PROJECT ESTIMATION TECHNIQUES

Information technology project estimation techniques

Case studies in **Software projects**

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ESTIMATES AND PROJECT SCHEDULE

The project plan should also include estimates and a project schedule:

A work breakdown structure (WBS) is defined. This is a list of tasks which, if performed, will generate all of the work products needed to build the software.

An estimate of the effort required for each task in the WBS is generated.

A project schedule is created by assigning resources and determining the calendar time required for each task.

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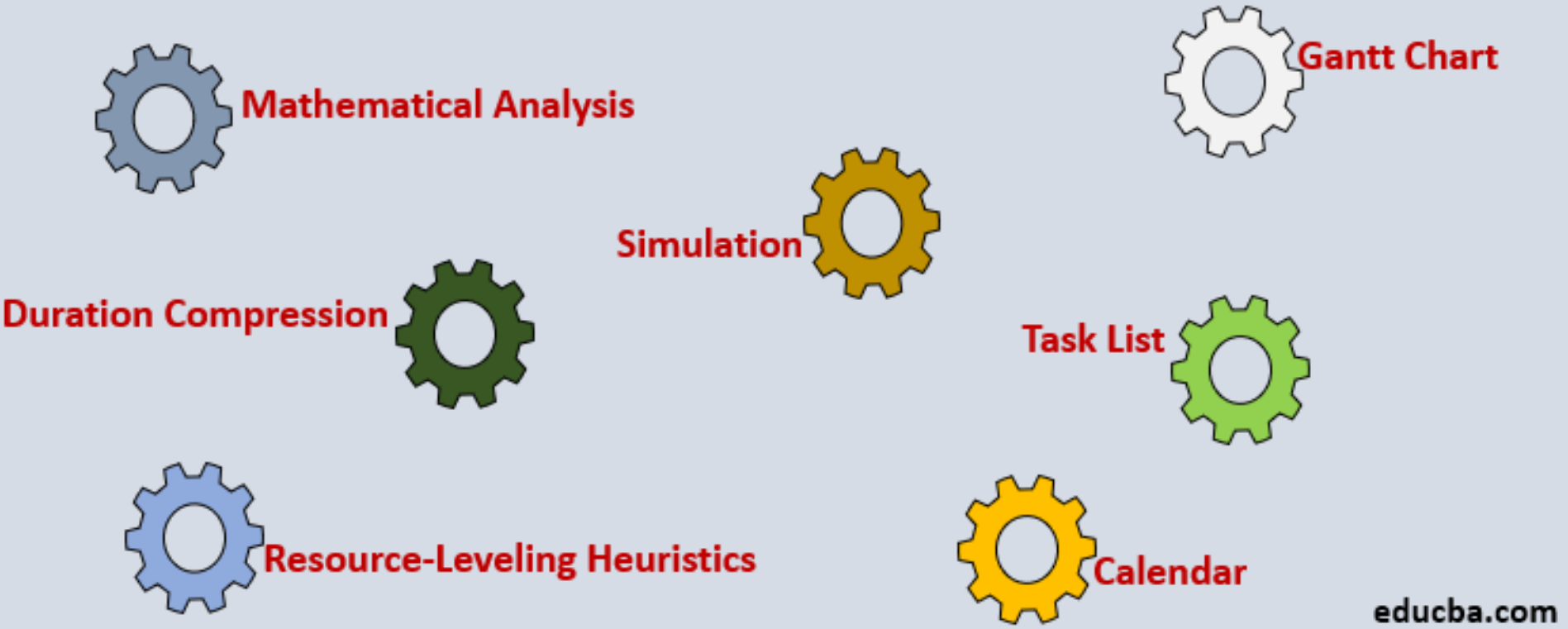
Project Scheduling Techniques



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https://www.educba.com/project-scheduling-techniques/

ASSIGNING RESOURCES WITHIN ESTIMATES AND PROJECT SCHEDULE

Once you have scheduled tasks in your project, you will need to associate resources involved in the tasks' completion. This will allow ConceptDraw Project (conceptdraw.com) to calculate costs related with those tasks. Also it will provide you with exact information about the usage of work resources, materials, or equipment. This will provide high accountability and understanding of the project as well.

That's why it's important to be mindful when assigning resources to tasks.

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WHAT IS PROJECT ESTIMATION?

The project manager must set expectations about the time required to complete the IT projects among the stakeholders, the team, and the organization's management.

If those expectations are not realistic from the beginning of the project, the stakeholders will not trust the team or the project manager.

