Project Management

Lecture 3

Software Engineering
CUGS
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(slides made by David Broman)

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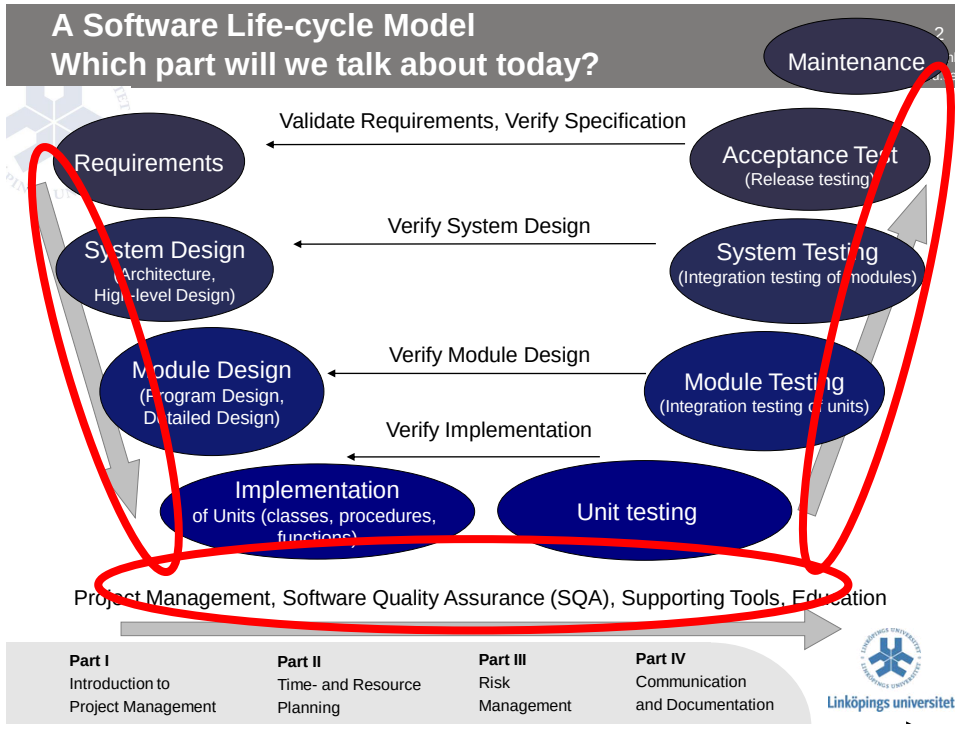
A Software Life-cycle Model
Which part will we talk about today?



Part I Introduction to Project Management
Part II Time- and Resource Planning
Part III Risk Management
Part IV Communication and Documentation

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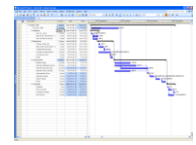
Agenda - What will you learn today?

Part I
Introduction to Project Management

Part II
Time- and Resource Planning



Part III
Risk Management

Part IV
Communication and Documentation

Part I

Introduction to Project Management

Typical properties of a project?

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Start and stop

A budget

Goal

An orderer

A single-time occurrence

Who are involved in a software project?

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Customer

Pays for the system

User

Development Organization

Uses the system

Stakeholders

Provides the system

Supplier

A person or organization with a major interest in the project outcome.

Dependent project parameters

Calendar Time

Resources

Project

Features

Quality

SMART Goals

Specific — Must be straightforward and answer the questions: **What** will you do? **Why** is it important?

Measurable — If you cannot measure it, how do you then know if the goal is reached or not?

Agreed Upon — Agreed upon with all stakeholders (e.g. customer, user etc.)

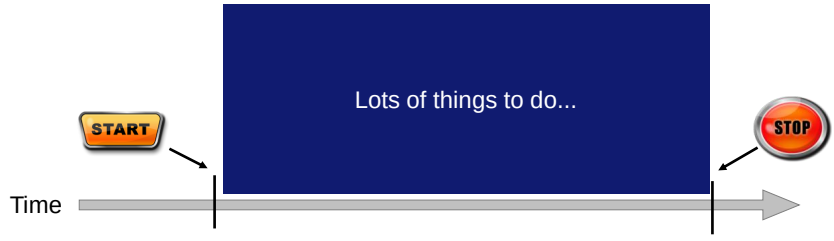
Realistic — Possible with the current resources, knowledge and time. You must be both willing and able to do it.

Timely — A clear time frame for the goal.

Note that there exists other similar versions the definition of SMART goals.

