

Managing Software Projects: An overview

COMP6204: Software Project Management and Secure Development

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October 21

Overview

- Why do software projects fail?
- How can we make sure that our projects succeed?
- Successful Software Project
- Project Management Lifecycle
- Project proposal selection
- Project analysis
 - SWOT, PESTAL. The Balanced Scorecard Method
 - Non-financial and Strategic Considerations

Why do software projects fail?

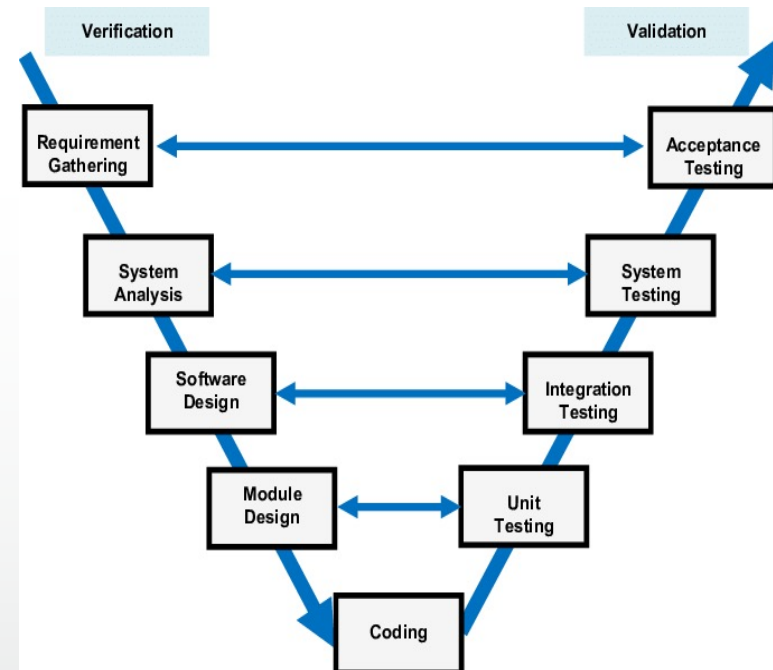
- People begin programming before they understand the problem
 - Everyone likes to feel that they're making progress
 - When the team starts to code as soon as the project begins, they see immediate gains
 - When problems become more complex (as they always do!), the work gets bogged down
 - In the best case, a team that begins programming too soon will end up writing good software that solves the wrong problem

Why do software projects fail?

- The team has an **unrealistic** idea about how much work is involved.
 - From far away, most **complex** problems seem simple to solve
 - Teams can commit to impossible deadlines by being overly optimistic and not thinking through the work
 - Few people realise the deadline is optimistic until it's blown

Why do software projects fail?

- Defects are injected early but discovered late.
 - Projects can address the wrong needs
 - Requirements can specify incorrect behavior
 - Design, architecture and code can be technically flawed
 - Test plans can miss functionality
 - The later these problems are found, the more likely they are to cause the project to fail



Why do software projects fail?

- Programmers have poor habits – and they don't feel accountable for their work.
 - Programmers don't have good control of their source code
 - Code written by one person is often difficult for another person to understand
 - Programmers don't test their code, which makes diagnosing and fixing bugs more expensive
 - The team does not have a good sense of the overall health of the project.

Why do software projects fail?

- Managers try to test quality into the software.
 - Everyone assumes that the testers will catch all of the defects that were injected throughout the project.
 - When testers look for defects, managers tell them they are wasting time.
 - When testers find defects, programmers are antagonized because they feel that they are being personally criticized.
 - When testers miss defects, everyone blames them for not being perfect.

How can we make sure that our projects succeed?

- Make sure all decisions are based on openly shared information
 - It's important to create a culture of transparency, where everyone who needs information knows where to find it and is comfortable looking at it.
 - All project documents, schedules, estimates, plans and other work products should be shared with the entire team, managers, stakeholders, users and anyone else in the organization who wants them.
 - Major decisions that are made about the project should be well-supported and explained.