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ELEMENTS OF A SOUND ESTIMATE

To generate a sound estimate, a project manager must have:

A work breakdown structure (WBS), or a list of tasks which, if completed, will produce the final product

An effort estimate for each task

A list of assumptions which were necessary for making the estimate

Consensus among the project team that the estimate is accurate

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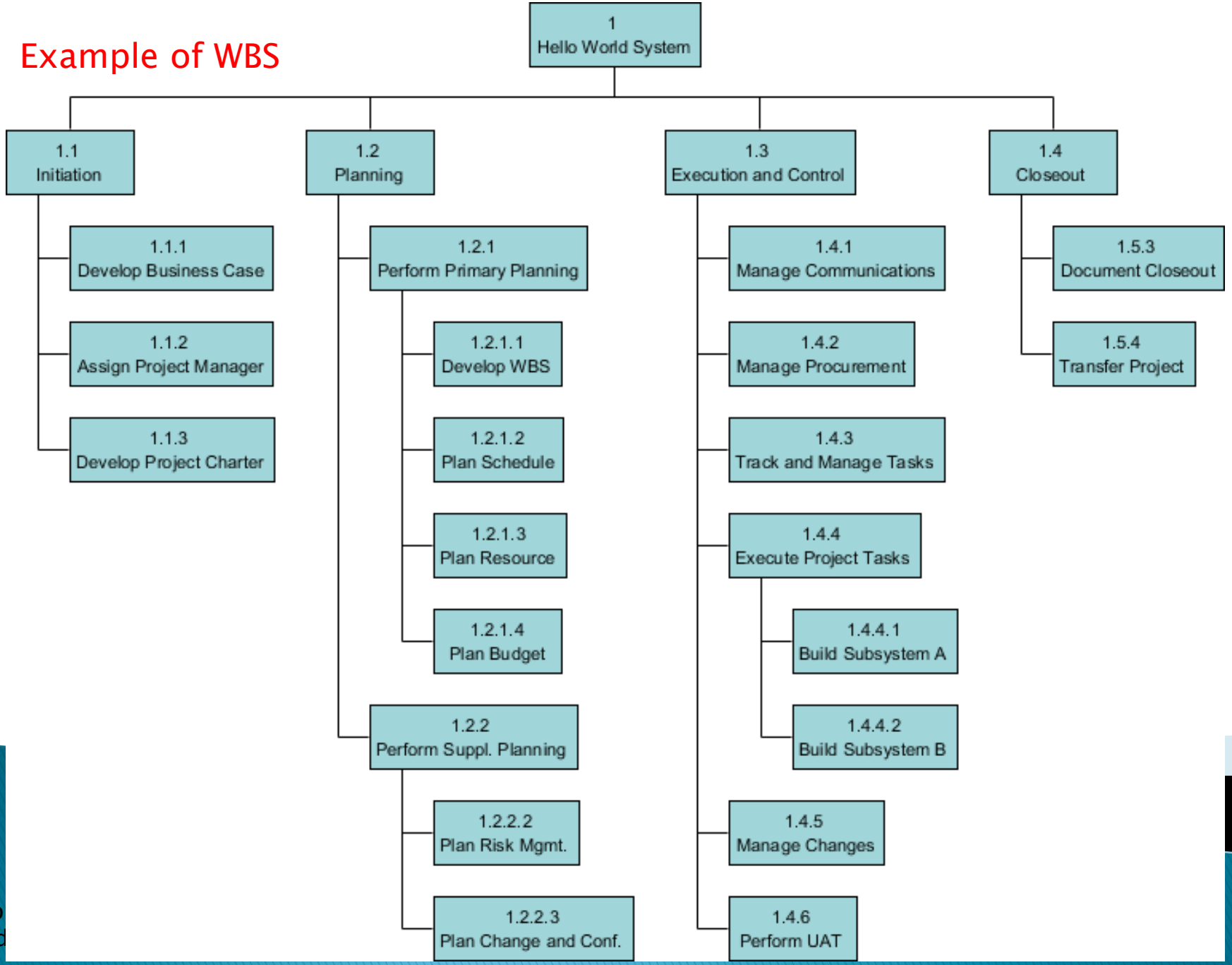
Example of WBS



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ASSUMPTIONS MAKE ESTIMATES MORE ACCURATE

Team members make assumptions about the work to be done in order to deal with incomplete information

Any time an estimate must be based on a decision that has not yet been made, team members can assume the answer for the sake of the estimate

Assumptions must be written down so that if they prove to be incorrect and cause the estimate to be inaccurate, everyone understands what happened

Assumptions bring the team together very early on in the project so they can make progress on important decisions that will affect development

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WIDEBAND DELPHI

Wideband Delphi is a process that a team can use to generate an estimate

The project manager chooses an estimation team, and gains consensus among that team on the results

Wideband Delphi is a repeatable estimation process because it consists of a straightforward set of steps that can be performed the same way each time

