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FOUNDATION



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STEM Project Management Guide

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AUTHORISED AGENT

Re-Engineering Australia Foundation Ltd.

PO Box 136
Castle Hill NSW 1765
P: 61 2 9620 9944
F: 61 2 8079 0622
E: contact@rea.org.au
W: www.rea.org.au

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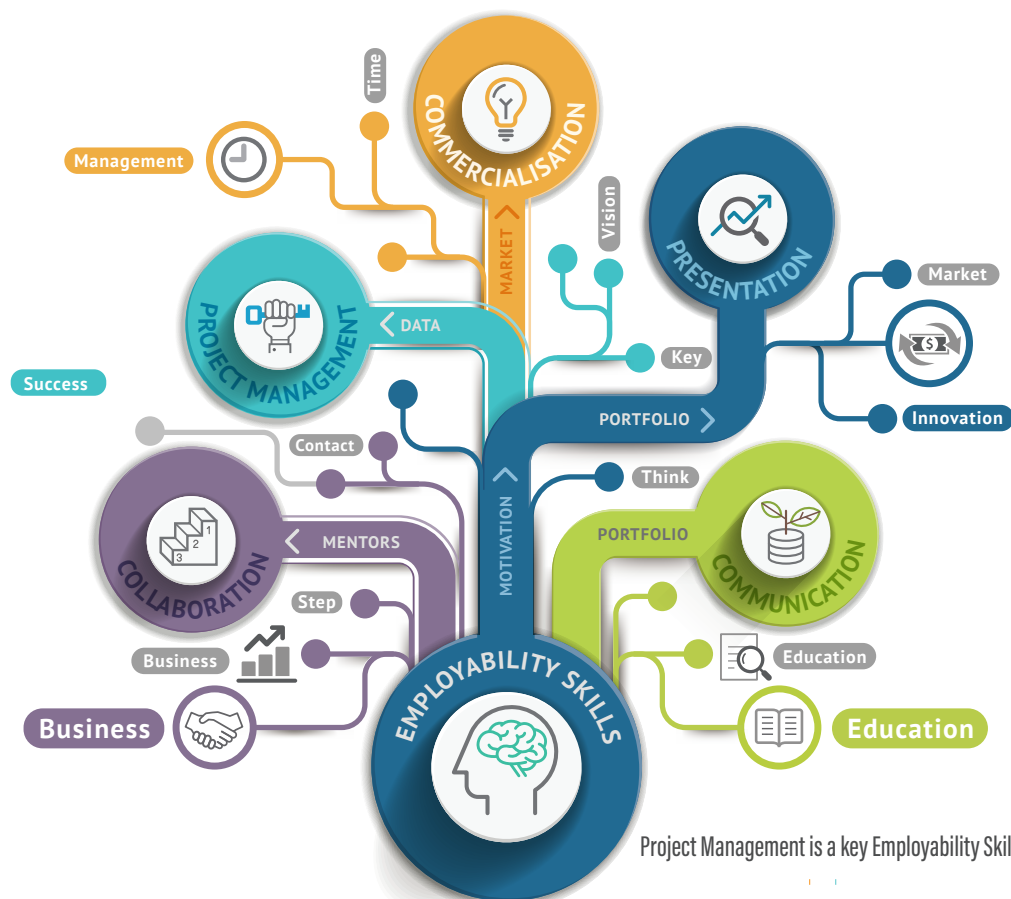
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CONTENTS