How can we make sure that our projects succeed?

- Don't second-guess your team members' expertise
 - Managers need to trust team members.
 - Just because a manager has responsibility for a project's success, it doesn't mean that he's more qualified to make decisions than the team members.
 - If you don't have a good reason to veto an idea, don't.

How can we make sure that our projects succeed?

- Introduce software quality from the very beginning of the project
 - Review everything, test everything.
 - Use reviews to find defects – but don't expect the review to be perfect.
 - Use reviews to gain a real commitment from the team.
 - It's always faster in the long run to hold a review than it is to skip it.

How can we make sure that our projects succeed?

- Don't impose an artificial hierarchy on the project team
 - All software engineers were created equal.
 - A manager should not assume that programming is more difficult or technical than design, testing or requirements engineering.
 - Managers should definitely not assume that the programmer is always right, or the tester is always raising false alarms.

How can we make sure that our projects succeed?

- Remember that the **fastest** way through the project is to use **good engineering practices**
 - Managers and teams often want to cut important tasks – especially estimation, reviews, requirements gathering and testing.
 - If it was faster to build the software without these practices, we would never use them.
 - Every one of these practices is about saving time and increasing quality by planning well and finding defects early. Cutting them out will cost time and reduce quality.

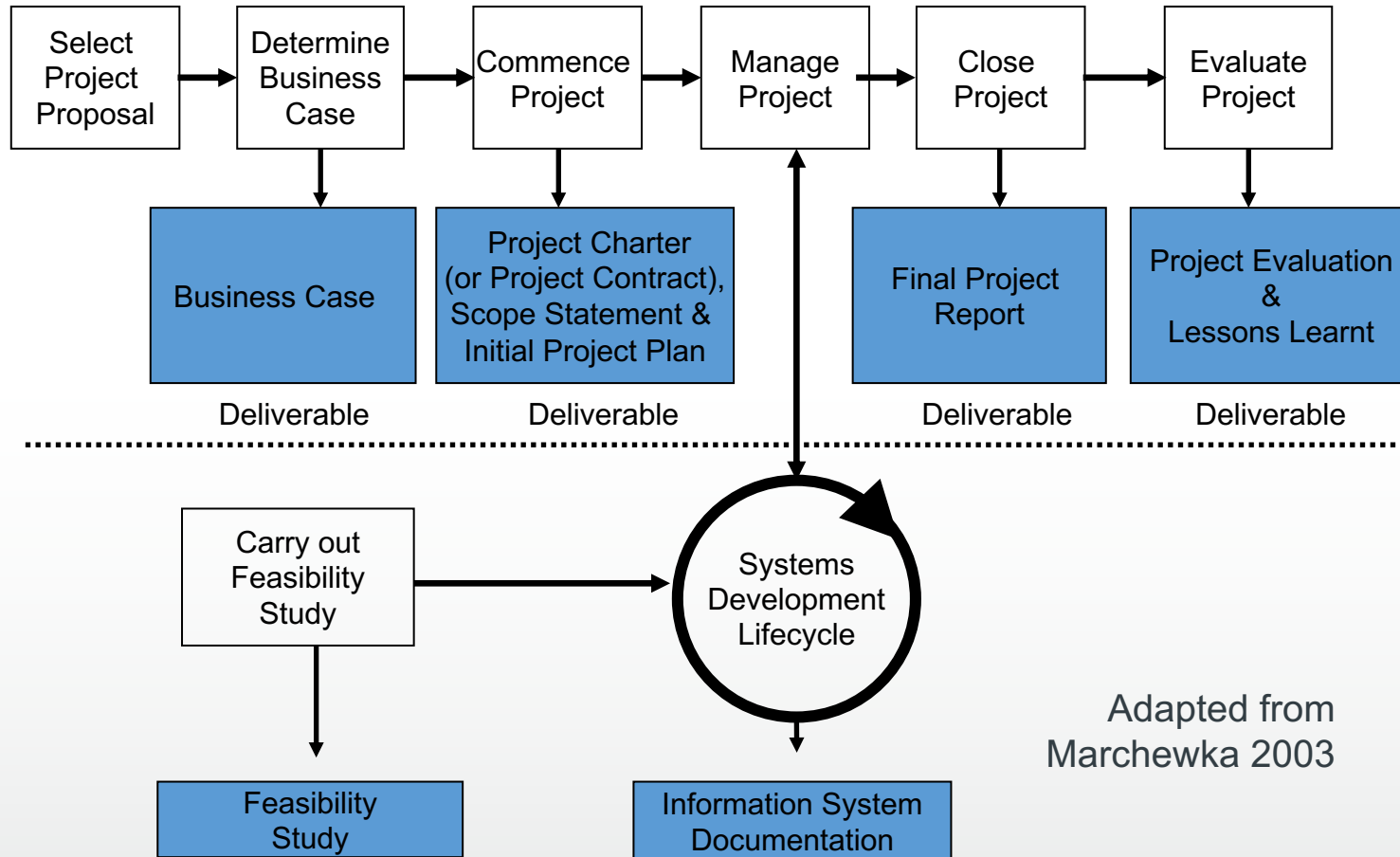
Successful Software Project

- Success factors
 - Is the goal clearly defined?
 - Is there a list of jobs so that everyone knows their part?
 - Is there one leader?
 - Have jobs been assigned to people?
 - Has the Project Manager adopted an appropriate leadership style?
 - Does the Project Manager know what's going on?

Successful Software Project – Cont.

- Success factors
 - Are the employees being told what is going on?
 - Does the project have a **fall-back position** (an achievable objective, though not the whole of what was wanted)?
 - The development **tends to be extended** as the specification becomes modified with better knowledge during the project.
 - The importance of **leeway** and *margin of safety*
 - This means that the first delivery may not fulfil the customer's requirements totally, and “nice to haves” are delayed until a second (or later) phase of delivery.

