Faraday

Project Management

Information Pack

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# Introduction

This document introduces project management within the Faraday organisation.

The report looks at a generic project management lifecycle, then compares this to two methodologies showing the similarities. The resources (People, Information, Facilities and Equipment, and Finance) available to a project manager are explored along with details of issues that can affect project management.

The report concludes with a review of four very different failed projects and looks a common theme.

# Project Management Methodologies

## Overview

In order to manage a project a methodology is followed, this may be a formally defined standard or a practice followed by a specific organisation. Typically a process will go through a number of stages indicated on the diagram below.

Project Lifecycle

The following sections describe each stage.

### Define / Specify

This stage of the project is about determining what the actual requirements are. The stage may include some form of analysis of the current systems, what is required of the new or changed systems and any performance needs. Activities in this stage could include:

* Interviews
* Analysis of requirements (perhaps using a structured approach)
* Writing a specification
* Producing a business case

The deliverables from this stage are usually:

* Specification of the system
* Business case including estimated costs and benefits/justification

### Plan and Design

This stage of the project turns the specification into a potential solution with a plan as to how this can be achieved. The first part of this is the Feasibility Study, where an evaluation of the proposal is carried out to determine the overall difficulty of the project.

### Collect Information

This phase involves collecting feedback on the proposed solution from stakeholders. The solution can be tested using techniques such as a structured walk through of the solution, the objective is to determine that the proposed solution is fit for purpose and will solve the requirement.

### Implement

The implementation stage could be the largest phase by some margin. This is where the project is actually undertaken. This phase will include:

* Building the product or service
* Testing that the product meets the requirements
* Documentation and User Training
* Handover of the product to the customer

### Complete and Review

This stage allows for the customer/users to feedback on the actual benefits and costs of the solution, which will be compared to those identified in the business case. This stage includes a project review, where the stakeholders can review how well the project/delivery was managed.

## PRINCE2

PRINCE2 is a project management methodology originally developed by the UK government, building on earlier works. As of 2009 the acronym was determined to stand for Projects IN a Controlled Environment. PRINCE2 emphasis is on dividing the project into manageable and controllable stages.

The processes in PRINCE2 are:

### Starting up a project (SU)

In this process the project team is appointed and a project brief is produced.

Key activities include:

* Creating a project board
* Appointing a sponsor (executive) and a project manager
* Designing and appointing the project team
* Writing the project brief
* Defining an approach
* Preparing a business case
* Looking back a Lessons Learned from previous projects
* Planning the Initiation phase

This stage is comparable to the “Define/Specify” stage in the project lifecycle.

### Initiating a project (IP)

This process builds on the work of the start-up process, and the project brief is used to prepare other management documents that will be needed during the project.

Key activities include:

* Planning quality
* Planning a project
* Refining the business case and risks
* Setting up project controls
* Setting up project files
* Writing Project Initiation Documentation

This stage is comparable to the “Plan and Design” stage in the project lifecycle.

### Directing a project (DP)

This process dictates when the Project Board should control the overall project.

Key activities include:

* Authorising initiation
* Authorising a project
* Authorising a stage or exception plan;
* Giving ad hoc direction
* Confirming project closure.

This stage is does not have a directly comparable stage in the project lifecycle.

### Controlling a stage (CS)

PRINCE2 suggests that projects should be broken down into stages and this process dictates how each individual stage should be controlled.

Key activities include:

* Authorising work packages
* Assessing progress
* Capturing and examining project issues
* Monitoring and controlling risks
* Reviewing stage status
* Reporting highlights
* Taking corrective action
* Escalating project issues

This stage corresponds to the “Plan and Design” and “Collect Information” stages in the project lifecycle.

### Managing product delivery (MP)

The Managing product delivery process has the purpose of controlling the link between the Project Manager and the Team Manager(s) by placing formal requirements on accepting, executing and delivering project work.

The objectives of this process are:

The key activities are:

* Accept a work package
* Execute a work package
* Deliver a work package

This stage is comparable to the Implement stage in the project lifecycle.

### Managing stage boundaries (SB)

Managing Stage Boundaries (SB) dictates what should be done towards the end of a stage.

Key activities include:

* Planning a stage
* Updating a project plan
* Updating a project business case
* Updating the risk register
* Reporting stage end
* Producing an exception plan

This stage corresponds in part to the “Plan and Design” and “Implement” stages in the project lifecycle.

### Closing a project (CP)

This covers the things that should be done at the end of a project. The project should be formally de-commissioned follow-on actions should be identified and the project itself be formally evaluated.

Key activities include:

* Decommissioning a project
* Identifying follow-on actions
* Preparing a benefits review plan and project evaluation review.

This stage corresponds the “Complete and Review” stage in the project lifecycle.