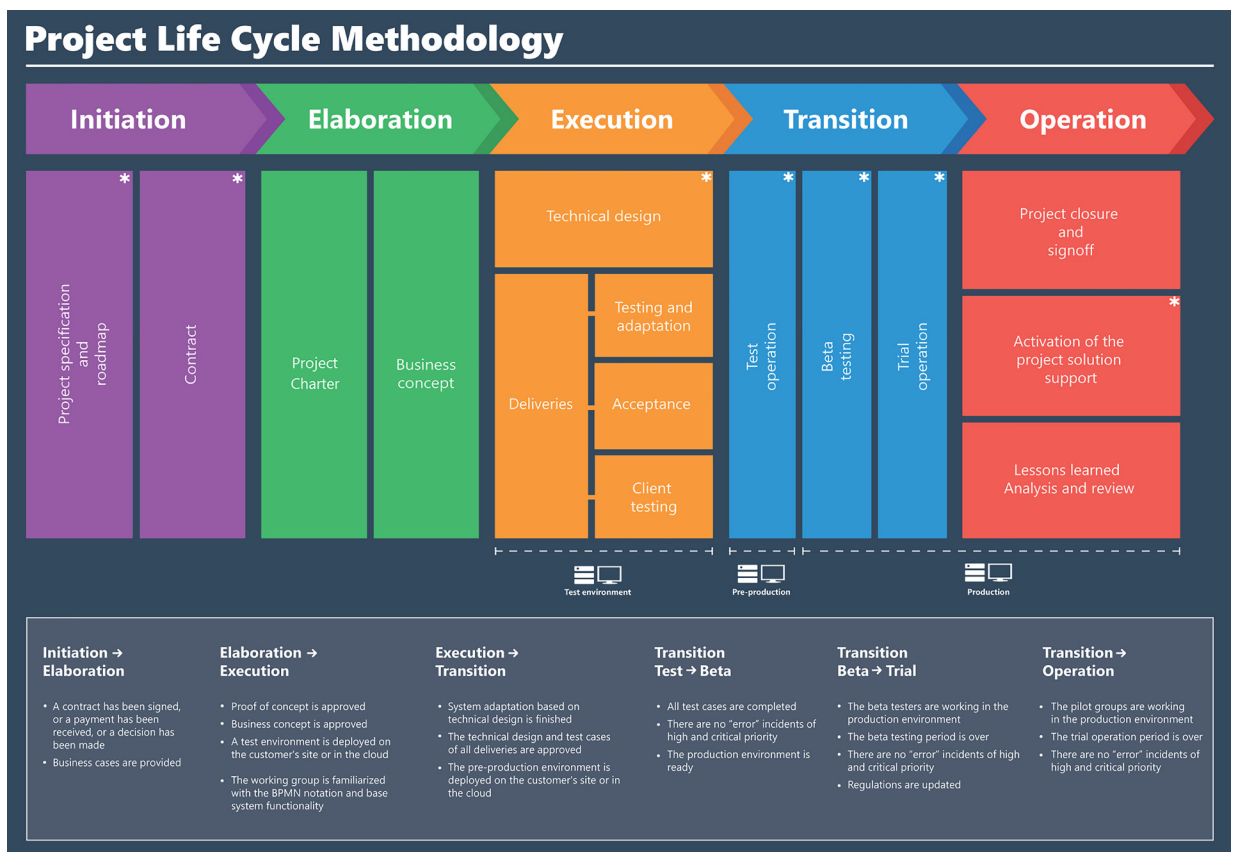
PRINCIPLES AND CONCEPTS	4
PROJECT MANAGEMENT PLAN	6
PROJECT MANAGEMENT PLAN TEMPLATE	7
Project Title	7
Background	7
Objectives	7
Scope	7
Products and services	7
Deliverables	7
Time	8
Example Project Schedule	8
Procurement and Cost	9
Assumptions and Constraints	10
Guidelines and Standards	10
Project Team Roles and Responsibilities	11
Stakeholder Engagement	11
Internal Project Team Communication	12
Risk Management	12
Quality	13
Continuous Improvement	13
GLOSSARY	14

