task	Assign more effective resources
Labour strikes	Resource	Very High	Very Low	8	Resources unavailable, project may be delayed	Ensuring employees work under proper conditions. Contingency fund.	Negotiate with employees.
Resource mismanagement	Financial, Legal	High	Low	8	Project may be delayed	Hire manager with good reputation	Replace manager
Financial mismanagement	Financial, Legal	High	Low	8	Project may be delayed or budget overrun.	Hire manager with good reputation	Replace manager
Resource not available for hire	Resources	Medium	Low	6	Project delay	Good hiring strategy, regular review	Reassign resources
Unplanned work that must be accommodated	Financial	High	Very Low	4	Project may be delayed or go over budget.	Contingency funds.	Hire additional resources.
Team conflict	Resources	Low	Low	4	Task delays, cohesion loss	Pre-emptive Managerial actions	Review planned managerial actions
Resource unavailability due to lockdown restrictions	Resources	Low	Low	4	Project may be delayed.	Proper planning	Assign another resource, review hiring strategy
Sick Leave	Resources	Low	Low	4	Project delay	Proper planning for resources	Assign another resource, review hiring strategy
Maternity Leave	Resources	High	Very Low	4	Project may be delayed	Proper planning for resources	Assign another resource, review hiring strategy
Injury at work	Resources	Medium	Very Low	3	Extra costs, task delays	Proper safety protocols	Have emergency protocols, reassign resources
Unskilled Resource	Resources	Low	Low	2	Task delays	Vet hires	Review training strategy
Managerial actions ineffective	Resources	Very Low	Low	2	Inefficient spending	No mitigation	Review planned managerial actions

Table C.1: Prioritized Internal Risk Register

Risk	Area Impacted	Impact	Prob	Score	Consequences	Mitigation	Response
Structural failure	External	Very high	Low	10	Product destruction, possible loss of life	Ensure good design, develop emergency response	Implement emergency response, investigate failure source
Product becomes obsolete early in lifetime	External	Medium	Medium	9	Product no longer in service	Explore avenues of improvement	Attempt refit/improvement or decommission
Economy shift to greener energy sources	External	Low	High	8	Reduced demand for product	Explore alternative product uses	Reduce production
Product not operating within advertised parameters	External	High	Low	8	Product might operate as it should. Product could be deemed unsafe	Thorough project testing	Retract product for further testing
Tank deformation or failure	Technical	Very high	Very low	5	Product failure	Test tank material and product	Redesign product with improvements
Valve control error	External	Very high	low	5	Product failure	Proper design, testing, and implementation. Add safety valves.	Implement emergency shutdown procedure
Flammable substance ignition	External	High	Low	4	Loss of life or injury. Damage to buildings due to fires. Loss of productivity for customers.	Follow correct codes and standards for flammable substances.	Implement hazard protocols.
Substance spillage into the environment	External	high	Very Low	4	Environmental impacts. Loss of customer's product.	Follow correct codes and standards for pressurized storage vessels. Ensure vessel testing is done correctly.	Implement hazard protocols.
Product sensor failure	External	High	Very Low	4	Loss of control of product, possible product failure	Add redundant sensors	Send technician to replace sensor
Power loss to product	External	High	Very Low	4	Loss of control of product, possible product failure	Add backup generators, design emergency shutdown	Implement emergency shutdown measures
Pressure limit control system failure	External	High	Low	4	Product failure	Proper testing of control system before installation	Add emergency shutdown to the system
Failure to the tank support structure due to fatigue	External	Very high	low	4	Product failure	Proper Maintenance	Frequent checks onsite for possible failures
User interface bugs	External	Low	Low	4	Process delayed	Proper user interface debugging.	Issue software patch
Unfavourable exchange rates	External	Medium	Very Low	3	Product manufacturing may go over budget	No mitigation	Adjust product price
Bad weather delaying product installation	External	Very low	Low	2	Installation delayed	Check weather report before installation	No response

Table C.2: Prioritized External Risk Register

Appendix D

Meeting Minutes

The minutes transcribed at the various meeting preceding this report in given on the following pages.

Minutes of the Meeting 1 of Group I-2
Project Management 412

on 12/04/2021 @13h00-13h30 at Chalkboard

1. Attendance

- Present: Andre (AV), Bianca (BK), Emile (EV), Leon (LE), Rorisang (RL)
- Apologies: Philip (PK)

2. Minutes of the previous meeting

N/A

3. Agenda

The following agenda was approved before the meeting:

- Talk through the Gantt chart as prepared by EV.
- Decide on hires and other bidding decisions.
- Discuss assignment 2 format.
- Discuss strategy and approach for assignment 2.
- Brainstorm fictitious product idea to use for assignment 2.

4. Discussion according to agenda

1. Organized the same strategy for the marketing phase as was done in the demo run.
2. Discussed replacing the project manager with a marketing manager or engineer. Decided on testing the effectiveness of an engineer in this role by assigning him/her in parallel for the first phase.
3. Discussed hiring and assigning two junior product designers to speed up execution, since design tasks are budgeted for $50 / hour.
4. Discussed switching the project manager role from the engineer to a marketing manager (after phase 1 when engineer must be assigned to other tasks), since this strategy was effective in the demo.
5. Discussed bidding strategy regarding bidding additional 50 cents to win a bid over a team who might bid the same amount.
6. Reviewed budget analysis (as prepared by EV) for bidding decisions.
7. Discussion about having enough space in budget to hire at 30%-40% above the standard rate.
8. Discussed organizing a collaboration document (eg. google doc) for the ‘rough work’.
9. Discussed the compiling of the final document on LaTex (EV volunteered to take on this task).
10. Decided on approach for assignment 2 to be everyone working collaboratively on every task (on the google doc). There was a

discussion about setting short-term deadlines to ensure even contribution by each team member.

11. Each group member will brainstorm and contribute ideas for the fictitious product on the google doc.
12. EV will do baseline and share the repository with mpp file (on GitHub) through the MS teams channel, so that every team member has access to the Gantt chart and its continuous updates.
13. Final bidding decisions were made and submitted at the meeting for bid 1 (due 12/04/2021 @ 20h00). Bidding decisions were as follows:

Name	Category	Quality level	Standard rate	Offered rate	Intended assignment for phase 1
Tom Becher	Engineer	Mid-level	$55	$67.50	Project management
Kurt Zollinger	Junior Marketing Specialist	High-level	$59	$62.50	Market assessment / commercialization
Jane Gavette	Junior Marketing Specialist	Mid-level	$52	$60.50	Market assessment / commercialization
Yukio Ashida	Marketing manager	Mid-level	$91	$97.50	Market assessment / commercialization
Fulberto Eberstark	Marketing manager	Low-level	$78	$91.50	Contingency
Kelly Doe	Project manager	Low-level	$100	$100.00	Project management / contingency

5. Next meeting

The next meeting is planned for 12/04/2021 @20h15 on MS Teams, to evaluate whether the first round of bidding was successful or not. If not successful, the meeting will be used to discuss and make bids for round 2.

Minutes of the Meeting 2 of Group I-2
Project Management 412

on 12/04/2021 @20h15-20h30 on MS Teams

1. Attendance

- Present: Andre (AV), Bianca (BK), Emile (EV), Leon (LE), Rorisang (RL)
- Apologies: Philip (PK)

2. Minutes of the previous meeting

Refer to Meeting 1 above.

3. Agenda

The following agenda was approved before the meeting:

- Review results of bidding round 1.
- Discuss decisions for bidding round 2.

4. Discussion according to agenda

1. Discussed bidding for a second engineer, to secure for when engineering tasks begin, as we anticipate needing at least two engineers to reduce the workload and time spent.
2. Discussed whether to bid for another project manager, given that we did not get the previous bid for Kelly Doe (project manager).
3. Final bidding decisions were made and submitted at the meeting for bid 2 (due 13/04/2021 @ 20h00). Bidding decisions were as follows:

Name	Category	Quality level	Standard rate	Offered rate	Intended assignment for phase 1
Darryl Sandefur	Engineer	Low-level	$46	$55.5	
Darryl Mendieta	Project manager	High-level	$140	$140	Project management
Shinchi Ishikawa	Project manager	High-level	$143	$130	Project management

5. Next meeting

The next meeting is planned for 13/04/2021 @20h15 on MS Teams, to evaluate whether the second round of bidding was successful or not. If not successful, the meeting will be used to discuss and make bids for round 3.

Minutes of the Meeting 3 of Group I-2
Project Management 412

on 13/04/2021 @20h15-20h30 on MS Teams

1. Attendance

- Present: Andre (AV), Bianca (BK), Emile (EV), Leon (LE), Philip (PK), Rorisang (RL)
- Apologies: N/A

2. Minutes of the previous meeting

Refer to Meeting 2 above.

3. Agenda

The following agenda was approved before the meeting:

- Review results of bidding round 2.
- Discuss decisions for bidding round 3.

4. Discussion according to agenda

1. Discussed further actions regarding the project management tasks, given that all bids for a project manager thus far were unsuccessful.
2. Decided not to bid for another project manager because the only remaining was too high in price per hour.
3. Decided to fire one Junior Marketing Specialist (Jane Gavette) and one Marketing Manager (Fulberto Eberstark), since they were originally intended as contingencies. These two people were over-bid for, and were thus chosen to be fired.
4. Final bidding and firing decisions were made and executed at the meeting (due 14/04/2021 @ 20h00).
5. The fictitious product was discussed and decided upon. To incorporate all engineering disciplines of the group members, the decision was made for the product to be a pressure vessel for industrial processes (with sensors).
6. The whole team was tasked with contributing to the google doc for assignment 2, over the next few days.

5. Next meeting

The next meeting is planned for 16/04/2021 @09h00 on MS Teams, to check on the progress for assignment 2.

Minutes of the Meeting 4 of Group I-2
Project Management 412

on 16/04/2021 @09h00-09h30 on MS Teams

1. Attendance

- Present: Andre (AV), Bianca (BK), Emile (EV), Leon (LE), Philip (PK), Rorisang (RL)
- Apologies: N/A

2. Minutes of the previous meeting

Refer to Meeting 3 above.

3. Agenda

The following agenda was approved before the meeting:

- Review results of run 1 and the bids made:

Name	Category	Quality level	Standard rate	Offered rate	Intended assignment for phase 1
Kelly Sauseda	Junior Product Designer	Mid-level	$49	$55.25	Product design
Raimund Vogel	Junior Product Designer	Low-level	$42	$50.25	Contingency
Douglas Rutten	Junior Product Designer	Low-level	$44	$52.25	Contingency
Lance Portier	Junior Product Designer	Mid-level	$53	$60.25	Product design

- Review progress for assignment 2.
- Plan a date and time for a special risk planning and response meeting.

4. Discussion according to agenda

1. Decided to fire 2 out of the 4 junior product managers that were successfully hired. The 2 lowest costs were chosen to be fired.
2. Reviewed the results of phase 1. The team had 100% on cost and time, but 0% on functionality and stakeholders. This was due to the decision to not hire a project manager (to save cost) and instead assign 2 engineers to the project management task for phase 1. The team decided to stick to this decision, with predictions that it will improve later.

3. Discussed keeping the 2 junior product designers for phase 2 (as their tasks are on the critical path), but spoke about firing one of them before the next phase because there is a lot of slack and so we might not require 2 people on the task.
4. Walked through the assignment 2 doc together, discussing each section (what still needs to be added, what can be improved) and ensuring each group member was on track with the sections they were charged with doing.
5. The main task the team is concerned with is the project risk analysis section, and so it was decided that the whole group will work on this.
6. The team will all read over the content for risk management in preparation for the special risk planning and response meeting.

5. Next meeting

The next meeting is planned for 17/04/2021 @10h00 on MS Teams, to have the special risk planning and response meeting.

Minutes of the Meeting 5 (Risk Planning and Response meeting) of Group I-2
Project Management 412

on 17/04/2021 @10h00-??h?? on MS Teams

1. Attendance

- Present: Andre (AV), Bianca (BK), Emile (EV), Leon (LE), Philip (PK), Rorisang (RL)
- Apologies: N/A

2. Minutes of the previous meeting

Refer to Meeting 4 above.

3. Agenda

The following agenda was approved before the meeting:

- Develop an appropriate technique to identify risks.
- Collaboratively identify risks. Includes each person identifying risks associated with their discipline of engineering.
- Develop a risk assessment technique (and a level of risk for each identified risk).
- Develop a prioritized risk register including detailed discussion on the priority risks.
- Compile risk management plan.

4. Discussion according to agenda

a. Designed a technique for quantifying risks using a matrix comprising the probability (score out of 5) and impact (score out of 5).
b. Collaboratively identified risks to the project as a whole (both internal and external) by describing the risk, area impacted, impact score, probability score, consequences, mitigation and response for each.
c. AV identified the following risks associated with his chemical engineering discipline:
    i. Flammable substances igniting
    ii. Substances spilling into the environment
d. EV identified the following risks associated with his electrical engineering discipline:
    i. The product's sensors failing
    ii. Power loss to the product

e. RL and LE identified the following risks associated with their mechatronic disciplines:
    i. The pressure limit control system failing
    ii. Valve control having an error/failing
f. BK identified the following risk associated with her mechanical engineering discipline:
    i. Tank deformation or failure
g. PK identified the following risk associated with his civil engineering discipline:
    i. Structural failure
    ii. Tank support structure failing due to fatigue

5. Next meeting

The next meeting is planned for 18/04/2021 @10h00 on MS teams, to review progress.