## Critical Chain Project Management

Critical chain project management (CCPM) is based on methods and algorithms derived from Theory of Constraints (<https://en.wikipedia.org/wiki/Theory_of_constraints>).  CCPM is a method of planning and managing projects that emphasizes the resources (people, equipment, physical space) required to execute project tasks.

The CCPM model has the following stages.

### Planning

A project plan or work breakdown structure (WBS) is created by working backward from a completion date with each task starting as late as possible. A duration is assigned to each task. Resources are then assigned to each task. Buffers are used to create contingency, as tasks are less likely to take less than the estimated duration.

This stage covers the “Define/Specify”, “Plan/Design” and “Collect Information” stages of the lifecycle.

### Execution

When the plan is complete and the project is ready to start, resources are encouraged to focus on the task at hand to complete it and hand it off to the next person or group. The literature draws an analogy with a relay race. Each element on the project is encouraged to move as quickly as they can: when they are running their "leg" of the project, they should be focused on completing the assigned task as quickly as possible, with minimisation of distractions and multitasking.

This stage somewhat resembles the “Implement” stage in the lifecycle.

### Monitoring

According to some sources the monitoring stage is the greatest advantage in this project management style. Rather than monitoring at the task level, the buffer usage is monitored –little utilisation of the buffers indicates a healthy “on-track” project, whereas heavier usage suggests that there is a problem to be solved.

There is no corresponding stage in the lifecycle here, this monitoring is usually handled in the execution or implementation phase feeding back on the rate of progress.

# Available Resources

When planning a project there are a range of resources which need to be considered. These include:

* Information
* People
* Facilities and Equipment
* Finance

Each project will potentially have a different mix of these elements. The sections below provide details on each.

## Information

Virtually no business could exist without information. Information that a project requires may be held in other systems or be the output from another process – in this case the project may need to include building a way to capture that information – perhaps as a feed.

Information will also be held about the project itself. When planning it may be necessary to elicit further information from stakeholders to find potential risks or to provide justification for the business case.

Detailed requirements gathering and structured analysis techniques exist that can be used for this, in some projects it may be necessary to do detailed analysis as a single project to determine that there is sufficient information (or business benefit) to go ahead with the build project.

## People

With any project there are a number of different skills that will contribute to the overall success. One person may be able to supply these skills in a small project, in a larger project each skill may be delivered by one or more specialists. The specialists would typically include:

* Project Managers
* Systems Analysts
* Product Developers (or Product Owner/Designer)
* Programmers

## Facilities and Equipment

Projects usually require some form of equipment and facilities such as furniture, machinery, computer hardware and software (or software tools such as Visual Studio). If these items are not already in place then they need to be arranged to arrive in suitable time for any setup to occur before they are needed.

Sometimes items are required that are built to a specification (this applies in software projects as much as in industrial projects), in this case the sub-components need to be specified and the corresponding project plan for the creation of them must align with the overall plan. Different planning tools have ways of showing links between sub-projects and project items – all agree that certain tasks are dependent on others and the timing of the start of one item cannot be before the completion of the preceding item. In software projects it is possible to develop against mock-ups of sub-components to allow progress to continue – something that is not usually possible in more physical projects (you cannot put the roof on a building if the top floor is not completed for example).

## Finance

In a business project the costs of the project (the People, Facilities and Equipment) needs to be assessed and budgeted for, and usually part of the justification for the project will include a return-on-investment calculation. The time taken to plan, manage and gather information will have a cost/budget attached to it as well as the actual building of the software or other item.

# Issues Affecting Project Management

## Overview

This section describes the issues, which may affect project management. We look into five specific categories of issues:

* Ethical Issues
* Sustainable Issues
* Consequences of Failure
* Risks
* Risk Mitigation

The sections below detail these.

## Ethical Issues

Apart from ensuring project delivery, the project managers and their team members should also fulfil their ethical and corporate social responsibilities being a good citizen. Following is an overview of some of the most common ethical issues related to project management.

**Violation of Workers Rights** – Even though a project manager may be under pressure to deliver, it is not ethical for them to transfer this pressure to the team and attempt to enforce working late or additional working days. Whilst this may solve a short-term problem, it may infringe on the workers’ rights under legislation (such as the Working Time Directive). Working the team harder/longer has been proven counterproductive in the medium to long term.

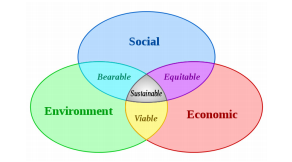
**Backstabbing/Blame Culture** – When you work in a team environment then failure of one person is considered as the failure of whole team. A project manager may attempt to blame certain team members for a specific item and report that this has caused a failure of delivery.