PRINCIPLES AND CONCEPTS

1. Projects can vary in size, nature and difficulty. It can be as simple as building a garden shed to building and launching a space craft. Regardless of your project's size, it will have a start and finish date, it will usually require resources (people, material and equipment), and result in the delivery of an outcome.
2. Before starting a project you should have clear objectives. That is, a concrete statement that describes the things your project is trying to achieve. Write it down so the objective can be evaluated at the end to see whether it was achieved. It does not have to be long and one technique for writing an objective is to make sure that it is SMART - Specific, Measurable, Achievable, Relevant, and Time-bound.
3. Objectives are important for three major reasons:
 - They are described in business terms: Once they are accepted, they represent an agreement between the Project Manager and the Project Sponsor (in this case your school or college and Re-Engineering Foundation Australia). The specific deliverables of the F1 in School STEM Challenge, 4x4 in Schools or SUBS in Schools Technology Challenges for instance, may or may not make sense to some people. However, the objectives should be written in a way that is understandable by team members, industry partners and the people who will judge your project.
 - They help frame the project: If you know the project objectives, you can determine the deliverables needed to achieve the objectives. This then helps you nail down the overall project scope, helps you identify risks and allows you to provide estimates on your effort, time and cost. Once the project starts, you will be able to see if all of the work that you identified or are doing will in the end help you achieve your outcome.
 - They help you achieve success: At the end of the project, you should be able to talk to people to determine whether everything expected in the project objectives had been achieved. If all of the objectives were not fully met, you may still be able to claim partial success.
4. The project objectives ideally should be agreed before the project starts. The outputs of the project are based on the objectives - not the other way around. That is, you don't agree on the outputs first and then establish objectives to match. A key is to understand your objectives and then determine outputs that are needed. Then structure the entire project to meet the objectives.
5. Project Management is a structured way of managing a project. It is simply applying your knowledge, skills, tools and techniques to activities to meet a project objective. Project Management is achieved by applying a combination of processes for initiating, planning, execution, monitoring, controlling, and closing a project.
6. Managing a project includes:
 - Identifying what you want to achieve
 - Establishing clear and achievable objectives
 - Balancing the competing demands for quality, scope, time and cost



- Adapting the specifications, plans, and approach to the different expectations of the various people involved in your project
 - A Project Management Plan is the ideal tool to assist with planning and managing your project from start to finish.
7. On completion of the project celebrate your achievement and delivery of the project.



PROJECT MANAGEMENT PLAN

Your Project Management Plan should explain how you will manage your project. Depending on how big or complicated your project is, your Project Management Plan might be a simple summary or quite long and detailed. It might be a "stand alone" document, or it might be part of a set with other separate more detailed plans for certain aspects of your project such as a marketing or quality management.

TIP

A common mistake is to make the plan too detailed. To avoid this, make sure your plan is a 'what' document not a 'how' document. Describe 'what' will be done, by 'whom' and 'when', but don't go into the detail of 'how' the work will be done.

Your Project Management Plan shows:

- How your project will be monitored and controlled
- Key stages and activities
- When key decisions will be made
- Team roles and responsibilities
- Other people involved in the project, such as industry partners
- Marketing actions.

The plan should also summarise:

- Your design and manufacturing process (including research and analysis)
- How you will test your components during development
- Track testing before competition judging
- Innovative ideas you plan to explore during development
- How you will collaborate with industry partners.

This plan will help you:

- Satisfy the rules and requirements of the competition
- Achieve your objectives
- Obtain the people, material and equipment you need
- Meet your deadlines
- Share the workload and make everyone's responsibilities clear
- Predict and avoid problems
- Tell interested people how you are going or what help you need.

Ideally you should write your plan before the project starts to make sure you have everything you need and your sponsors and supporters agree on how you propose to manage your project.

TIP

Some sections might not be relevant to you. Don't be concerned if some sections of the first version don't contain much detail. As the project progresses you can add more detail or change the plan.

PROJECT MANAGEMENT PLAN TEMPLATE

Use this template to work out all the details of how you will do the project. You can work as a group to brainstorm some sections, and work on some sections individually.

Project Title

Background

Briefly explain the background to your project, including a basic description of the competition, how and why you and your school got involved.

Objectives

Explain why you are doing the project and what you hope to achieve. Your objectives should be one sentence statements starting with the word 'To'. For example: "To build the fastest racing car and win the competition".

Scope

Your scope is a list of the things you will create for the project and scope items are usually expressed as nouns. Sometimes they are called outputs or deliverables.

Read all the competition documents carefully and make a list of all the things you need to produce, for example:

- A design portfolio
- Examples of marketing material
- A presentation to the judges.

Discuss and agree what will be included in your scope, so everyone has a shared understanding of what you need to deliver. You need to understand the scope to be able to work out what resources you need and to check if you can deliver everything identified within the time frame.

TIP

If there is an item you are unsure of, make a note to check and confirm if it is in scope or out of scope.

TIP

It might be helpful to split your scope into two sub-headings, for example:

Products and services:

Deliverables:

The main things you will produce.

Any supporting documents and extras, such as marketing material and presentations.

Time

The project schedule (or time frame) is a simple, high-level summary of tasks and deadlines. It can be created as a table using MS Word, a MS PowerPoint slide, a chart in MS Excel, or as a Gantt chart in MS Project.