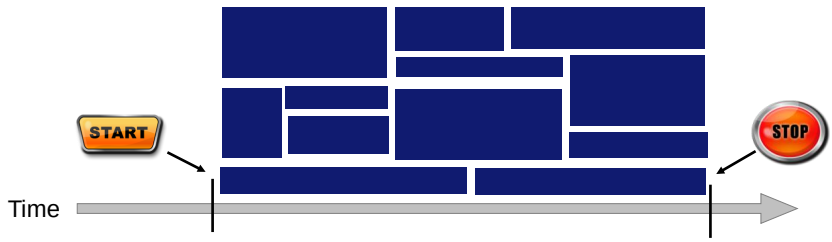
Part II
Time- and Resource Planning

A project



A project

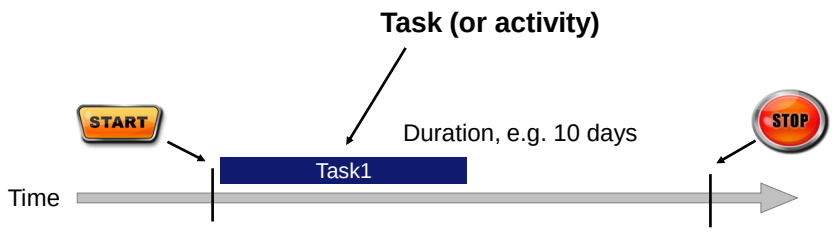
Work breakdown



A task or an activity

Examples:

- Implement encryption module
- Interview users
- Design user-interface prototype

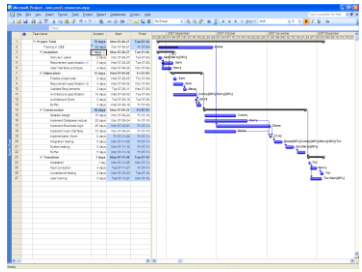


Dependencies between tasks

Task1 and Task2 are precursors
(predecessors) to Task3

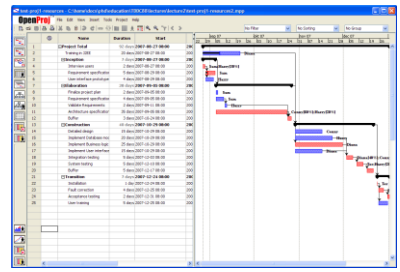
Tool Support

Microsoft Project



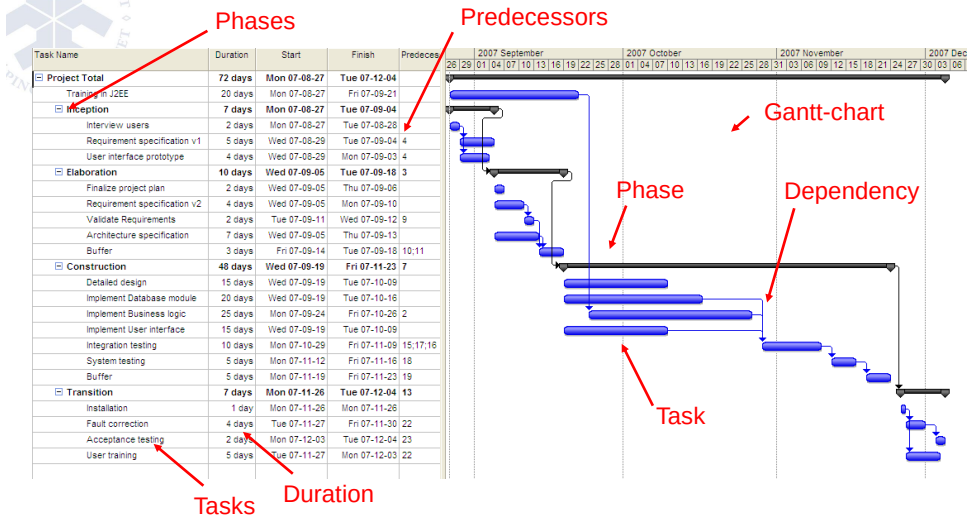
IDA's MSDN Academic Alliance
(see "Resources" on course page)

OpenProj



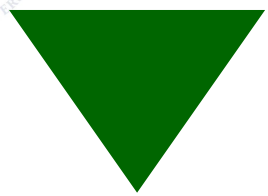
http://openproj.org

Tasks, Duration, and Dependencies



Task Name	Duration	Start	Finish	Predeces
Project Total	72 days	Mon 07-08-27	Tue 07-12-04	
Training in J2EE	20 days	Mon 07-08-27	Fri 07-09-21	
Inception	7 days	Mon 07-08-27	Tue 07-09-04	
Interview users	2 days	Mon 07-08-27	Tue 07-08-28	
Requirement specification v1	5 days	Wed 07-08-29	Tue 07-09-04	4
User interface prototype	4 days	Wed 07-08-29	Mon 07-09-03	4
Elaboration	10 days	Wed 07-09-05	Tue 07-09-18	3
Finalize project plan	2 days	Wed 07-09-05	Thu 07-09-06	
Requirement specification v2	4 days	Wed 07-09-05	Mon 07-09-10	
Validate Requirements	2 days	Tue 07-09-11	Wed 07-09-12	9
Architecture specification	7 days	Wed 07-09-05	Thu 07-09-13	
Buffer	3 days	Fri 07-09-14	Tue 07-09-18	10;11
Construction	48 days	Wed 07-09-19	Fri 07-11-23	7
Detailed design	15 days	Wed 07-09-19	Tue 07-10-09	
Implement Database module	20 days	Wed 07-09-19	Tue 07-10-16	
Implement Business logic	25 days	Mon 07-09-24	Fri 07-10-26	2
Implement User interface	15 days	Wed 07-09-19	Tue 07-10-09	
Integration testing	10 days	Mon 07-10-29	Fri 07-11-09	15;17;16
System testing	5 days	Mon 07-11-12	Fri 07-11-16	18
Buffer	5 days	Mon 07-11-19	Fri 07-11-23	19
Transition	7 days	Mon 07-11-26	Tue 07-12-04	13
Installation	1 day	Mon 07-11-26	Mon 07-11-26	
Fault correction	4 days	Tue 07-11-27	Fri 07-11-30	22
Acceptance testing	2 days	Mon 07-12-03	Tue 07-12-04	23
User training	5 days	Tue 07-11-27	Mon 07-12-03	22