Project Management Lifecycle

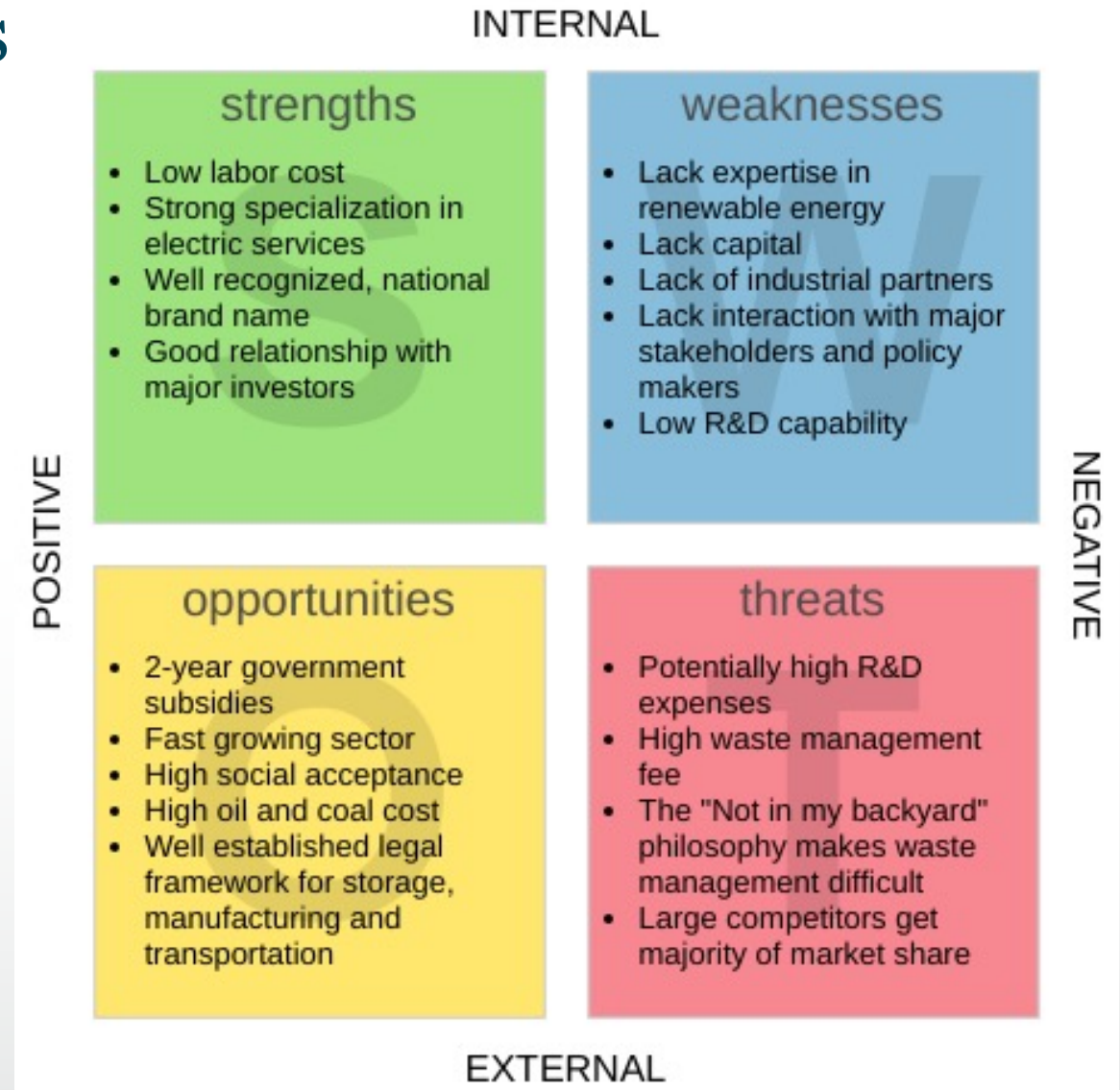


Adapted from
Marchewka 2003

Project proposal selection

- Establishing a project's contribution to the organization's objectives:
 - **SWOT**: identifying **Strengths** and **Weaknesses**, any other **Opportunities** and **Threats** to the project face.
 - **PESTAL**: political, economic, social, technological, legal and environmental factors describes a framework of macro-environmental factors affecting a project.
 - **Balanced Scorecard**: used by managers to keep track of the execution of activities by the staff within their control and to monitor the consequences arising from these actions

SWOT Analysis



PESTAL

POLITICAL

- No clear policy in the Middle East to protect IT copyrights.
- Middle East governments promote and encourage e-learning development by investing in IT with public or private partnership.

ECONOMIC

- Increasing trend of e-learning in Middle East.
- Drop in the price of on the internet connectivity.

SOCIAL

- Increasing number of students in the Middle East.
- Arab students engaged in digital applications that provide rewards to increase their motivation .

TECHNOLOGICAL

- Middle East countries have focused on implementing and developing IT initiatives
- Increasing use of IT products.

LEGAL

- The project will support e-learning, which is supported by the policy in educational environments.

