Project Management Fundamentals

What is Project Management?

There are various definitions as to what constitutes a *project*. Essentially, a project is a one-off endeavour, with a start, a middle and an end.

Examples of projects include:

- Building a bridge
- Putting a man on the moon
- Developing a new type of aircraft
- Developing a software system

Projects thus differ from *operations* in one key respect - operations are repetitive in nature. Examples of operations include the mass production of a car, or in a software environment, the system management of a network.

Project Management is the application of areas such as knowledge, skills, tools and techniques that meet the needs or expectations of a project. Meeting these expectations involves balancing demands, such as time, cost and customer requirements - Project Management is thus an organised approach to managing these demands in a planned, systematic manner.

Many people think of Project Management as simply a *Gantt Chart*, in other words, a schedule with a list of tasks. However, good Project Management is much more than this, involving activities, such as Quality Assurance, Human Resources and Risk Management, as well as balancing costs, effort and time. Many problems, such as late delivery of a project, or an overrun in cost or time, result from the fact that many project managers have not taken account of these factors at the outset.

Some disciplines and factors that a Project Manager will have to deal with include:

Management of a Project's Scope

By *Scope* we mean an overall statement of what the project is intended to achieve. The scope statement provides a boundary around the project. It will also include a statement as to the problem the project is trying to solve, and/or some of the business benefits that the project will bring. The statement will also include some of the high level *deliverables*, in other words, items produced from the project, such as the code, manuals, specifications etc.

Scope Management therefore covers all activities required to produce the Scope Statement. In most organisations, the Scope Statement will usually be stated in a couple of pages. Alternative names for Scope may include *Business Statement* or *Problem Statement*. The Scope statement may also need to be revised; it will thus be subject to *change control*, in other words, previous versions of the scope may need to be stored, and the changes to the Scope recorded.

Management of Time

Time Management is the traditional view of a project. Time Management covers the activities or tasks required to complete a project. It usually includes a *Work Breakdown Structure* - a list of activities showing the major tasks with the sub-tasks indented in the list. Time management will also include *sequencing* - the order in which the tasks occur, and, any *dependencies* between the tasks, in other words, a particular task that has to be completed before another can begin.

Time management also includes estimates for the time taken to complete each task. It will also include *Time Control* - the manner by which the time to complete a particular task will be *tracked* during the project - in other words, how the estimates for time to complete compare to the actual task duration during the project.

If the estimates vs actuals differ significantly, then actions may need to be taken to rectify the difference. Re-estimating the duration of the tasks may also be needed.

A key aspect of Project Management is keeping a pro-active view on these figures, and continually reviewing them, to allow the manager to take the required action at the earliest opportunity.

The most common method for displaying tasks, their sequence and any dependency is through a Gantt Chart. Many software tools exist to allow a Project Manager to produce a Gantt Chart, for example Microsoft Project.

Management of Costs

Cost Management describes what is required to bring a project within budget. It includes *Resource Planning* - the number (*loading*) of people required throughout the project to complete the various tasks. It will also include other resources, such as tools or equipment that will be needed during the project.

Resource planning will also include when people are available because, say, they may be on holiday or involved in other projects. It may also include *Contingency*, to cover the unexpected - for example, sick leave, or a key individual leaving the organisation.

Cost Management will include estimates for all costs incurred in the project. As with time, estimating will also include *Cost Control* - the actual costs vs the estimates at any point in the project. Similarly to time estimates, if cost estimates differ from the actual values, they may need to be re-estimated during the project.

Management of Quality

Quality Management covers activities related to the project's quality. It will include:

Quality Planning - deciding the standards that are relevant to the project. For example, coding standards, procedures and templates for Requirements Specification and Design.

Quality Assurance covers the activities required to ensure by reviews throughout the project that company standards are being adhered to.

Quality Control - ensuring that the results, deliverables etc comply with the quality standards, and identifying ways of eliminating project results that are unsatisfactory.

Management of Human Resources

Human Resource Management describes the tasks required to make efficient use of the people involved in the project.

HR Management includes the recruitment of staff for the project, if required, and any specific training of staff involved in a project. *Organisational planning*, covering the roles and responsibilities within the project will need to be catered for, as well as any HR practices or standards in use in the organisation.