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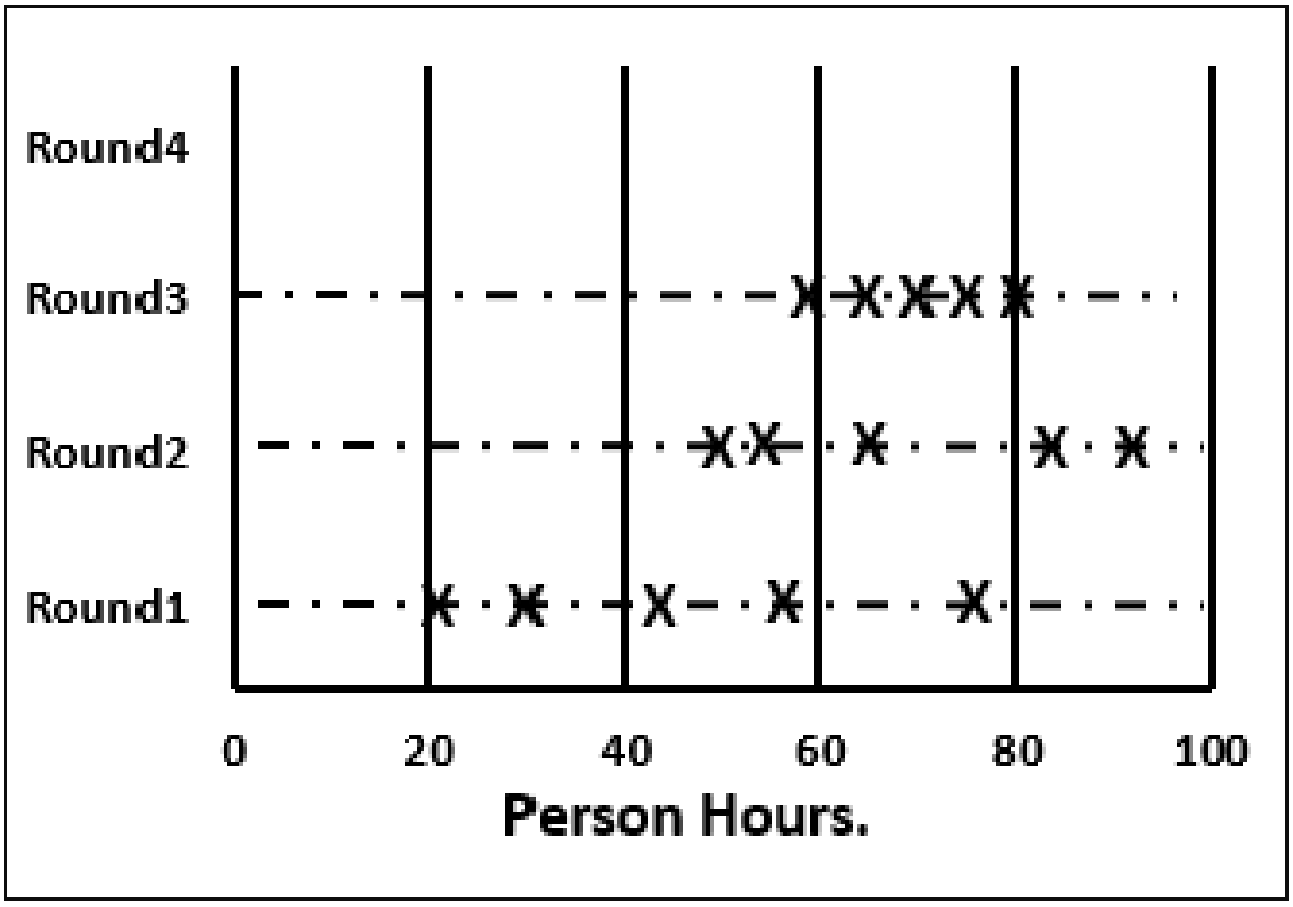
EXAMPLE OF WIDEBAND DELPHI



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THE WIDEBAND DELPHI PROCESS

Step 1: Choose the team

The project manager selects the estimation team and a moderator. The team should consist of 3 to 7 project team members.

The moderator should be familiar with the Delphi process, but should not have a stake in the outcome of the session if possible.

If possible, the project manager should not be the moderator because he should ideally be part of the estimation team.

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THE WIDEBAND DELPHI PROCESS

Step 2: Kickoff Meeting

The project manager must make sure that each team member understands the Delphi process, has read the vision and scope document and any other documentation, and is familiar with the project background and needs.

The team brainstorms and writes down assumptions.

The team generates a WBS with 10-20 tasks.

The team agrees on a unit of estimation.

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THE WIDEBAND DELPHI PROCESS

Step 3: Individual Preparation

Each team member independently generates a set of preparation results.