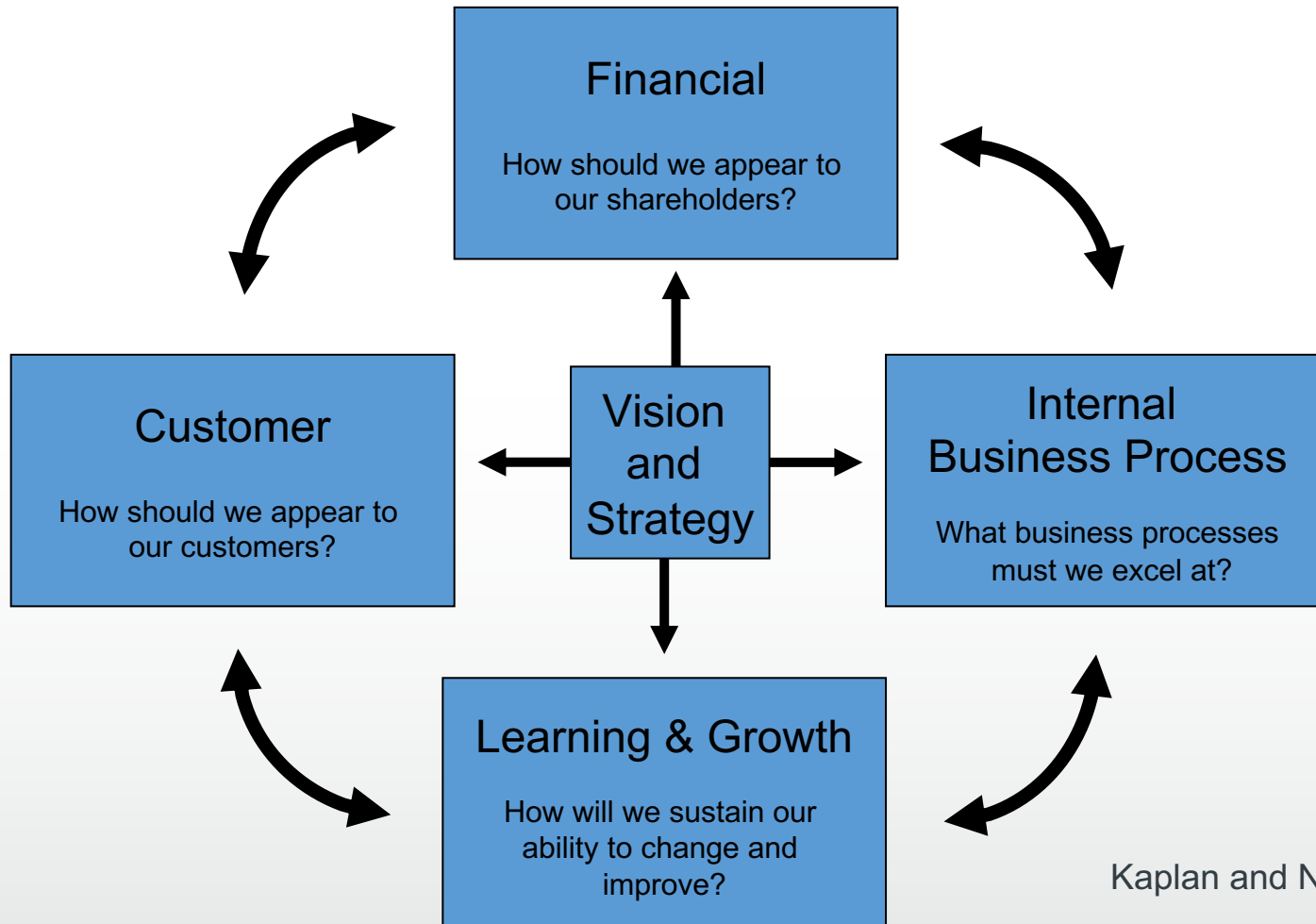
ENVIRONMENTAL

- The project will use internet, which has not effect on the environment.

The Balanced Scorecard

- What is a Balanced Scorecard?
 - Communicate what you are trying to accomplish
 - Align the day-to-day work that everyone is doing with strategy
 - Prioritise projects, products, and services
 - Measure and monitor progress towards strategic targets
- The name “*balanced scorecard*” comes from the idea of looking at *strategic* measures in addition to *traditional* financial measures to get a more “*balanced*” view of performance.