As a group:

- List all your tasks and deadlines
- Work out the best order
- Work out where you can save time by overlapping tasks.

Your deadlines are your project milestones. You do not need a start date for a milestones event, only a finish date.

Example Project Schedule

No.	Task/ Milestone	Start Date	Finish Date
Stage One: Establishment			
1	Assemble Project Team		
2	Register application with REA		
3	Raise project funds		
4	Identify industry partners and mentors		
Stage Two: Design			
5	Design F1 Race Car		
6	Start design & development		
Stage Three: Assembly			
7	Component Manufacture Complete	Milestone 1	
8	Assemble prototype race car		
Stage Four: Testing			
9	Conduct Testing (Stage 1)		
10	Conduct Testing (Stage 2)		

Once you have completed your list of tasks, group them into stages. This will make it easier to plan and manage your activities. For each task you may want to do more detailed planning. You can break down each task into steps, and make notes about everything you need to do.

For example, Stage Four could be broken down further:

1. Write test plan
2. Do the tests
3. Fix issues
4. Re-test

5. Write test report
6. Update design documents, if required
7. Review and approve test report.

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Stage One: Establishment											
1	Assemble Project Team										
2	Register application with REA										
3	Raise project funds										
4	Identify industry partner										
Stage Two: Design											
5	Design F1 Race Car										
6	Industry partner starts design & development										
Stage Three: Assembly											
7	Industry partner delivers product										
8	Assemble prototype race car										
Stage Four: Testing											
9	Conduct Testing (Stage 1)										
10	Conduct Testing (Stage 2)										

Procurement and Cost

Discuss and write down what you need money for (your budget) and how you will manage your budget. Think about:

- What do you need money for, and how much you need?
- Who you are getting money from, how much, and any rules about what you can use it for?
- Who will keep records of spending and update your budget?
- Who will check that spending requests fit within your budget, and approve spending the money?

Discuss and write down any events or anything you don't know for sure yet that might affect your budget, such as:

- Unexpected costs that arise during the project
- Possible costs linked to risks you have identified (refer to the risk section below)
- Potential differences between estimates and final costs
- Unexpected changes in the development phase.

An allowance for these in your budget, becomes your contingency. Decide how much contingency you need based on how likely or serious the events are. Once you have listed all your costs, add 5% to 15% of the total costs to be held in reserve. State within your budget the percentage used.

Example Budget			
Item	Estimate	Actual Expenditure	Balance remaining
Equipment/ components			
Hire of facilities			
Travel expenses			
Materials			
Sub Total			
Contingency – 10%			
Total			

Procurement for a project is about planning how you will buy the materials and services you need that are identified in your budget. It can also include hiring equipment and other resources. As a group, discuss and write down:

- Where will you get all the materials and parts you need?
- What arrangements will you make with industry partners or suppliers to ensure parts are manufactured, tested and delivered on time?

Assumptions and Constraints

A constraint is a limit that you must work within.

An assumption is something that you are relying on being provided by others, or something that you expect to be controlled by other people outside of your project team.

Check the competition rules, write down and discuss any assumptions and/or constraints. For example, a constraint might be a rule about the length of the car. An assumption might be that your school will arrange transport.

Guidelines and Standards

List all guidelines, rules or methods you will need to follow. For example, the competition rules and specifications.

Project Team Roles and Responsibilities

List the key people involved in the project team, and their responsibilities.

Role	Name	Responsibilities
Team Manager		
Resources Manager		
Manufacturing Engineer		
Design Engineer		
Test Manager		
Graphic Designer		
Other		

TIP

Make sure you have included any roles that are mentioned in the rules. Add any other roles you think will be needed.

TIP

Make sure each section of the Project Management Plan will be covered by at least one of your team roles, for example who is responsible for monitoring and controlling the budget; who is responsible for monitoring the schedule.

Stakeholder Engagement

List the key people (stakeholders) who will impact the success of your project. Discuss and decide how you will engage with them to meet their needs. Consider where poor communication could lead to failure.

Stakeholders			
Role	Name	Organisation	Engagement activities
Teacher			
Industry contact			
Supporter/sponsor			
Other			

TIP

Do you need to provide progress reports or a final report? Include details in the Engagement activities column of when reports must be provided, and what format is needed (e.g. written or verbal).