**Corruption** – Large projects may have considerable budgets, in this case there is a risk that a project manager will enter into arrangements, which benefit them personally (by way of a bribe) or assign work to a linked entity (company or individual such as a family member even if they are not qualified for the job).

**Nature of the project** – the project itself may not be ethical. There may be elements of the project that involve work that is considered by the project manager or others to be unethical.

## Sustainable Issues

As well as delivering the project and related business benefits, many organisations now require that projects are planned with sustainability in-mind. There is a model (the Triple-P or Triple Bottom Line) model, which allows organisations to map not only the direct profitability of projects but the effect on the economic, social and environmental aspects too and as the model shows these all actually interact.



The Triple-P concept of sustainability

**Economic Sustainability** – will include the Return on Investment (the direct financial benefits) and the flexibility of the business.

**Environmental Sustainability** – will include the energy used in the project (including the CO2 emissions); the transport impact of the project (will large volumes of items be shipped, will people travel a great distance, can work be done digitally from a remote location); waste recycling or responsible disposal; the materials and resources and if these are reusable.

**Social Sustainability** – will include factors such as good employee relations; health and safety; Human rights; Customer Protection (including privacy); and general ethical behaviour such as having an anti-corruption initiative.

It is perhaps easy to see how these aspects fit with a large scale engineering project such as road building, but the same aspects may appear in an IT project. For example, with the growing number of users Facebook has commissioned a new data centre in Fort Worth, Texas. This data centre as well as running very efficient equipment (designed by Facebook engineers to minimise the financial and environmental cost of the servers and networking hardware required) the entire data centre will be run using electricity generated from clean energy.

## Consequence of Failure

A project may fail for any number of reasons. The consequence of the failure will be related not to the reason but to the purpose of the project. There are many potential consequences that I have listed three below.

**Economic Uncertainty** – a project may have been initiated to build a new version of a product or to significantly enhance an existing product. This would have been justified in part as being a way in which the organisation could either reduce operating costs or maintain/extend its revenue and associated profits. In this case, failure would lead to a period of financial uncertainty. If the organisation had invested significantly in the project, then failure could leave the business in financial difficulty.

**Breach of Contract** – a project may be being undertaken under the terms of a contract (typically done where the work is being paid for by another organisation) either under an outsourcing framework or as a supplier. If the project fails, then the contract may have financial penalties attached.

**Risk to Health** – failure in some projects, such as development of civil engineering projects or anti-viral medication could leave the public at risk. A failed bridge that collapses or a drug that is not ready on time or insufficiently tested could put the public’s health at risk.

**Reputation** – a failed project that is made public can result in the organisation responsible suffering from a loss of reputation. An example could be the G4S Company failing to hire sufficient security personnel for the 2012 Olympic Games in London. Following the failure of that project, what cost was there in terms of lost opportunities for G4S as potential customers looked elsewhere?

## Risks

All projects face risks that need to be assessed and considered. There are many types of risk – business, IT and implementation risks.

A business risk is that the nature of the business or requirement may change during the life of a project, this may be due to market conditions or a change is legislation.

Typical IT risks include:

* Reliability of Hardware/Software
* Availability of staff with the right business/technical skills
* Integration of different technologies

A project implementation risk would include the timing of the roll-out of a new system. For example, introducing a revised e-commerce system just ahead of a very busy period would be considered a risk as even small issues with the new system could lead to a major revenue/profit related risk.

## Risk Mitigation

Although risks cannot be eliminated, they can be managed. This management of risk is referred to as risk mitigation. As risks are identified during the project they can be added to a log (risk register) and evaluated for the possible impact. Critically the actions that will be taken to both prevent and recover from the risk, can be documented and a suitable plan put in place.

# Failed Projects

## The Millennium Bridge

The Millennium Bridge is a bridge that started construction in 1996 and was completed in 2000. The bridge is notorious for the original design moving whenever someone tried to walk across it. On opening day, an estimated upwards of 100,000 people gathered to cross with a maximum of 2000 on the bridge at a given time. As soon as pedestrians began to walk across the bridge there was immediate and excessive lateral movement. The movement became so large that people found it hard to maintain their balance. To remedy the situation an occupancy limit was enforced in an attempt to reduce the swaying. Ultimately, fearing public safety concerns, the bridge was closed for investigation on June 12, 2000, only two days after opening.

Eventually it was closed and reopened two years later after the bridge was improved (using passive dampening) and the swaying stopped the result being that people no longer complained of feeling sick from the swaying motion.

While the design engineers followed every protocol for the structural and dynamic design of the bridge, they did not foresee the formation and effects of the phenomenon that is now referred to as “crowd step synchrony”.

