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# Engineering opportunities



Student sheet

Problem-based learning resources

Engineers keep this fountain in Paris running day and night.

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The **Royal Academy of Engineering** is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public.

Together we're working to tackle the greatest challenges of our age.

## Introduction

Engineers are people who solve problems. They build bridges to carry essential supplies across rivers, design phones that keep us in contact across the world and plan dams that produce huge amounts of cheap, clean energy.

They can also repair engines, upgrade computer systems and build rockets that can take us to the Moon! As well as solving problems engineers can also create works of art and dream of ways to improve lives for everyone. Engineers are people who see opportunities to make the world better.

## Engineers are everywhere

You may be a qualified gas fitter, designing a new giant stadium, building a garden shed or just trying to work out how to connect your phone to the local wifi. People solve problems and think of new products by applying engineering principles. Look around at your workplace, college or local area and see if you can find an opportunity to apply your engineering skills to make things better.

This project gives you an opportunity to use your engineering knowledge and skills to solve a problem or develop a new product that is important to you. You will need to look at your local context, perhaps your workshop, college or neighbourhood, and see what problems or opportunities are available.

The following pages will help you to construct an engineering project based around your workspace - what do you see that needs changing or repairing? What opportunities are available to exploit to make it better? This is an open brief where you can do anything!

Of course, you will need to plan your own work and carry it out in a way that shows you have mastered key engineering knowledge and skills. Your teacher may need you to do particular things to match any assessment requirements for your course.

**Plan carefully – and good luck!**



Engine bust? Who ya gonna call? Engineers!



How does your workshop compare with this one in a school in London?



Humans have been engineers for thousands of years!

All images © Gareth Price

# Constructing your project strategy

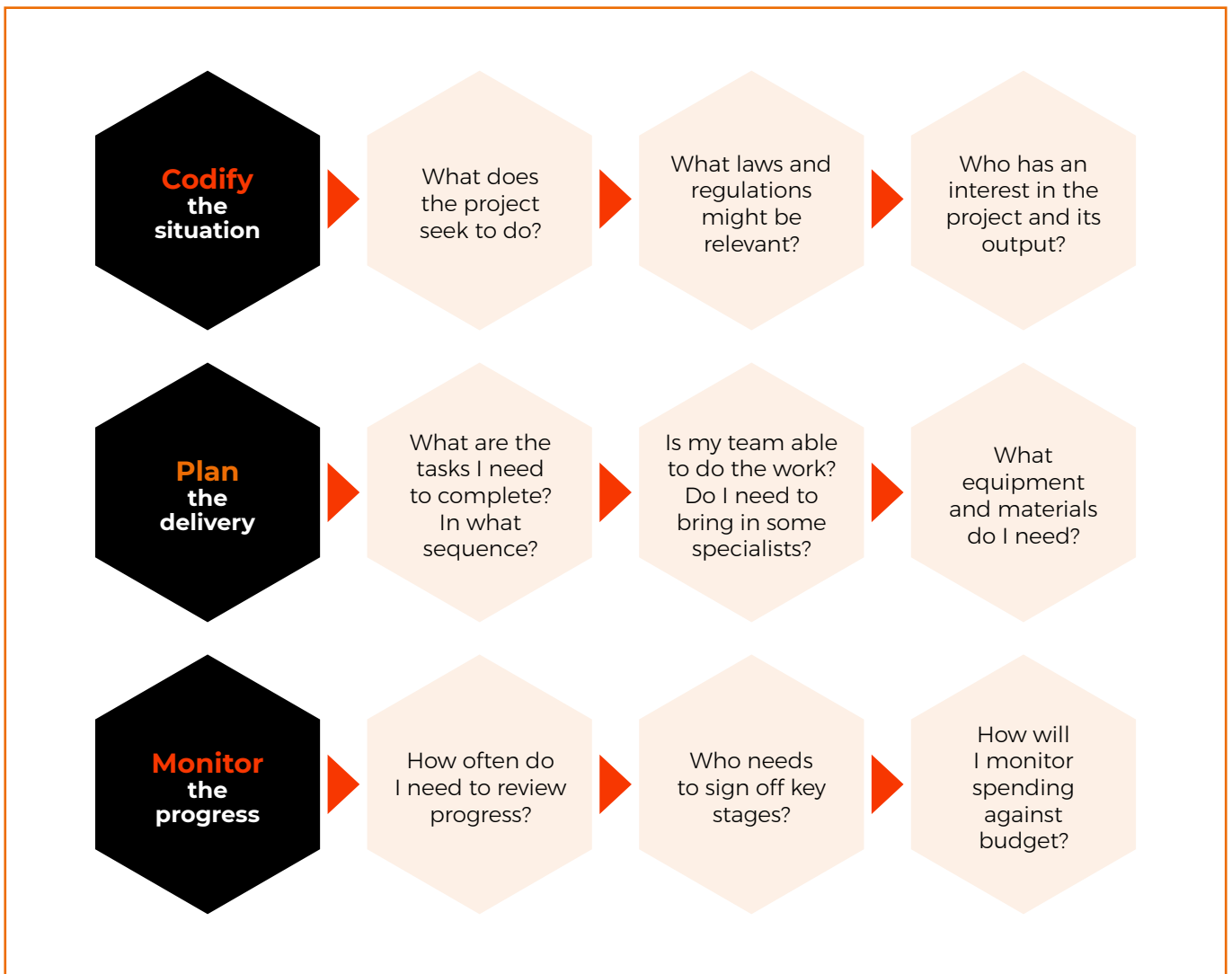
The first part of the project is to construct a project strategy.

A project strategy is the big picture overview of what the project is for, any key limitations or possibilities and any wider context problems. It is not as detailed as a project delivery plan but should ensure that you are busy doing the right things – not just busy!

The strategy consists of three big areas:

- codifying the situation
- planning the delivery
- developing a system to monitor progress.

The diagram below shows some of the things you need to consider at each stage.



Finally, you can set yourself some tasks and targets. The tasks are the larger parts of the project, so you might need to draw up your initial plan and calculate all the relevant measures like the length of track needed.

The targets are smaller jobs that together make up these tasks or things you need to complete because of the assessment system at your college (e.g. produce a report, demonstrate your ability to weld metals).

Use the tables on the next pages to set these tasks and targets and record your progress.

## Setting tasks

Use this table to list your key tasks – a typical project will have five or fewer big tasks.

| Task – what are the big jobs you need to do? | Start date | Finish date | Evidence – how do you know you have done it? |
|----------------------------------------------|------------|-------------|----------------------------------------------|
|                                              |            |             |                                              |
|                                              |            |             |                                              |
|                                              |            |             |                                              |
|                                              |            |             |                                              |
|                                              |            |             |                                              |



## Using the Project Record on page 8

Enter your **name and college** details here with the start date for the project.

Make the **title** short (under 10 words) and descriptive – so that other people can recognise what its about.

The project can have more than one **aim** – what are you planning to do? And why?

Use this space to record your **thoughts and ideas** before you get to planning the project. Record your research ideas and any findings here.

| Project record                                                                                                               |           |            |
|------------------------------------------------------------------------------------------------------------------------------|-----------|------------|
| <b>Personal details</b>                                                                                                      |           |            |
| Name                                                                                                                         | Workspace | Start date |
| <b>Title</b>                                                                                                                 |           |            |
|                                                                                                                              |           |            |
| <b>Aim</b>                                                                                                                   |           |            |
|                                                                                                                              |           |            |
| <b>Codify</b>                                                                                                                |           |            |
| Use the space below to record your research and understanding of the key issues apparent in the situation you are exploring. |           |            |
|                                                                                                                              |           |            |

Use this space to **plan** – a flow chart or sequence of tasks you need to complete will go in here. Time spent in planning is never wasted! You might not get the plan right first time – so be prepared to change it before you start – and even during the project!

You must stay safe! Think about the **risks** in what you plan to do and work out how you can reduce the risk or prepare so that if something does go wrong you are ready. Make sure you list any safety equipment you need before you start work.

| <b>Plan</b>                                                                                                                                   |                                                          |                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
| Draw a simple diagram to show the sequence of tasks in your plan. Pencil is a good idea – you can add things and rub bits out if you need to! |                                                          |                                                       |
|                                                                                                                                               |                                                          |                                                       |
| <b>Health and safety</b>                                                                                                                      |                                                          |                                                       |
| List the key risks in the table below and show how you will prepare for them.                                                                 |                                                          |                                                       |
| Risk                                                                                                                                          | How will you reduce the chance of an accident happening? | How will you reduce the impact if an accident occurs? |
|                                                                                                                                               |                                                          |                                                       |

Now you get to the details of **what you need**. Think about the materials you will use (don't forget connectors if you're working with computers!) and any tools you will use. Most of your tools will already be in your toolkit so you don't need to mention these but do check if you need any specialist equipment like meters or specialist spanners.

The **perform** section records your work. Every time you complete a task add it to the table. Now is a good time to reflect on anything you learnt from doing the work. The table continues on to the next page.

At the end of the project, **review** how well you did and note down your thoughts in this space. Get a colleague to comment on your work as well – feedback is always useful. You can offer to comment on their work as well. Finally, your supervisor may need to add a comment.

This document can be added to the front of your project.

This is a public document so only include things you are happy for other people to read. More personal comments can be added to your personal logbook.

Also, you won't be able to fill in everything at the start – this document will grow as you work through the project.

#### Resources required

Use the table below to make your list of essentials. Be thorough – if you forget something the whole job might fail!

#### Perform

Use the space below to record your activities during the project – and note down important learning.

#### Review

Use the space below to record your thoughts about your work when the project is finished. Ask a colleague and a supervisor to add their thoughts as well if you wish.

##### Personal

##### Colleague

Name Date

##### Supervisor

Name Date

# Project record

## Personal details

Name

Workspace

Start date

## Title

## Aim

## Codify

Use the space below to record your research and understanding of the key issues apparent in the situation you are exploring.

## Plan

Draw a simple diagram to show the sequence of tasks in your plan. Pencil is a good idea – you can add things and rub bits out if you need to!

## Health and safety

List the key risks in the table below and show how you will prepare for them.

| Risk | How will you reduce the chance of an accident happening? | How will you reduce the impact if an accident occurs? |
|------|----------------------------------------------------------|-------------------------------------------------------|
|      |                                                          |                                                       |

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Name

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