Management of Project Performance

Performance Management covers the reporting of the project performance to all parties affected by the project, and could include:

- Those working on the project
- Customers
- Senior Management
- Other Projects
- Subcontractors

It will include planning of activities related to reporting, for example, at the end of a project phase or major deliverable, and any information to be distributed from the project. It will cover how this information is to be generated, collected and stored, for use within the project, and for future use.

Management of Risks

Risk Management covers the identification, analysis and reporting of risks likely to affect the project.

The major risks need to be identified at the outset of the project. Factors that could affect the project include:

- Technological e.g. use of new tools or technology in a project
- People e.g. loss of a key individual who moves to a new job
- Schedule e.g. critical dates, dependence on other projects
- Operational e.g. system performance, user acceptance
- Cost e.g. budget available, personnel available

When risks are identified, there also needs to be a *Risk Response*, which will usually attempt to categorise the risks in terms of impact on the project, and probability of the risk occurring. The Risk response will also include a "fall-back" plan to minimise the impact of the risk happening to the project. For example, the introduction of new technologies could involve providing the people involved in the project receiving training, or bringing in outside expertise, in the form of a mentor or consultant, or perhaps even moving to a more familiar technology.

Risks also need to be reviewed and controlled during the project, and will need to be updated to take account of new risks not previously identified, or risks already identified that are no longer a problem.

Management of Subcontractors

The project manager may have to deal with subcontractors as part of their project plan. *Subcontractor Management* deals with the activities to acquire products or services outside of the organisation.

Subcontractor Planning covers all activities related to the subcontractor, and includes the selection of subcontractor, the contract with the subcontractor and the review of the performance of the subcontractor during the project.

Subcontractor Selection covers the activities to decide on the subcontractor to the work required for the project. The criteria an organisation will typically use to decide on a particular subcontractor include:

- Location - do they need to be near to the organisation awarding the contract?
- Previous Experience - has the contractor previous experience of dealing with a subcontractor?
- Technical Expertise - do they have experience of, say, a particular technology
- Quality Assurance - does the subcontractor have sufficient quality assurance required by the Contractor e.g. ISO 9001

Subcontractors will also agree a *Contract* with the contractor, and the project manager will need to take account of activities in agreeing a contract. The contract would typically include the following:

- List of items to be delivered
- Cost of subcontract
- Due dates for items to be delivered
- Penalties for late delivery
- Resolution of conflicts between contractor and subcontractor

Integration Management

Integration Management covers the activities to ensure that the project is properly co-ordinated. Typically integration may cover issues such as:

- Whether the project contains a number of subsystems that have to interface with one another
- Whether the project uses sub-systems that are being developed as part of another project
- Whether the project is being developed by a consortium of different companies or different business units of the same company
- Whether elements of the project are geographically spread over several development units in the same country or in different countries

The integration aspects of the project will be subject to *Integration Change Control*, in the same manner as cost or time. The integration activities will be continuously reviewed through the project, and actions taken and recorded to minimise their impact.

Conclusion

If it isn't already apparent, good Project Management skills require a high intellect, ability to organise, good communication skills, ability to manage resources and take difficult decisions. A good Project Manager can be the difference between a company's major success and major failure!

Further Information:

The CSE runs a two-day course in Project Management Fundamentals.

Details at: http://www.cse.dcu.ie/cse/events/project.html

Books

The following are useful books on project management:

How to Run Successful Projects II - The Silver Bullet
Fergus O' Connell
Prentice-Hall, 1996 ISBN: 0-13-239856-7

Risk Management for Software Projects
Alex Down, Michael Coleman, Peter Absolon
McGraw-Hill, 1994 ISBN: 0-07-707816-0

Practical Risk Assessment for Project Management
Stephen Grey
Wiley, 1995 ISBN: 0 471 93979 X

Technical Briefing Notes are issued on a range of software engineering topics as an aid to software developers, project leaders and managers. The intention is to provide a 'status report' on the state of the art (and/or the state of practice) in relation to particular aspects of software engineering. In addition they aim to highlight, where appropriate, a likely roadmap on a time horizon for future developments of the technology.

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