Internal Project Team Communication

Discuss and agree the methods you will use to ensure good communication within your team. How often will the team meet? Where will the team meet and do the work?

TIP

Be specific- think about who, what, when, where, how and why.



Risk Management

As a group, discuss and write down what might go wrong. Work out what you could do to stop the risks from happening, or minimise their impact (risk mitigation).

Describe how you will monitor the project risks. For example, by reviewing the register and discussing risks at team meetings.

Risk Register					
Risk	Consequence	Likelihood	Seriousness	Mitigations	Responsibility
What might go wrong?	What impact will this have on the project?	How likely is it that this will happen?	How serious would the impact be if this happened?	What will you do to reduce the likelihood and/or impact?	Who will ensure the mitigations are actioned?
Example:					
A part breaks during track testing	Delay while a new part is built, and we miss the judging deadline	Low	Medium	Stress test the part in the workshop before track testing to reduce the likelihood	Test Manager

Focus your efforts on those risks that will have the greatest impact on your success, should they happen.

Quality

Discuss and write down how you will make sure your outputs (what you design or make) are fit-for-purpose and meet expectations. This section could be a table and include:

Quality Acceptance Criteria	Testing and Assessment	Review, Acceptance and Sign Off	Timing	Responsibilities
Example: No component breakages.	Example: Check for visible signs of cracking.	Team Manager	Example: At end of first and second round of Testing	Test Manager

Discuss and write down how you will control changes to your design and maintain accurate and complete design information. You might want to create a checklist to capture design development that includes:

- The initial physical and functional design criteria including a list of physical items and their configuration requirements
- A column to note changes
- A column to check off that the design (and changes) meets the criteria.

Continuous Improvement

Discuss and write down how you will capture the lessons learnt during your project. This could include having team meetings at critical stages to discuss what went well, what didn't go well, and how you might do it better for the next stage of your next project.

TIP

Discuss what advice you might give to a future entrant.

GLOSSARY

Assumption	Something that you are relying on being provided by others, or something that you expect to be controlled by other people outside of your project team.
Budget	The approved estimate for the project.
Constraint	A limit that you must work within and could limit the project teams' options.
Contingency	A reserve identified within the project budget to cater for possible costs linked to identified risks and differences between estimated and actual costs.
Deliverables	Tangible work outputs such as a detailed design, working prototype, any report developed as part of the project.
Fit-for-purpose	The features by which the quality of an output is determined.
Gantt chart	Horizontal bar charts that can graphically show the time relationship of tasks, activities and resources in a project.
Likelihood (Risk)	The possibility of the risk happening during the project on a scale of Low, Medium or High.
Milestone	A significant scheduled event that acts as a progress marker in the life of a project.
Mitigations (Risk)	Activities that could help reduce the likelihood of a risk occurring and/or could reduce the impact if it does happen.
Objective	A statement of the overarching reason for why the project is being undertaken.
Outcome	The benefits that will be realised from the use of the project outputs.
Output	The products or services delivered by the project. See also deliverable.
Procurement	The approach to source the materials and services needed and identified in your budget – this could be buying materials or hiring equipment and other resources.
Product	Something that is produced which is quantifiable and can be an end item or a component item. See also deliverable.
Project	A project is a group of inter-related activities that are planned and executed in a certain order to create a unique product/service (output) within a specific time frame – it has a start and end date.
Project Management	Project Management is a formalised and structured method of managing change. It involves the application of your knowledge, skills, tools and techniques to project activities to realise a project outcome.
Project Schedule	Representation of the project time frame showing tasks and deadlines.
Quality	The degree to which a set of characteristics fulfills requirements.
Risk Management	The processes involved with identifying, analysing and responding to project risk.
Risk Register	A document that records the results of the risk analysis process and is used to monitor implementation of the identified risk mitigation activities and any changes to the status of the risks.
Scope	A clear statement of the areas of impact and boundaries of the project.
Seriousness (Risk)	The level of impact to the project if the risk happens on a scale of Low, Medium or High.
Stage	A major segment of a project.
Stakeholder	An individual or organisation whose interests are positively or negatively impacted by the project or who can positively or negatively impact the project.

NOTES:

