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Project Management
Assignment 1

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Executive Summary

In today's day and age, engineers are expected to be versatile in more aspects than ever before. One of these is project management. This assignment hopes to introduce and ready engineering students for project management and as close to reality as possible. For example, the teams of students are multi-disciplinary, and had most probably not had prior experience working together.

For this particular assignment, a project structure / 'blueprint' has been designed in order to manage the creation of a beer brewery.

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1 Introduction

Stellenbosch is a town that mainly consist of students and if there is one thing that students like to do, it's drinking beer. This Project plan Document consists of the process that team G2 went through to create a brewery in Stellenbosch.

The objective of this project is to create a scope, baseline plan, a risk plan and a very detailed budget to determine which resources are needed. The resources will be bid on through a simulation. This simulation will let the students bid against other teams to recreate a real life scenario. The group needs to consider all possibilities and must determine what their needs are in terms of resources.

This project will run through twelve different simulations simultaneously. The group has a budget of $380 000 and has to use this money to bid on resources. This project will run from 9 February to 3 May 2017.

Using this multi-disciplinary group every member can contribute in a way that insures an optimal solution. The students in this team consists of a E&E engineer, a civil engineer, a mechanical engineer, a chemical engineer and an industrial engineer. By having students from all of these fields insures that they can combine their different skill sets to come to a solution.

2 Project Scope Statement

2.1 Objectives

A local micro-brewery will be designed and constructed in the Stellenbosch area. The main objective of this product/service is to design a local brewery for in the Stellenbosch area, that will have a deliverance of 3 600 000 draft beers per annum which is equivalent to 1 800 000 liters.

Other objectives include the following:

- Designing a brewery that will be able to cater as a bar that can be used by the public of Stellenbosch.
- To create a product that is economically viable for the target market namely students.
- To create a local product that will make use of local based – products.
- To create a building that is environmentally friendly and also aesthetically appealing.

2.1.1 Project Objectives

The objective of this project is to efficiently utilize the resources, manage the time and cost of the project.

The project must be completed within the budget of $380 000.

The project must be completed within the 9 month period which will start

2.2 Deliverables

To ensure that the project stays on track the deliverables are submitted to approve the continuation of the project. These intermediate checks are listed below.

- *Market Assessment*
  Conducting a market research study with information about possible customers, prefaces and needs.
- *Business evaluation*
  Set up a preliminary budget and cost of the project. Identify the target market

- *Design & development*
  Designing necessary plans and schematizations of the project. Identify the specifications and technical requirements needed for the project.
- *Market*
  Setting up of Responsibility allocations and timetable for the marketing program.
- *Risk Analysis*
  Identify the possible risks that will influence the project negatively and have an effect on the timeline and budget of the project.
- *Develop Design*
  Set up a finalized design with all engineering specifications and that are in alignment with the customers requirements.
- *Identify possible Vendors & set up RFQ*
  Set up a requests for quotes developed and issued.
- *Prototype Development*
  Develop a functional prototype that is based on the final product design This prototype is then evaluated.
- *Process Engineering Plan*
  Set up a supply chain network for a larger scale production.
- *Production plan*
  Manufacturing, engineering and quality control signed approval. Machinery implemented for production. Set up schedule for delivering based on sales forecast.
- *Assess or RFQ*
  Review RFQ's and specify the terms of the contract.
- *Product Launch*
  Product is officially signed off from manufactures and launched into the industry.
- *Production Pilot Test*
  Run a test of the production with normal operation and staff. Assess whether any errors occur or if changes need to be made.

Listed below is a short timeline:

Period 1

- Business evaluation
- Customer Preferance Study
- Evaluate Market

Period 2

- Design specifications
- Design and Development Plan
- Market Program Development
- Develop preliminary market plan

Period 3

- Campaign advertisement
- Train sales team

- Risk analysis
- Identify testing requirements

Period 4

- Approve the design
- Design labelling
- Identify the initial engineering specifications

Period 5

- Verification activities to be developed and reviewed
- Release the pre-production specifications

Period 6

- Build a functional model
- Create a RFQ
- Identify vendors
- Evaluate the design specifications

Period 7

- Develop a testing protocol
- Issue a sample

Period 8

- Approve sample parts
- Design the validation activities
- Process engineering plan
- Show a functional model at trade show
- Test prototype

Period 9

- Approve model design
- Evaluate test of model and identify weaknesses
- Validation design review

Period 10

- Design transfer activitiesz
- Develop production plan
- Product release meeting
- Qualify supplier

Period 11

- Approve production parts
- Evaluate RFQ responses and select vendors
- Contracting for delivers

- Develop the production control plan

Period 12

- De-bugging system
- Product launch
- Production pilot test
- Production release
- Submit production process order

2.3 Milestones

Table 1: Milestones

Milestone	Critical Path Tasks	Task Group	Task Duration (Days)	Target Date
1	Evaluate Market	Market Assessment	12	27-04-2017
	Develop Business Opportunity		14	
	Customer Preference Study		21	
	Business Evaluation (NPV, etc.)		4	
2	Design and Development Plan	Design	6	06-06-2017
	Design Specifications		22	
3	Advertising Campaign	Commercialization	28	14-07-2017
4	Design Labeling	Design	5	03-08-2017
	Approve Design		4	
	Initial Engineering Specifications	Engineering	5	
5	Design Verification Activities	Engineering	7	01-09-2017
	Verification Design Review		4	
	Release Pre-production Specifications		10	
6	Build Functional Model	Engineering	18	27-09-2017
7	Issue Sample (Production Equivalent)	Procurement	5	24-10-2017
	Perform Supplier Process Capability	Supplier Quality	14	
8	Process Engineering Plan	Manufacturing	15	14-11-2017
9	Validation Design Review	Engineering	4	24-11-2017
	Approve Model Design		4	
10	Qualify Supplier	Supplier Quality	10	08-12-2017
	Design Transfer Activities	Engineering	7	
	Product Release Meetings	Engineering Quality	3	
11	Develop Production Control Plan	Manufacturing	8,5	08-01-2018
	Approve Production Parts		5	
	Contracting for Deliveries		8	
12	Submit Production Purchase Order	Manufacturing	2	31-01-2018
	Production Pilot Test		5	
	Debugging Production System		4	
	Production Release		3	
	Product Launch	Commercialization	3	

2.4 Work Breakdown Structure

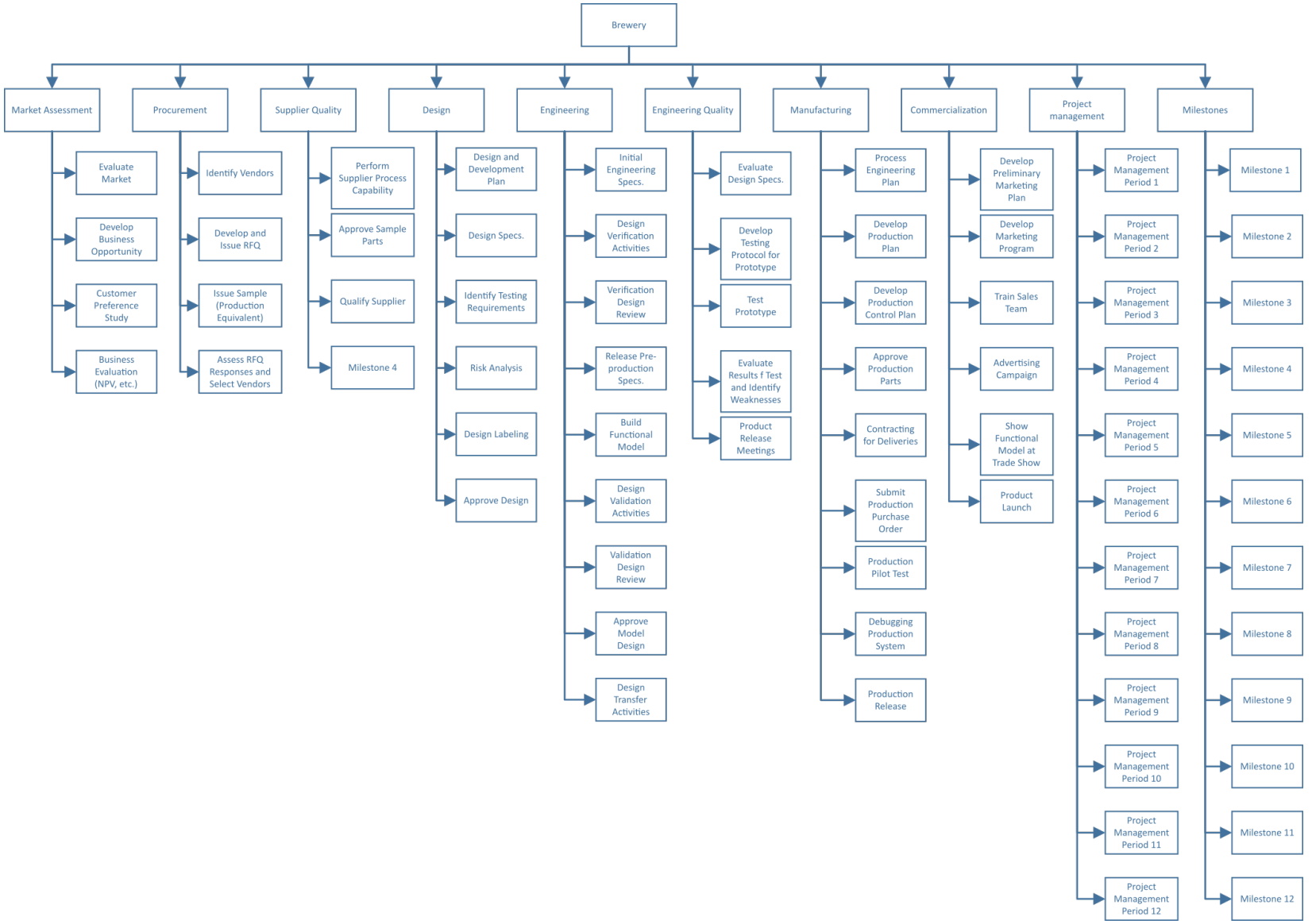


Figure 1: Work Breakdown Structure

2.5 Work Responsibilities of disciplinary

Sarel Swart – Process Engineer
It will be the work of the process engineer to develop the process that needs to be followed from start to finish of the beer brewery production. This engineer will identify the different ingredients that will have to be added and processes during the development of this product. The engineer will identify the different stages of the process such as malting, mashing and fermentation process.

Biancé Huysamen – Civil Engineer
The engineer will have the responsibility of designing the factory/ building of the brewery. A finished building will be renovated and adapted to fit the purpose of a brewery. It is also necessary to use natural lighting and environmentally friendly materials for the building in the most cost efficient way. Civil engineers are also skilled in communicating with different parties. Huysamen also exhibits good financial qualities and will therefore be responsible for the setting up the budget.

Daniel Robinson & Eduard van der Merwe – Electrical Engineers
The brewery will be controlled by electronic systems that have to be developed and programmed. It will be the responsibility of the engineer to update this and ensure the working of the different machinery of the processes and assist will all the programming of the project. Electrical engineers also are focused on detail and therefore Robinson will act as the Quality engineer whilst van der Merwe will assist with the risk analysis.