For each task, the team member writes down an estimate for the effort required to complete the task, and any additional assumptions he needed to make in order to generate the estimate.

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THE WIDEBAND DELPHI PROCESS

Step 4: Estimation Session

During the estimation session, the team comes to a consensus on the effort required for each task in the WBS.

Each team member fills out an estimation form which contains his estimates.

The rest of the estimation session is divided into rounds during which each estimation team member revises her estimates based on a group discussion. Individual numbers are not dicsussed.

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THE WIDEBAND DELPHI PROCESS

Step 4: Estimation Session (continued)

The moderator collects the estimation forms and plots the sum of the effort from each form on a line:

Wideband Delphi Estimation Sheet						
Project: <Project Name>				**Estimation Units:**	Person Hours	
Estimation Team Member:	<Name>			**Date:**	<MM-DD-YY>	
Task	**Initial Estimate**	**Change 1**	**Change 2**	**Change 3**	**Change 4**	**Final**
Task1	n_1					
Task2	n_2					
Task3	n_3					
Task4	n_4					
Task5	n_5					
Task6	n_6					
Task7	n_7					
Task8	n_8					
Net Change						
Total	$\sum n_i$					

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THE WIDEBAND DELPHI PROCESS

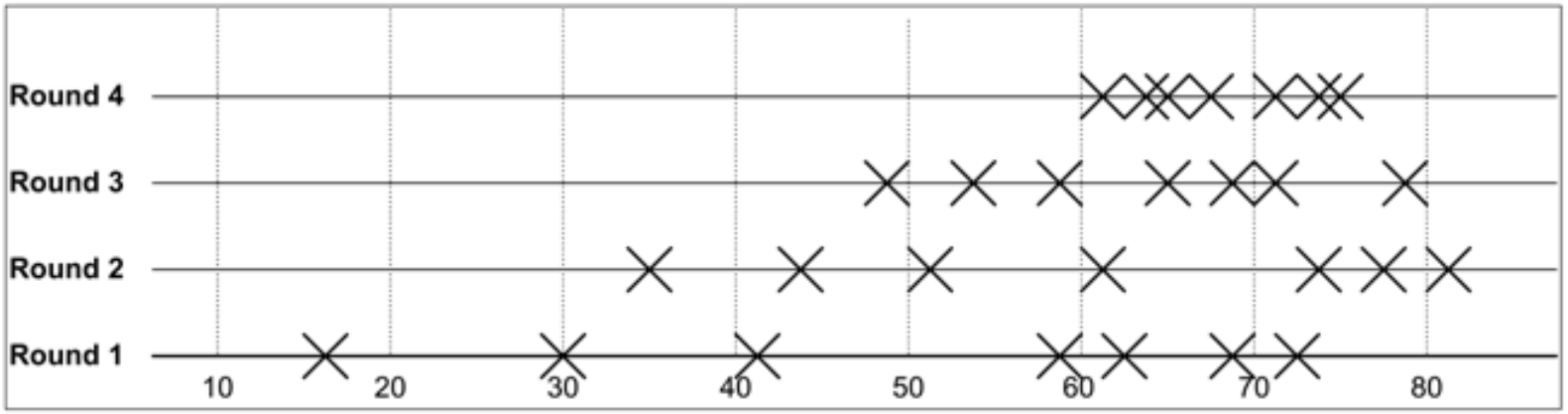
Step 4: Estimation Session (continued)

The team resolves any issues or disagreements that are brought up.

Individual estimate times are not discussed. These disagreements are usually about the tasks themselves.

Disagreements are often resolved by adding assumptions.

The estimators all revise their individual estimates. The moderator updates the plot with the new total:



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THE WIDEBAND DELPHI PROCESS

Step 4: Estimation Session (continued):

The moderator leads the team through several rounds of estimates to gain consensus on the estimates. The estimation session continues until the estimates converge or the team is unwilling to revise estimates.

Step 5: Assemble Tasks

The project manager works with the team to collect the estimates from the team members at the end of the meeting and compiles the final task list, estimates and assumptions.

Step 6: Review Results

The project manager reviews the final task list with the estimation team.

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ADVANTAGES AND DISADVANTAGES OF WIDEBAND DELPHI TECHNIQUE

Advantages

WDT is a consensus-based estimation technique for estimating effort.

Participation of experienced people and they individually estimating would lead to reliable results.

People who would do the work are making estimates thus making valid estimates.

A very simple technique and assumptions are documented, discussed and agreed.

Disadvantages

Management support is required.

The estimation results may not be what the management wants to hear.

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OTHER ESTIMATION TECHNIQUES

PROBE, or Proxy Based Estimating

PROBE is based on the idea that if an engineer is building a component similar to one he built previously, then it will take about the same effort as it did in the past.

Individual engineers use a database to maintain a history of the effort they have put into their past projects.

A formula based on linear regression is used to calculate the estimate for each task from this history.

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EXAMPLE

The PROBE Estimating Method

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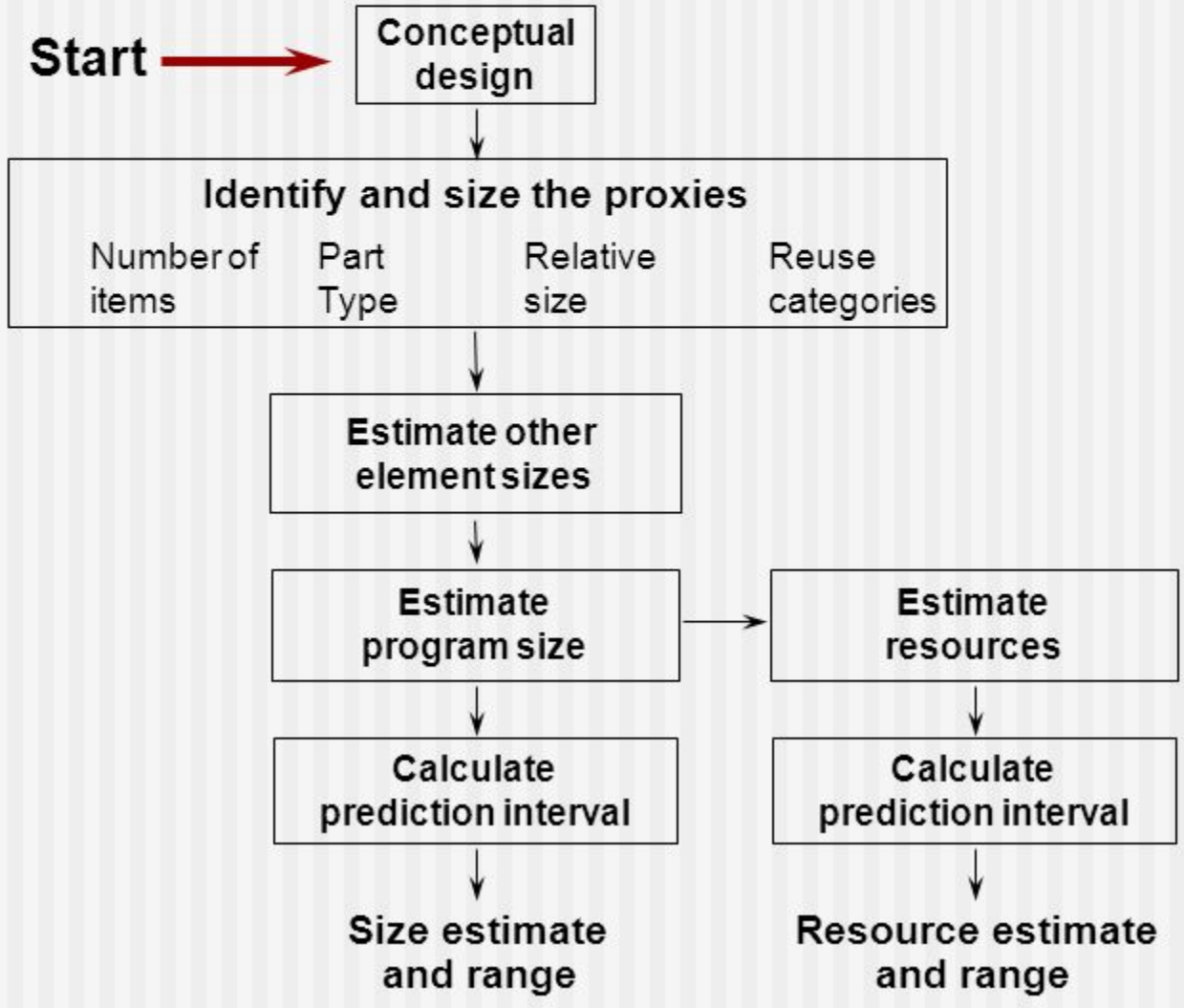
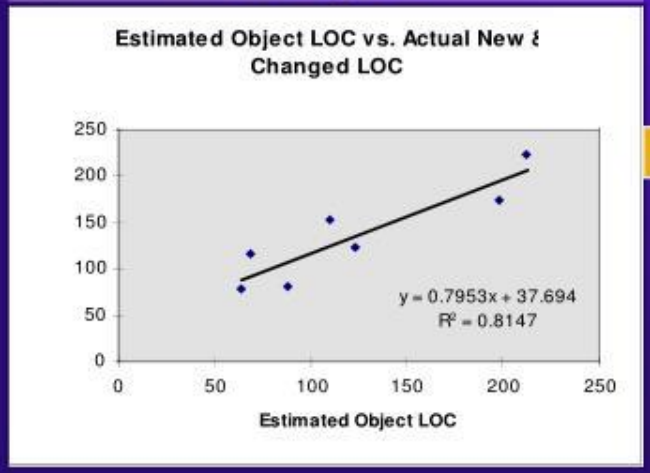


Size Estimation Methods - PROBE

Choose a Proxy → Conceptual Design (Count Proxy)

Historical Proxy-to-LOC data

Calculate Est. Proxy-LOC → Linear Regression Analysis



Regression Parameters

$\beta_0 = ?$ $\beta_1 = ?$ $r^2 = ?$

Est N&C LOC = $\beta_0 + \beta_1$ * Est Proxy-LOC

https://www.slideserve.com/hong/software-size-estimation-powerpoint-ppt-presentation

OTHER ESTIMATION TECHNIQUES

COCOMO II

In Constructive Cost Model, or COCOMO, projects are summarized using a set of variables that must be provided as input for a model that is based on the results of a large number of projects across the industry.

The output of the model is a set of size and effort estimates that can be developed into a project schedule.

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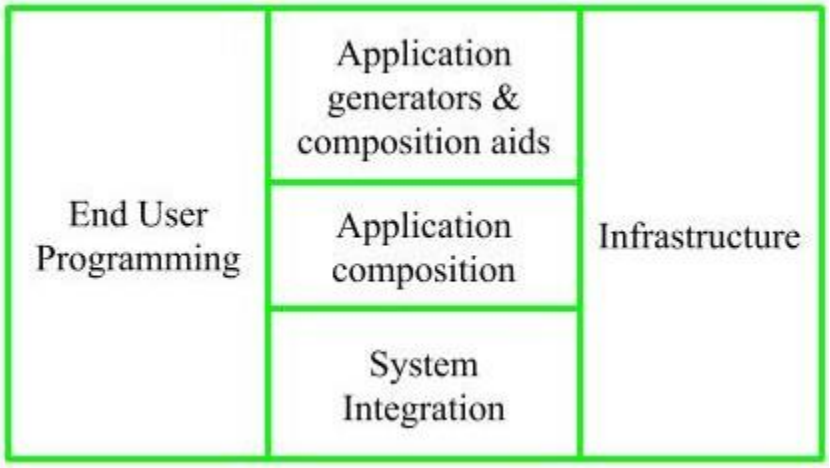
COCOMO II

COCOMO-II is the revised version of the original Cocomo (Constructive Cost Model). The model was developed at University of Southern California. It is the model that allows one to estimate the cost, effort and schedule when planning a new software development activity.

It consists of three sub-models:



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https://www.geeksforgeeks.org/software-engineering-cocomo-ii-model/

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COCOMO II

1. End User Programming:
End user write the code by using application generators.
Example – Spreadsheets, report generator, etc.

2. Intermediate Sector:
(a). Application Generators and Composition Aids –has capabilities for user programming. For example, these are Microsoft, Lotus, Oracle, IBM, Borland, Novell.
(b). Application Composition Sector –may include GUI, Databases, domain specific components such as financial, medical or industrial process control packages.
(c). System Integration – deals with large highly embedded systems.

3. Infrastructure Sector: for the software development like Operating System, Database Management System, User Interface Management System, Networking System, etc.

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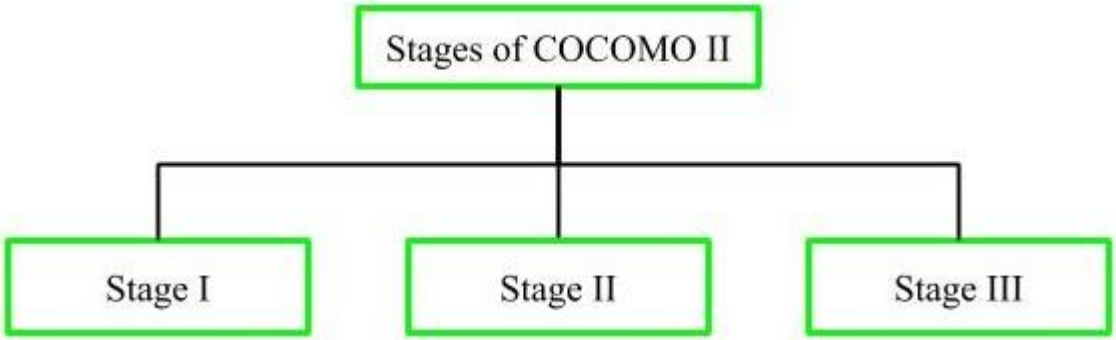
COCOMO II STAGES



Stage-I: for estimation of prototyping, its Application Composition Estimation Model is used for the prototyping stage of application generator and system integration.
Stage-II: Early Design Estimation Model is used in early design stage of application generators, infrastructure, system integration.
Stage-III: Post Architecture Estimation Model is used after the completion of the detailed architecture of application generator, infrastructure, system integration.

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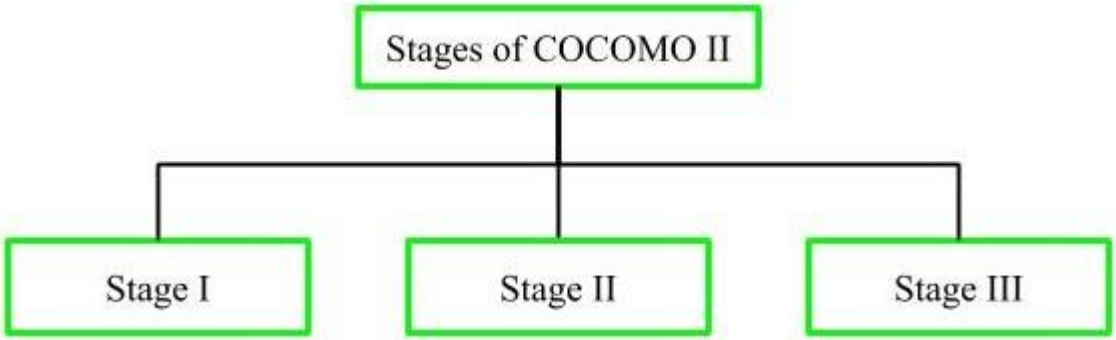
COCOMO II STAGES



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OTHER ESTIMATION TECHNIQUES

The Planning Game

The Planning Game is the software project planning method from Extreme Programming (XP), a lightweight development methodology developed by Kent Beck in the 1990s at Chrysler.

It is a full planning process that combines estimation with identifying the scope of the project and the tasks required to complete the software.

The Planning Game is highly iterative. The scope is established by having Development and Business work together to interactively write “user stories” written on index cards to describe the scope. Each story is given an estimate of 1, 2 or 3 weeks. This process is repeated continuously throughout the project.

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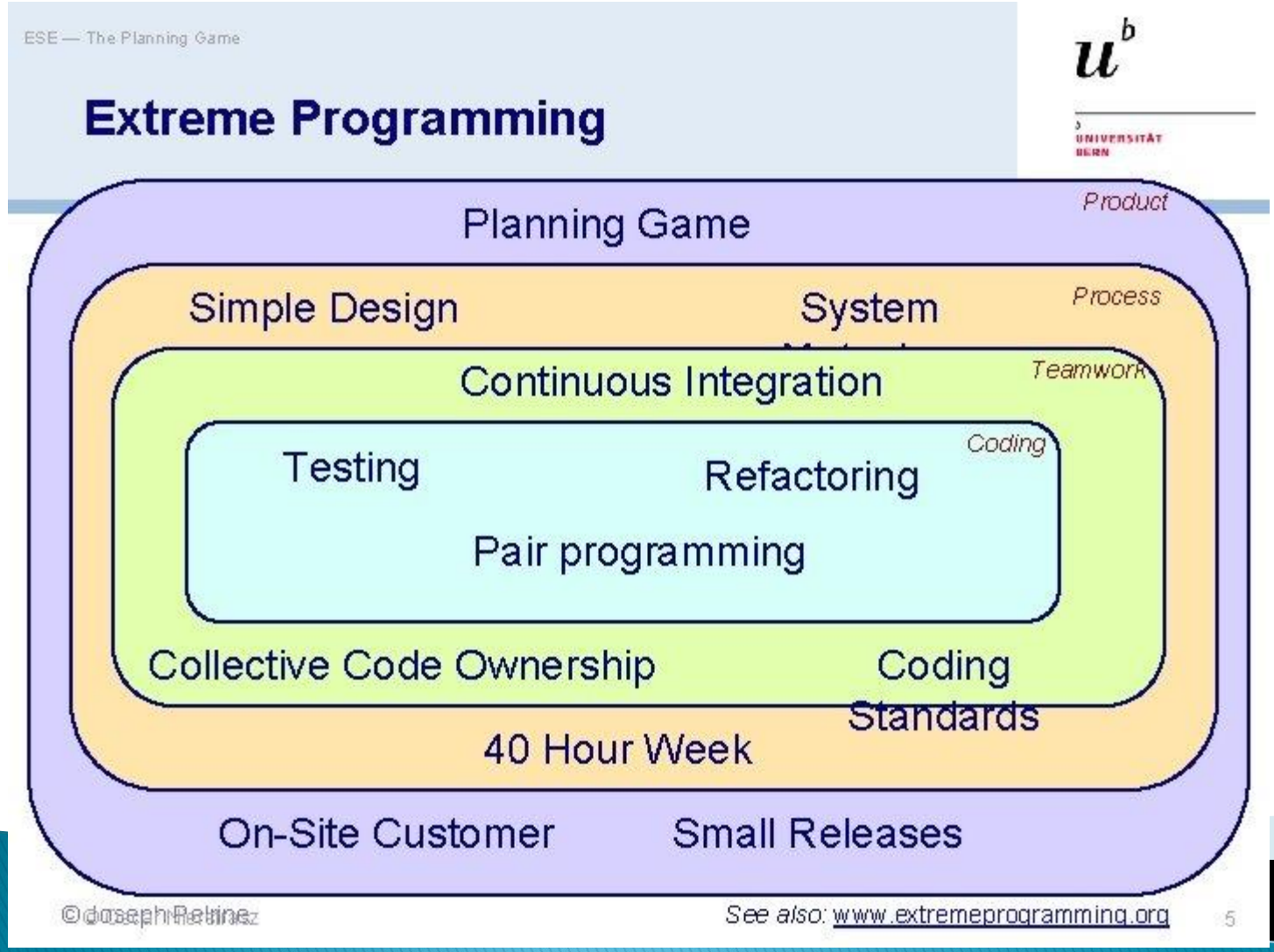
THE PLANNING GAME



https://slidetodoc.com/ese-the-planning-game-ese-einfhrung-in-software/

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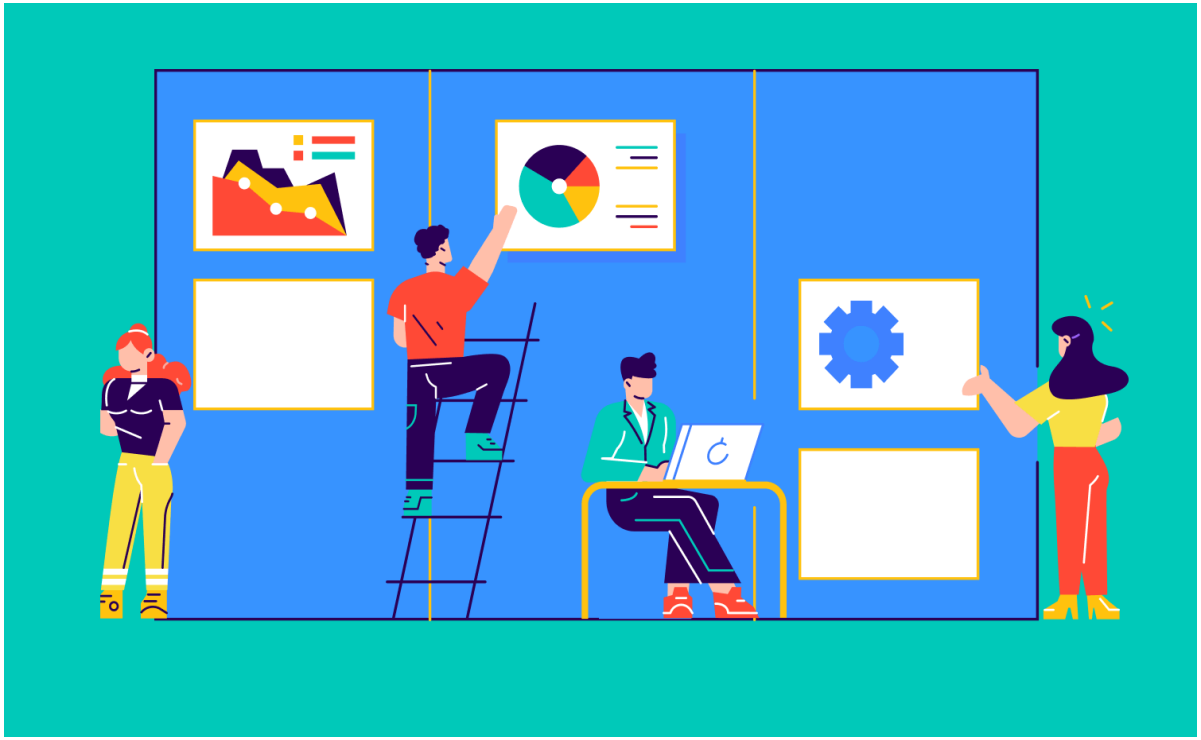
PLANNING GAME IN EXTREME PROGRAMMING

Step 1: Creation or selection

of the story

Step 2: Story estimation

Step 3: Prioritization of stories



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Thank you.

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