The Balanced Scorecard



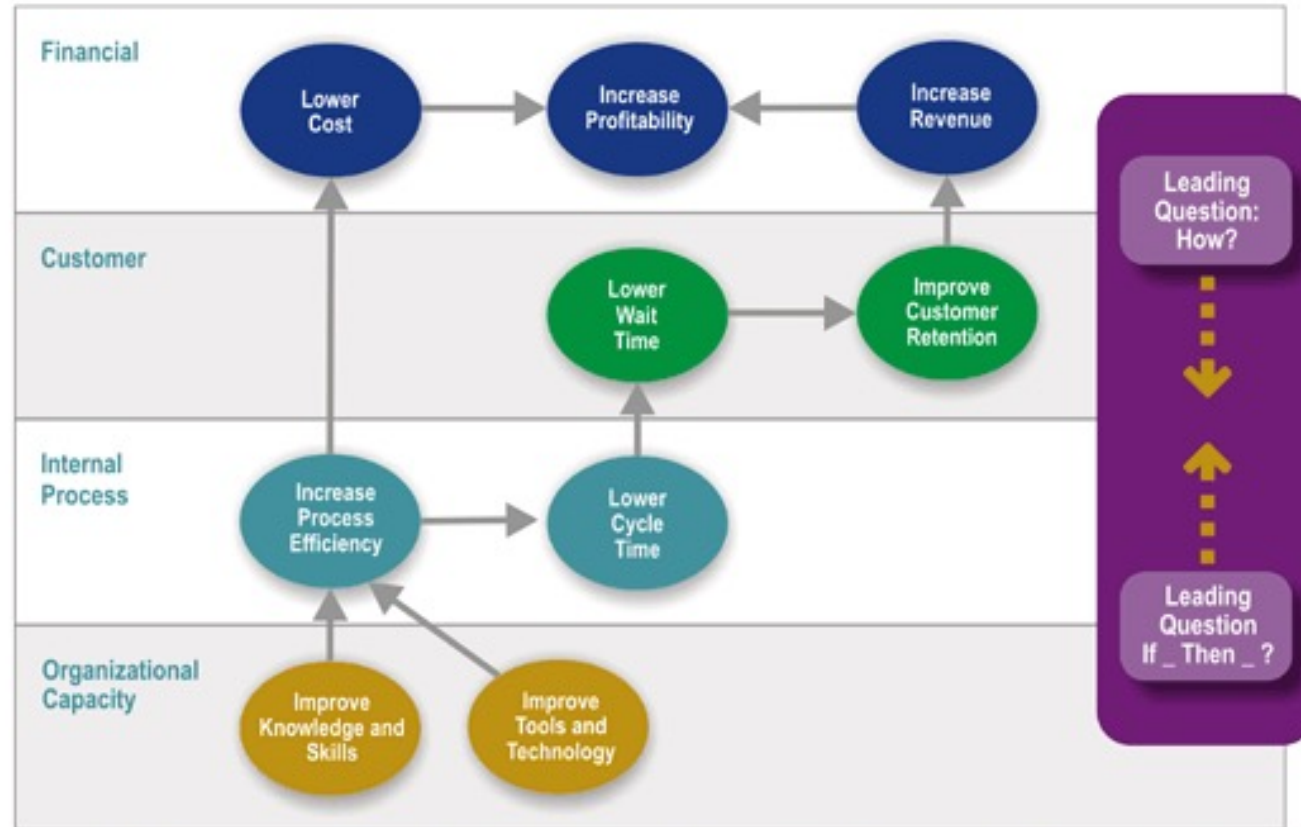
Kaplan and Norton 1996

The Balanced Scorecard



<https://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard>

Strategy Map



Reference: The Institute Way: Simplify Strategic Planning & Management with the Balanced Scorecard.

What is a Strategy Map?

- A strategy map is a simple graphic that shows a logical, *cause-and-effect* connection between *strategic objectives* (shown as ovals on the map).
- It is one of the most powerful elements in the balanced scorecard methodology, as it is used to quickly communicate how *value* is created by the organization.
- Strategy mapping can vastly improve any strategy *communication* effort, as it forces the team to agree on what they are trying to *accomplish* in simple, easy-to-understand terms.

How to Create a Balanced Scorecard: *Nine Steps to Success*™

- Program Launch

Step 1: Assessment

Step 2: Strategy

Step 3: Strategic Objectives

Step 4: Strategy Mapping

Step 5: Performance Measures

Step 6: Strategic Initiatives



Reference.

Scorecard Rollout: Integrating Steps 1 through 6

Step 7: Performance Analysis

Step 8: Alignment

Step 9: Evaluation

Non-financial and Strategic Considerations

- Portfolio Analysis
 - Every application carries *risks* and *benefits*
 - Firms in *information-intensive* industries normally have a few *high-risk, high-benefit* projects to ensure that they stay current with technology.
 - Firms in *non-information-intensive* industries should focus on *high-benefit, low-risk* projects.

Non-financial and Strategic Considerations

		Project Risk	
		High	Low
Potential benefits to the firm	High	Cautiously Examine (High Risks but high Returns)	Identify and develop (High possibility of success and high returns)
	Low	Avoid (High risk with low returns)	Routine Projects (Safe, but low returns)

Determining project scope

- Determine what is included in the project and what is not.
- *Scope* can be defined as ‘the work the project has to do’.
- Establishing the scope includes consideration of:
 - Functionality
 - Levels of objectives
 - Extent of the deployment within an organisation
- Benefits, costs and timescales are linked to the project scope.

Project management triangle

- The **project management triangle** (called also the *triple constraint*, *iron triangle*) is a model of the constraints of project management.
- While its origins are unclear, it has been used since at least the 1950s.



- Source: [Wikipedia](#)

Project management triangle

- It contends that:
- The **quality** of work is constrained by the project's *budget*, *deadlines* and *scope* (features).
- The project manager can *trade between* constraints.
- **Changes** in one constraint **necessitate** changes in others to compensate or quality will suffer.
- For example, a project can be completed faster by **increasing budget** or **cutting scope**.
 - Similarly, **increasing scope** may require equivalent **increases in budget and schedule**.
 - **Cutting budget** without adjusting schedule or scope will lead to **lower quality**.

Identifying the project aim

- A project should have **one major aim** and several **objectives supporting** the aim.
 - For example: To improve our customers' experience of ordering our products.

Project management activities

- Project management encompasses:
 - measurement and metrics
 - estimation
 - risk analysis
 - schedules
 - tracking and control

Required Skills

- Management techniques required to:
 - plan
 - organize
 - monitor
 - control
- Software projects
- Effective SW project management focuses on 3 P's:
 - people
 - problem
 - process

People & Problem Aspects

- People
 - Must be organized into effective teams
 - Motivated to do high-quality work
 - Coordinated to achieve effective communication and results
- Problem
 - Must be communicated from customer to developer
 - Decomposed into its parts
 - positioned for work by software development team

The Process Aspect

- The process must be adapted to the **people** and **problem**
- To get the SW developed:
 - common process framework is selected
 - appropriate Software Engineering paradigm is applied
 - set of work tasks chosen

Management activities

- Proposal writing
- Project planning and scheduling
- Project costing
- Project monitoring and reviews
- Personnel selection and evaluation
- Report writing and presentations

Types of project plan

Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project
Validation plan	Describes the approach, resources and schedule used for system validation
Configuration management plan	Describes the configuration management procedures and structures to be used
Maintenance plan	Predicts the maintenance requirements of the system, maintenance costs and effort required
Staff development plan.	Describes how the skills and experience of the project team members will be developed

Project planning process

Establish the project constraints

Make initial assessments of the project parameters

Define project milestones and deliverables

while project has not been completed or cancelled loop

 Draw up project schedule

 Initiate activities according to schedule

 Wait (for a while)

 Review project progress

 Revise estimates of project parameters

 Update the project schedule

 Re-negotiate project constraints and deliverables

if (problems arise) then

 Initiate technical review and possible revision

end if

end loop

Management activities

- Proposal writing
- **Project planning and scheduling**
- Project costing
- Project monitoring and reviews
- Personnel selection and evaluation
- Report writing and presentations

The Process

- Most Software projects follow a System Development Life Cycle:
 - PRINCE2[®] (Projects IN Controlled Environments) is one of the popular instances.
 - The initial project plan is part of the initiation phase following the high-level analysis identifying the main tasks for the project.
- TickIT is run by the BSI as part of ISO9001 for assuring Quality Assurance.
 - By implementing a quality system and gaining certification, an organization is demonstrating management's commitment to quality and is sending a clear signal to users and competitors that the delivery of quality is a principal management objective.

The Process

- Agile software development promote a disciplined project management process that encourages frequent inspection and adaptation,
 - Aligns development with customer needs and company goals.

The Process

- Once the project has the go-ahead and the method of acquisition has been decided upon, a detailed project plan can be drawn up.
 - This planning has to occur when the project is already running.
 - It is not possible to make accurate **estimates** for **time** and **cost** until sufficient analysis of the problem has taken place, otherwise a “best guess” or a ballpark figure has to be given and a probability calculated.

Management activities

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- Project planning and scheduling
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Estimation

- The **estimation** process involves prediction and decisions about the **tasks** needed to complete the project.
 - The project is **broken down** into a hierarchy of **tasks** and sub-tasks and cost, time and quality are identified.
- In Information systems development, it is common to break the project into tasks that **parallel** to the **modules** of the application.
 - This allows a link to be developed between testing of modules, interfaces and the **project's milestones**.

Estimation

- Accurate estimation of **project costs** provides the basis for management control.
 - To do this a well-defined specification is required, something that is often not available at the time of initiation.
 - Importantly, the degree of estimating accuracy will determine the element of **risk** in being able to complete to **time** and **budget**.
 - Because of this problem, more than one estimate is needed, reflecting improved knowledge about the project.

Management activities

- Proposal writing
- Project planning and scheduling
- Project costing
- **Project monitoring and reviews**
- **Personnel selection and evaluation**
- **Report writing and presentations**

Scheduling

- Scheduling sets out when a task will take place and the resources that will be allocated to it.
- Tasks can take place consecutively or overlap.
- Diagrams are the best way to view the schedule because the relationships between the tasks are easier to see and understand.

Monitoring and Control

- Monitoring ensures that a project is following its **schedule**.
 - Controls are then used to **correct** any **deviation**.
 - The main components for monitoring the project are **time**, **cost** and **quality**.



- The **structure** of the project **team** is vital to the success of the project, for without clear **reporting structures** and **responsibilities** large projects can easily be dragged off track.

Monitoring and Control

- There are published methodologies that can be used to structure projects.
 - PRINCE 2 (OGC 2002) is used by the UK government to define organisation structure, responsibility and user roles.
- Within the standard you find job descriptions such as:
 - Business assurance co-Ordinator, controlling **financial** aspects
 - Technical assurance co-Ordinator, controlling **technical** aspects
 - User assurance co-ordinator controlling **user** aspects

Documentation

- Documentation of the various stages of the project is needed for
 - quality control,
 - involving **validation** and **verification**,
 - especially in the later maintenance phase of the software projects.

Planning for when things go wrong.

MANAGEMENT ACTIVITIES

Disaster Recovery Plan

- The final operations task is to ensure that there exists a **Disaster Recovery Plan**,
 - that people know where it is,
 - that it is kept up to date
 - that it actually works.
- This means that it must be practised from time to time, and until it works effectively.

Disaster Recovery Plan

- It is as well to employ specialist consultants to check on the plan, since they have wide experience with disaster situations.
 - “you get what you pay for”: some situations are tolerable, while others are critical to business survival.
- The Disaster Recovery Plan must concentrate on the latter.
 - E.g. where will people work if the building is destroyed by fire, but all the documentation, data and systems are recovered from the off-site storage?

Questions

- Project management traditional methods for managing project has received a lot of criticism, explain why this is?
 - Diagram (slide 15) plus explanation
- Explain why approaches to project and quality management used in industries such as civil engineering or mass production may not be effective for software development projects.
- You are an IT Manager having to decide which of the project proposal you are to fund. How will you go about doing this?
- How is the Balanced score used in selection of projects?
- How is SWOT analysis used in the selection of projects?
- How is PESTAL used in the selection of projects?