Carmen Steyn – Industrial Engineer
The engineer will ensure that the whole project will run smoothly and will have a broad overview of the project. Industrial engineers are skilled in optimizing systems. The engineer will help with the efficiency of the production process. It's important that a logical process is developed and designed. The engineer will also oversee the administrative and financial aspects of the project, since industrial engineers are exposed to the business aspects. Steyn will therefore also focus on Marketing and Commercialization.

Peter Toulouras – Mechanical Engineer
Toulouras will be responsible for the designing of the different machinery, pumps and tanks that will be used in the brewery process. Toulouras also exhibits great leadership, communication and delegation skills and therefore will fulfill the position of Project leader. It is the responsibility of the project leader to ensure that deadlines are met, that the clients are happy and that the project stays within budget and timeline. Therefore Toulouse will assist with running the entire project.

2.6 Technical Requirements

2.6.1 Summary of product

There are four types of beer that need to be manufactured namely: Weiss, Ale and two different flavoured lagers. All the beers utilize the same brewing system with slight alterations needed to create each unique beer. These alterations include different fermenting processes and different grains used. There needs to be four brewing systems working simultaneously in order to produce a sufficient amount of all beers.

2.6.2 Product Requirements

- There should be 4 varieties of beer
- Each beer will be sold in 500ml glasses
- The temperature of the beer should always be carefully monitored from the brewing process until the product is sold to the customer
- Control systems should be put in place in order to monitor and control each stage of the brewing process
- The quality of the final product needs to be of a high standard in order to compete in the respective market

- The final product should be marked at a reasonable price in order to appeal to a wider target market (students)
- The process compromises of 12 stages that need to be carefully executed in order to produce the best possible product

2.6.3 Project Requirements

- Project commences 20^{th} February 2017 and terminates 3^{rd} May 2017
- All the suppliers of the company should be identified and have their capabilities assessed
- The final product must be designed completely. The components should include specifications, risk analysis, design analysis, production process and possible testing requirements.
- A full quality assessment must be done throughout all stages of production of the final product

2.7 Limits and Exclusions

2.7.1 Limits

2.7.2 Exclusions

2.8 Review and Approval

When developing a product or service for a client it is very important to keep client satisfaction in mind. If the client is not happy then there the feasibility of the project in general is compromised. If the project is not feasible there is market for the product or service because the customers will not buy it. This is why it is very important to do a feasibility study early on in the process. The feasibility study must ensure that the customer will be willing to spend money on this product or service. To determine if the product will be feasible the customer must evaluate the following; cost, the benefits of the project, the likelihood that the project will succeed and the reputation of the contractor that is used for the project.

To be able to do a feasibility study all of the phases in the process need to be documented. These documents need to contain diagrams and schematic representations of the entire process and all the steps and resources that were used. By documenting everything it is easier for the customer to review all of the decisions made. It can also make it easier to see why these decisions were made. By making it easier for the customer to review the projects progress the contractor can be ensured of customer satisfaction. Customer approval procedure must be done regularly throughout the process, this ensures that if there are any errors early on in the process, they can be evaluated and alternative solutions can be made. By doing this regularly the contractor can ensure that the client stays satisfied throughout the process. If these errors are picked up early it can save the contractor a lot of money later in the process.

3 Project Baseline Plan

3.1 Baseline Commentary

A baseline following 40% quicker estimates compared to the original simulation estimates, seems to correlate well with the simulated runs.

need more

Table 2: Resource costs per hour

Resources	Rate
Engineer 1	$58.00
Engineer 2	$42.00
Junior Marketing Specialist	$57.00
Junior Product designer	$47.00
Marketing Manager	$95.00
Operation Specialist	$53.00
Quality Engineer	$71.00
Senior product designer	$84.00
Engineer 3	$55.00

4 Project Budget

The estimated budget and estimated hours provided by Sim4 project was used as a guideline of what should be spent during each period to ensure that the project would stay within the budget of $380 000.

To calculate the budget the effectiveness of the resources were brought into consideration. An assumption was made that all resources will work at an 80% effectiveness rate. The estimated hours of each task as well as the safety margin of 80% effectiveness was used to determine the hours worked for each task using the formula provided.

$$Actual\ time\ worked\ (hours) = \frac{Estimated\ time\ (hours)}{\%effectiveness}$$

The budget forecast is provided in Appendix A.

4.1 Direct Resource Costs

Table 2 provides the estimated cost of the different resources that will be hired. More than one engineer will be hired since the engineer will be working as a Project Manager for the period.

4.2 Training and Events prospective costs

There was decided that during the first period the engineer will be sent for training on project Management. This is to ensure that the engineer will be more effective as a project Manager. There was also decided to hire resources that are cheaper but have less skills and send them for training to improve their skills and effectiveness.

Managerial actions will also be rewarded to resources to improve their work ethic and effictiveness.

Table 3 provides information regarding the different training and managerial actions that will take place during the provided timeline.

4.3 Total Costs

The total cost estimate of each period is listed Table 4.

Table 3: Training and Managerial Actions costs

Period	Action	Amount of People	Cost	Total Cost
1	Project Management	1	$1,000.00	$1,000.00
	Project Evaluation	1	$1,000.00	$1,000.00
3	Interpersonal training	2	$600.00	$1,200.00
5	company sponsored event	3	$100.00	$300.00
6	Pizza Party	6	$10.00	$60.00
	Process Engineering	1	$600.00	$600.00
8	Management Recognition event	4	$50.00	$200.00
9	Pizza Party	6	$10.00	$60.00
	Negotiation techniques	2	$600.00	$1,200.00
10	Principles of Quality	1	$600.00	$600.00
	Pizza Party	8	$10.00	$80.00
11	Milestone celebration	4	$1,000.00	$4,000.00
				$10,300.00

Table 4: Total estimated costs

Period	Cost of period	Total cumulative cost	Budget Left over
Period 1	$57,920.00	$57,920.00	$322,080.00
Period 2	$43,560.00	$101,480.00	$278,520.00
Period 3	$60,420.00	$161,900.00	$218,100.00
Period 4	$15,535.00	$177,435.00	$202,565.00
Period 5	$19,185.00	$196,620.00	$183,380.00
Period 6	$30,561.25	$227,181.25	$152,818.75
Period 7	$18,865.00	$246,046.25	$133,953.75
Period 8	$17,420.00	$263,466.25	$116,533.75
Period 9	$10,850.00	$274,316.25	$105,683.75
Period 10	$16,990.00	$291,306.25	$88,693.75
Period 11	$27,452.50	$318,758.75	$61,241.25
Period 12	$14,660.00	$333,418.75	$46,581.25

5 Risk Assessment Plan

Table 5: Project Risks

Risks	Probability	Impact	Risk Rank	Risk Response Strategy	Risk Management	Expected Frequency
Overestimation of resource effectiveness leading to delays	4	4	16	Contingency Plan	Reassess resource capability and change taks allocation strategy.	Every Period
Budget Cuts	4	4	16	Contingency Plan	Revise budget, and redirect costs where necessary. Allocate funds for unexpected costs in budget.	Once-off
Mismanagement causing demotivation and inefficiency	4	3	12	Contingency Plan	Take managerial action. Consider reallocating or terminating resource employment.	Quarterly
Required resources not available	2	5	10	Contingency Plan	Hire alternative resources, and send for appropriate training.	Once-off
Low effectiveness	2	5	10	Risk Control	Make sure critical path stays protected.	Once-off
Training delay	3	3	9	Risk Acceptance	Allow extra time for training.	Once-off
Unplanned leave for resources	2	4	8	Contingency Plan	Consider re-allocation of available resources or hiring tempory resources.	
Extended deadline	2	4	8	Risk Acceptance	Evaluate influence on costs and take appropriate action.	Once-off
Resource training inadequate	2	3	6	Risk Avoidance	Send multiple resources for the same training.	Monthly
Low moral mong resources	1	4	4	Contingency Plan	Tank managerial action (pizza party)	Monthly

5.1 Risk identification

Table 6: Product Risks

Risks	Probability	Impact	Risk Rank	Risk Response Strategy	Risk Management	Expected Frequency
Legal & regulatory changes	4	5	20	Risk Avoidance	Anticipate legal and regulatory changes, and make provisions based on forecasts. Seek professional legal advice.	Yearly
Low product demand	3	5	15	Risk Control	Develop marketing strategy for product promotion	Once-off
Low quality infrastructure	3	4	12	Risk Control	Work closely with manicipality and surrounding businesses for improvement of relevant infrastructure.	Once-off
Market changes	4	3	12	Risk Control	Monitor market trends, and keep design flexible for process and supplier changes	Yearly
Vendors start late	3	4	12	Contingency Plan	Allocate funds to accomodate for project delays	Once-off
Product causes legal liability	2	5	10	Risk Avoidance	Maintain strict product quality procedures and tests	Once-off
Response to RFP of low quality	3	3	9	Risk Control	Send RFP to international companies to assess alternatives proposals.	Once-off
Inaccurate cost estimate	3	3	9	Risk Avoidance	Add contingency to budget. Use locally available equipment instead of importing.	Once-off
Low service quality	3	3	9	Contingency Plan	Allocate reserve funds for delay. Consider changing service provider.	Once-off
Resources inexperienced	3	3	9	Contingency Plan	Pair inexperienced resources up to allow for lower efficiency	Quaterly
Unflexible design	3	3	9	Contingency Plan	Identify problematic process areas, and consult specialist for possible solutions.	Once-off
Recruiting process incurrs delays	3	3	9	Risk Avoidance	Ensure critical task resources are hired early to account for a possible delay.	Yearly
Power Failures	2	4	8	Contingency Plan	Check load shedding notifications. Hire generators when neccessary.	Monthly
Low communications within project team	2	4	8	Risk Avoidance	Set up standard communication platforms.	Once-off
Design fails technical review	2	4	8	Contingency Plan	Allocate funds to accomodate for project delays	Once-off
Monitoring and control components lack stability	2	4	8	Contingency Plan	Include testing procedure to identify and assess control system performance. Allocate funding for project delays.	Once-off
Vendor components fail to meet requirements	2	4	8	Contingency Plan	Make contact with another vendor as soon as possible. Allocate funds for unwanted costs. Seek legal advice.	Once-off
Low quality vendor components	2	4	8	Contingency Plan	Send items back to vendor if they do not adhere to requiments in contract. Allocate funds for project delays.	Once-off
Unreliable control system	2	4	8	Contingency Plan	Include testing procedure to identify and assess control system performance. Allocate funding for project delays.	Once-off
Stake holders become disengaged	2	3	6	Risk Control	Meet up with stakeholders and give progress of product development.	Yearly
Monitoring and control components are overengineered	2	3	6	Risk Avoidance	Maintain conformity to international standards.	Once-off
Contract terms and price unreasonable	2	3	6	Risk Control	Make contact with other local or international suppliers.	
Exchange rate	4	1	4	Risk Avoidance	Provide reserve fund for cost increases associated with exchange rate instability. Use local vendors.	Once-off
Infeasible design	1	4	4	Risk Control	Extend design period. Allocate more resources.	Once-off
Design not fit for purpose	1	4	4	Riks Avoidance	Set up a testing procedure to identify problematic areas.	Once-off
Monitoring and control components not fit for purpose	1	4	4	Risk Avoidance	Set up a testing procedure to identify problematic areas.	Once-off
No response to RFP	1	3	3	Contingency Plan	Extend RFP internationally to possibly import.	Once-off
Conflict between vendors	1	3	3	Risk Avoidance	Review contracts and schedules to avoid clashes between vendors caused by misanderstandings.	Once-off
Loss of intellectual property	1	3	3	Risk Avoidance	Inform resources on a need-to-know basis regarding processing specifics.	Once-off

5.2 Risk Classification

Table 7: Risk Matrix

Probability \ Impact	**VL**	**L**	**M**	**H**	**VH**
VH	M	M	H	H	VH
H	L	M	M	H	H
M	L	L	M	M	H
L	VL	L	L	M	M
VL	VL	VL	L	L	M

Appendices

A Budget Documentation and Analysis

A.1 Simulated Task Estimations

PERIOD 1

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Evaluate market	Market Assessment	$4 800,00	96	$50,00
Develop Business opportunity	Market Assessment	$10 080,00	112	$90,00
Customer preference study	Market Assessment	$8 400,00	168	$50,00
Business evaluation (NPV, etc.)	Market Assessment	$4 000,00	32	$125,00
Project Management Period 1	Project Management	$25 000,00	200	$125,00
		$52 280,00		

Total cost	$52 280,00
Budget left over	$327 720,00

PERIOD 2

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Design and development plan	Design	$2 400,00	48	$50,00
Design specs.	Design	$8 800,00	176	$50,00
Develop preliminary marketing plan	Commercialization	$3 600,00	40	$90,00
Develop marketing program	Commercialization	$10 800,00	120	$90,00
Project Management Period 2	Project Management	$14 000,00	112	$125,00
		$39 600,00		

Total cost	$91 880,00
Budget left over	$288 120,00

Figure 2: Budget Forecast from simulation (period 1 and 2)

PERIOD 3

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Identify testing requirements	Design	$4 000,00	80	$50,00
Risk analysis	Design	$10 000,00	80	$125,00
Train sales team	Commercialization	$8 800,00	176	$50,00
Advertising campaign	Commercialization	$11 200,00	224	$50,00
Project Management Period 3	Project Management	$14 000,00	112	$125,00
		$48 000,00		

Total cost	$139 880,00
Budget left over	$240 120,00

PERIOD 4

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Design labeling	Design	$2 000,00	40	$50,00
Approve design	Design	$1 600,00	32	$50,00
Initial engineering specs.	Engineering	$2 000,00	40	$50,00
Project Management Period 4	Project Management	$13 000,00	104	$125,00
		$18 600,00		

Total cost	$158 480,00
Budget left over	$221 520,00

Figure 3: Budget Forecast from simulation (period 3 and 4)

PERIOD 5

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Design verification activities	Engineering	$4 200,00	56	$75,00
Verification design review	Engineering	$1 600,00	32	$50,00
Release pre-production specifications	Engineering	$4 000,00	80	$50,00
Project Management Period 5	Project Management	$15 000,00	120	$125,00
		$24 800,00		
Total cost	$183 280,00			
Budget left over	$196 720,00			

PERIOD 6

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Identify vendors	Procurement	$2 800,00	56	$50,00
Develop and Issue RFQ	Procurement	$2 400,00	48	$50,00
Build functional model	Engineering	$10 800,00	144	$75,00
Evaluate design specifications	Engineering Quality	$4 000,00	80	$50,00
Project Management Period 6	Project Management	$9 000,00	72	$125,00
		$29 000,00		
Total cost	$212 280,00			
Budget left over	$167 720,00			

Figure 4: Budget Forecast from simulation (period 5 and 6)

PERIOD 7

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Issue sample (production equivalent)	Procurement	$3 000,00	40	$75,00
Perform supplier process capability	Supplier Quality	$5 600,00	112	$50,00
Develop testing protocol for prototype	Engineering Quality	$3 200,00	64	$50,00
Project Management Period 7	Project Management	$11 000,00	88	$125,00
		$22 800,00		

Total cost	$235 080,00
Budget left over	$144 920,00

PERIOD 8

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Approve sample parts	Supplier Quality	$4 800,00	64	$75,00
Design validation activities	Engineering	$2 000,00	40	$50,00
Test prototype	Engineering Quality	$4 000,00	80	$50,00
Process engineering plan	Manufacturing	$6 000,00	120	$50,00
Show functional model at trade show	Commercialization	$2 160,00	24	$90,00
Project Management Period 8	Project Management	$3 000,00	24	$125,00
		$21 960,00		

Total cost	$257 040,00
Budget left over	$122 960,00

Figure 5: Budget Forecast from simulation (period 7 and 8)

PERIOD 9

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Validation design review	Engineering	$4 000,00	32	$125,00
Approve model design	Engineering	$2 400,00	32	$75,00
aluate results of tests and identify weakn	Engineering Quality	$2 400,00	48	$50,00
Project Management Period 9	Project Management	$4 000,00	32	$125,00
		$12 800,00		

Total cost	$269 840,00
Budget left over	$110 160,00

PERIOD 10

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Qualify Supplier	Supplier Quality	$4 000,00	80	$50,00
Design transfer activities	Engineering	$4 200,00	56	$75,00
Product release meetings	Engineering Quality	$3 000,00	24	$125,00
Develop production plan	Manufacturing	$2 400,00	48	$50,00
Project Management Period 10	Project Management	$5 000,00	40	$125,00
		$18 600,00		

Total cost	$288 440,00
Budget left over	$91 560,00

Figure 6: Budget Forecast from simulation (period 9 and 10)

PERIOD 11

Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Assess RFQ responses and select vendo	Procurement	$4 000,00	80	$50,00
Develop production control plan	Manufacturing	$3 400,00	68	$50,00
Approve production parts	Manufacturing	$2 000,00	40	$50,00
Contracting for deliveries	Manufacturing	$3 200,00	64	$50,00
Project Management Period 11	Project Management	$13 000,00	104	$125,00
		$25 600,00		

Total cost	$314 040,00
Budget left over	$65 960,00

PERIOD 12

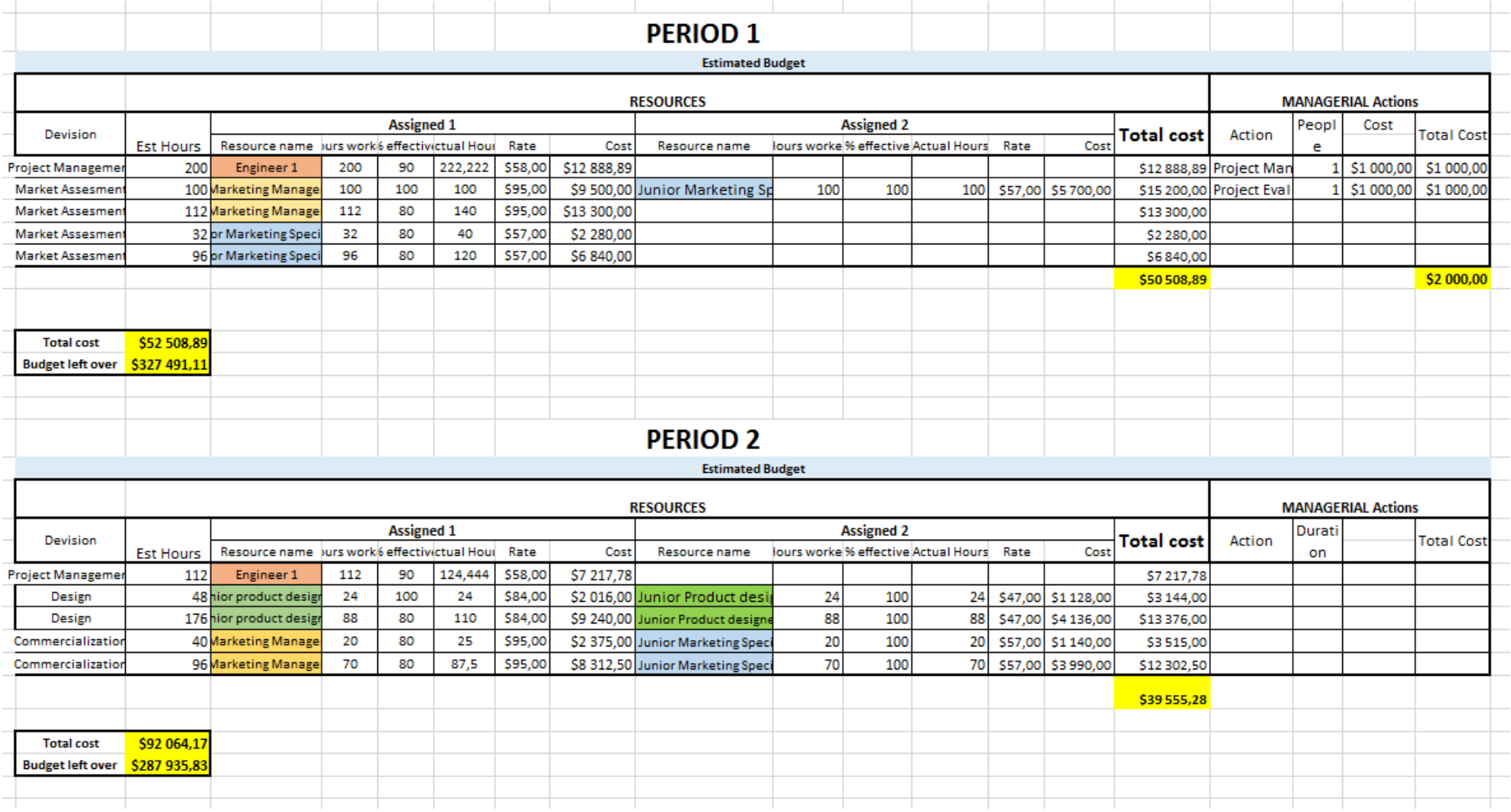
Simulation Estimate

TASK NAME	TYPE	Estimated Cost ($)	Estimated Time (hours)	Estimated Cost per Hour
Submit production purchase order	Manufacturing	$800,00	16	$50,00
Production pilot test	Manufacturing	$2 000,00	40	$50,00
Debugging production system	Manufacturing	$1 600,00	32	$50,00
Production release	Manufacturing	$1 200,00	24	$50,00
Product launch	Commercialization	$3 000,00	24	$125,00
Project Management Period 12	Project Management	$10 000,00	80	$125,00
		$18 600,00		

Total cost	$332 640,00
Budget left over	$47 360,00

Figure 7: Budget Forecast from simulation (period 11 and 12)

A.2 Direct Resource, Managerial and Training Costs



PERIOD 1

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action	People	Cost	Total Cost
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	200	Engineer 1	200	90	222,222	$58,00	$12 888,89							$12 888,89	Project Man	1	$1 000,00	$1 000,00
Market Assesment	100	Marketing Manage	100	100	100	$95,00	$9 500,00	Junior Marketing Sp	100	100	100	$57,00	$5 700,00	$15 200,00	Project Eval	1	$1 000,00	$1 000,00
Market Assesment	112	Marketing Manage	112	80	140	$95,00	$13 300,00							$13 300,00				
Market Assesment	32	or Marketing Speci	32	80	40	$57,00	$2 280,00							$2 280,00				
Market Assesment	96	or Marketing Speci	96	80	120	$57,00	$6 840,00							$6 840,00				
														$50 508,89				$2 000,00

Total cost	$52 508,89
Budget left over	$327 491,11

PERIOD 2

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action	Durati on		Total Cost
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	112	Engineer 1	112	90	124,444	$58,00	$7 217,78							$7 217,78				
Design	48	nior product design	24	100	24	$84,00	$2 016,00	Junior Product desi	24	100	24	$47,00	$1 128,00	$3 144,00				
Design	176	nior product design	88	80	110	$84,00	$9 240,00	Junior Product designe	88	100	88	$47,00	$4 136,00	$13 376,00				
Commercialization	40	Marketing Manage	20	80	25	$95,00	$2 375,00	Junior Marketing Speci	20	100	20	$57,00	$1 140,00	$3 515,00				
Commercialization	96	Marketing Manage	70	80	87,5	$95,00	$8 312,50	Junior Marketing Speci	70	100	70	$57,00	$3 990,00	$12 302,50				
														$39 555,28				

Total cost	$92 064,17
Budget left over	$287 935,83

Figure 8: Budget Forecast from estimation (period 1 and 2)

PERIOD 3

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action	peopl	cost	Total Cost
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	112	Engineer 1	112	90	124,444	$58,00	$7 217,78							$7 217,78	Interperson	2	$600,00	$1 200,00
Design	80	nior product design	40	100	40	$84,00	$3 360,00	Junior Product desi	40	70	57,142857	$47,00	$2 685,71	$6 045,71				
Design	80	nior product design	40	80	50	$84,00	$4 200,00	Junior Product designe	40	80	50	$47,00	$2 350,00	$6 550,00				
Commercialization	176	Marketing Manage	88	90	97,7778	$95,00	$9 288,89	Junior Marketing Speci	88	80	110	$57,00	$6 270,00	$15 558,89				
Commercialization	224	Marketing Manage	112	80	140	$95,00	$13 300,00	Junior Marketing Speci	112	80	140	$57,00	$7 980,00	$21 280,00				
														$56 652,38				**$1 200,00**

Total cost	**$149 916,55**
Budget left over	**$230 083,45**

PERIOD 4

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action			Total Cost
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	104	Engineer 1	104	85	122,353	$58,00	$7 096,47							$7 096,47				
Design	40	nior product design	20	80	25	$84,00	$2 100,00	Junior Product desi	20	70	28,571429	$47,00	$1 342,86	$3 442,86				
Design	32	nior product design	16	85	18,8235	$84,00	$1 581,18	Junior Product designe	16	80	20	$47,00	$940,00	$2 521,18				
Engineering	40	Engineer 2	40	90	44,4444	$42,00	$1 866,67							$1 866,67				
							$0,00							$0,00				
														$14 927,17				

Total cost	**$164 843,72**
Budget left over	**$215 156,28**

Figure 9: Budget Forecast from estimation (period 3 and 4)

PERIOD 5

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision		Assigned 1						Assigned 2						Total cost				
	Est Hours	Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost		Action			Total Cost
Project Managemer	120	Engineer 1	120	90	133,333	$58,00	$7 733,33					FALSE		$7 733,33	compony sp	3	$100,00	$300,00
Engineering	56	Engineer 2	28	85	32,9412	$42,00	$1 383,53	Engineer 3	28	70	40	$55,00	$2 200,00	$3 583,53				
Engineering	32	Engineer 2	16	85	18,8235	$42,00	$790,59	Engineer 3	16	80	20	$55,00	$1 100,00	$1 890,59				
Engineering	80	Engineer 2	40	90	44,4444	$42,00	$1 866,67	Engineer 3	40	80	50	$55,00	$2 750,00	$4 616,67				
							$0,00							$0,00				
														$17 824,12				**$300,00**

Total cost	**$182 967,84**
Budget left over	**$197 032,16**

PERIOD 6

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision		Assigned 1						Assigned 2						Total cost				
	Est Hours	Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost		Action			Total Cost
Project Managemer	72	Engineer 1	72	90	80	$58,00	$4 640,00							$4 640,00	Pizza Party	6	$10,00	$60,00
Procurement	56	Marketing Manage	28	85	32,9412	$95,00	$3 129,41	Junior Product desi	28	80	35	$47,00	$1 645,00	$4 774,41	Process Eng	1	$600,00	$600,00
Procurement	48	Marketing Manage	48	85	56,4706	$95,00	$5 364,71							$5 364,71				
Engineering	114	Engineer 2	57	90	63,3333	$42,00	$2 660,00	Engineer 3	57	80	71,25	$55,00	$3 918,75	$6 578,75				
Engineering Qualit	80	Quality Engineer	80	85	94,1176	$71,00	$6 682,35							$6 682,35				
														$28 040,22				**$660,00**

Total cost	**$211 668,06**
Budget left over	**$168 331,94**

Figure 10: Budget Forecast from estimation (period 5 and 6)

PERIOD 7

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action			Total Cost
		Resource name	urs work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	88	Engineer 1	88	90	97,7778	$58,00	$5 671,11							$5 671,11				
Procurement	40	Marketing Specialis	20	85	23,5294	FALSE	$0,00	Junior Product desi	20	80	25	$47,00	$1 175,00	$1 175,00				
Engineering Quality	64	Quality Engineer	32	85	37,6471	$71,00	$2 672,94	Engineer 2	32	85	37,647059	$42,00	$1 581,18	$4 254,12				
Supplier quality	112	Engineer 2	56	90	62,2222	$42,00	$2 613,33	Engineer 3	56	80	70	$55,00	$3 850,00	$6 463,33				
							$0,00							$0,00				
														$17 563,56				

Total cost	$229 231,62
Budget left over	$150 768,38

PERIOD 8

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action			Total Cost
		Resource name	urs work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					
Project Managemer	24	Engineer 1	24	90	26,6667	$58,00	$1 546,67					FALSE		$1 546,67	Manageme	4	$50,00	$200,00
Supplier Quality	64	Engineer 2	32	85	37,6471	$42,00	$1 581,18	Engineer 3	32	80	40	$55,00	$2 200,00	$3 781,18				
Engineering	40	Engineer 2	20	85	23,5294	$42,00	$988,24	Engineer 3	20	85	23,529412	$55,00	$1 294,12	$2 282,35				
Engineering Quality	80	Quality Engineer	40	90	44,4444	$71,00	$3 155,56	Engineer 2	40	80	50	$42,00	$2 100,00	$5 255,56				
Manufacturing	120	nior Product design	60	91	65,9341	$47,00	$3 098,90	Senior product designe	60	81	74,074074		$0,00	$3 098,90				
Commercialization	24	or Marketing Speci	24	92	26,087	$57,00	$1 486,96							$1 486,96				
														$15 964,65				$200,00

Total cost	$245 396,27
Budget left over	$134 603,73

Figure 11: Budget Forecast from estimation (period 7 and 8)

PERIOD 9

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action			
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					Total Cost
Project Managemer	32	Engineer 1	32	80	40	$58,00	$2 320,00							$2 320,00	Pizza Party	6	$10,00	$60,00
Engineering	32	Engineer 2	16	85	18,8235	$42,00	$790,59	Engineer 3	16	80	20	$55,00	$1 100,00	$1 890,59	Negotiatior	2	$600,00	$1 200,00
Engineering	32	Engineer 2	16	85	18,8235	$42,00	$790,59	Engineer 3	16	70	22,857143	$55,00	$1 257,14	$2 047,73				
Engineering Quality	48	Quality Engineer	24	70	34,2857	$71,00	$2 434,29	Engineer 2	24	80	30	$42,00	$1 260,00	$3 694,29				
														$9 952,61				$1 260,00

Total cost	**$256 608,88**
Budget left over	**$123 391,12**

PERIOD 10

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision	Est Hours	Assigned 1						Assigned 2						Total cost	Action			
		Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost					Total Cost
Project Managemer	40	Engineer 1	40	80	50	$58,00	$2 900,00							$2 900,00	Principles c	1	$600,00	$600,00
Supplier Engineer	80	peration Specialis	40	85	47,0588	$53,00	$2 494,12	Junior Marketing Sp	40	85	47,058824	$57,00	$2 682,35	$5 176,47	Pizza Party	8	$10,00	$80,00
Engineering	56	Engineer 2	28	85	32,9412	$42,00	$1 383,53	Engineer 3	28	70	40	$55,00	$2 200,00	$3 583,53				
Engineering Quality	24	Quality Engineer	12	70	17,1429	$71,00	$1 217,14	Engineer 2	12	80	15	$42,00	$630,00	$1 847,14				
Manufacturing	48	nior Product desigr	48	70	68,5714	$47,00	$3 222,86							$3 222,86				
														$16 730,00				$680,00

Total cost	**$274 018,88**
Budget left over	**$105 981,12**

Figure 12: Budget Forecast from estimation (period 9 and 10)

PERIOD 11

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision		Assigned 1						Assigned 2						Total cost				
	Est Hours	Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost		Action			Total Cost
Project Managemer	104	Engineer 1	104	75	138,667	$58,00	$8 042,67							$8 042,67	Milestone	4	$1 000,00	$4 000,00
Procurement	80	or Marketing Speci	80	80	100	$57,00	$5 700,00							$5 700,00				
Manufacturing	68	Engineer 2	34	85	40	$42,00	$1 680,00	Operation Specialist	34	80	42,5	$53,00	$2 252,50	$3 932,50				
Manufacturing	40	Engineer 2	20	70	28,5714	$42,00	$1 200,00	Operation Specialist	20	80	25	$53,00	$1 325,00	$2 525,00				
Manufacturing	64	Engineer 2	32	70	45,7143	$42,00	$1 920,00	Operation Specialist	32	75	42,666667	$53,00	$2 261,33	$4 181,33				
														$24 381,50				$4 000,00

Total cost	$302 400,38
Budget left over	$77 599,62

PERIOD 12

Estimated Budget

		RESOURCES													MANAGERIAL Actions			
Devision		Assigned 1						Assigned 2						Total cost				
	Est Hours	Resource name	ours work	% effectiv	ctual Hou	Rate	Cost	Resource name	lours worke	% effective	Actual Hours	Rate	Cost		Action			Total Cost
Project Managemer	80	Engineer 1	80	75	106,667	$58,00	$6 186,67							$6 186,67				
Commercializatior	24	peration Specialis	24	80	30	$53,00	$1 590,00							$1 590,00				
Manufacturing	16	peration Specialis	16	85	18,8235	$53,00	$997,65							$997,65				
Manufacturing	40	or Marketing Speci	40	70	57,1429	$57,00	$3 257,14							$3 257,14				
Manufacturing	32	nior product desigr	32	70	45,7143	$84,00	$3 840,00							$3 840,00				
Manufacturing	24	Engineer 2	24	70	34,2857	$42,00	$1 440,00											
														$15 871,46				

Total cost	$318 271,83
Budget left over	$61 728,17

Figure 13: Budget Forecast from estimation (period 11 and 12)

B Risk Register

C Meeting Minutes