* What was the brief? – To build a pedestrian crossing over the Thames
* How was the project organised? – The project was designed by architects (Foster and Partners) and built by Arup.
* Were there any failures in the planning? – The designers failed to consider the lateral movement caused by the walking pedestrians, whilst there was no risk of collapse the project failed. Similar bridges had seen the same problem at peak loads.
* How could they have been fixed? – Better analysis of the non-catastrophic risks
* If it was fixed, how was it done? – By fitting dampers to suppress the effect of the movement.

## Challenger Space Shuttle

The Space Shuttle Challenger was a space shuttle that had its maiden voyage in 1983. In 1986, three years after the craft was first launched it exploded and disintegrated after being broken up by aerodynamic forces.

The cause was determined to be that an O-ring in the right solid rocket booster failed and caused a breach that created a plume of flame that cut through the external fuel tank and caused a huge ball of flame that engulfed the entire fuel tank. All seven members of the crew, five NASA astronauts and two payload specialists, were killed. It is debated whether the crew died during the fire or when then hit the ocean.

The phenomenon of abnormal O-Ring erosion had been observed in previous flights. Instead of requesting an investigation, NASA Management ignored the problem and chose instead to increase the tolerance.

The failure to test their products safety and structural strength led to the incident, coupled with the management approach of increasing the tolerance rather than accepting the delay that a redesign would require.

These could possibly have been avoided if the craft was checked over before launch and further testing of the craft's components and more careful developments of the project as a whole.

* What was the brief? – To have a re-usable spacecraft
* How was the project organised? – NASA used a range of subcontractors to build the design, working to specific plans and tolerances.
* Were there any failures in the planning? – The project management failure was the allowing of a change of tolerance to occur, rather than escalating the risk.
* How could they have been fixed? – By having more focus on the risks of every change to the specification and detailed impact analysis.
* If it was fixed, how was it done? – The design of the connector featuring the O-ring was changed.

## Chernobyl Nuclear Incident

The Chernobyl Nuclear Incident was a catastrophic nuclear disaster that occurred in 1986. The reactor at the Chernobyl Nuclear Power Station was undergoing a stress-test when the team left after their shifts without telling the next team.

The stress-test had required the disabling of the automatic cooling management system and allowing the temperature to climb. It was unknown to the next shift team that the cooling system had been disabled and the heat levels rose to a point where the reactor core exploded. However since the cooling filters were also disabled and the shutdown procedure followed by the new team in reaction to the rising heat levels caused the explosion that leaked radiation to the surrounding area.

* What was the brief? – To test the backup power systems for a steam turbine.
* How was the project organised? – The experiment and plan was agreed between the management and the day-shift.
* Were there any failures in the planning? – There was no appropriate plan to halt the experiment early.
* How could they have been fixed? – Better “roll-back” plan and wider communication about the experiment.
* If it was fixed, how was it done? – It was not fixed, the reactor explosion caused widespread radioactive contamination. Lessons learned should impact future project planning.

## Titanic

The Titanic was a large cruise liner that in 1912 sunk when it collided with an iceberg and sunk. The project was at the time the largest of its kind. It was known that there were not enough lifeboats for everyone on-board.

Because of the Titanic's claim that it was unsinkable there was no thought through evacuation plan apart from getting people to the few lifeboats. The idea of "women and children first" led to much time wasted in sifting through the crowds. This meant that many more died because they could not reach the lifeboats in time.

The collision with the iceberg was most likely down to the spotters not having any binoculars and the bridge officers would not share theirs. This act of bitterness led to the spotters being totally ineffective until it was too late and the ship collided with the iceberg.

* What was the brief? – Build an ocean liner.
* How was the project organised? – The build of the ship was completed to plan.
* Were there any failures in the planning? – There was insufficient planning for catastrophic failure (not enough life boats for all).
* How could they have been fixed? – More lifeboats. Planning should have been for sufficient for all passengers and crew.
* If it was fixed, how was it done? – Retrospectively ensuring all vessels had sufficient lifeboats, nothing could fix the Titanic problem.

## Common Themes in Failed Projects

Considering four very different projects, there are two key themes:

Failure to analyse and mitigate risks - (the non-catastrophic risks to the bridge, the failed belief of an unsinkable ship, the risk of changing a tolerance in the O-ring specification, the failure to have a back-out plan in the experiment at Chernobyl).

Communication – in the Space Shuttle and the Chernobyl incidents, there were communication failures. Wider communication (outside of the project team) of the nature and assessment of risks in both cases could have led to a different outcome.

# Conclusion

This document introduced project management within the Faraday organisation.

The report looked at a generic project management lifecycle, then compares this to two methodologies showing the similarities. The resources (People, Information, Facilities and Equipment, and Finance) available to a project manager were explored along with details of issues that can affect project management.

The report concluded with a review of four very different failed projects and looks the common themes in the assessment of why and how these projects failed.

Using this guide, you should now understand more about project management.

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