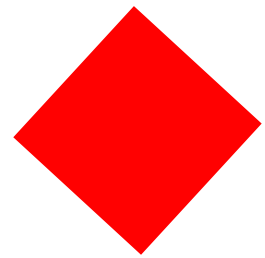
Milestone and Tollgate



Milestone

Verify internal sub-goal fulfillment

- Properties of a SMART goal

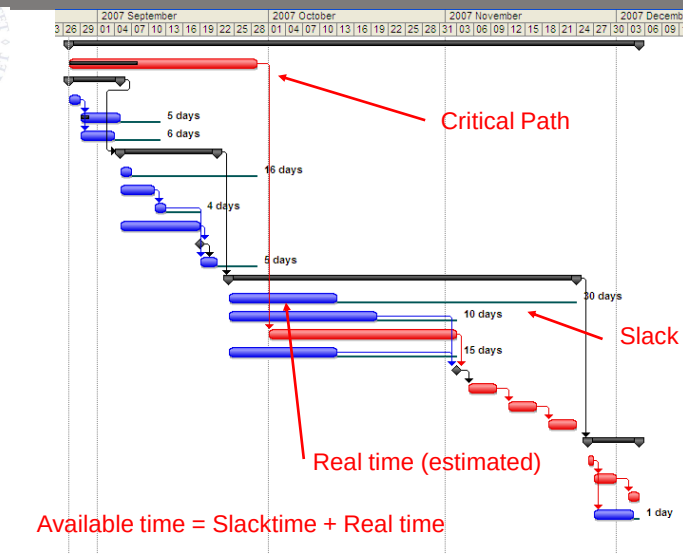


Tollgate

External decision point

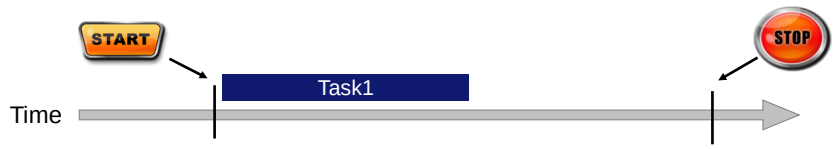
- E.g. after a pre-study phase, the customer decides if the project should continue or not.

Critical Path, Slack and Real time



Resource Planning

Who is going to "do" the task and with **what?** → Resource planning



Resource Planning

		Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate
1		Harry	Work		H		100%	300,00 kr/hr	450,00 kr/hr
2		Diana	Work		D		100%	350,00 kr/hr	560,00 kr/hr
3		Sam	Work		S		100%	500,00 kr/hr	750,00 kr/hr
4		Tor	Work		T		100%	200,00 kr/hr	300,00 kr/hr
5		Conny	Work		C		100%	950,00 kr/hr	950,00 kr/hr
6		Handheld hardware	Material		H			0,00 kr	

Resource name

Type of resource

Cost

Resource assigned to task

Task Name	Duration	Start	Finish	Predecessors	Resource Names	Cost
Project Total	**72 days**	**Mon 07-08-27**	**Tue 07-12-04**			**524 600,00 kr**
Training in J2EE	25 days	Mon 07-08-27	Fri 07-09-28		Diana	70 000,00 kr
Inception	**7 days**	**Mon 07-08-27**	**Tue 07-09-04**			**36 640,00 kr**
Interview users	2 days	Mon 07-08-27	Tue 07-08-28		Sam;Harry[30%]	7 040,00 kr
Requirement specification v1	5 days	Wed 07-08-29	Tue 07-09-04	4	Sam	20 000,00 kr
User interface prototype	4 days	Wed 07-08-29	Mon 07-09-03	4	Harry	9 600,00 kr
Elaboration	**13 days**	**Wed 07-09-05**	**Fri 07-09-21**	**3**		**76 160,00 kr**
Finalize project plan	2 days	Wed 07-09-05	Thu 07-09-06		Sam	8 000,00 kr
Requirement specification v2	4 days	Wed 07-09-05	Mon 07-09-10		Sam	16 000,00 kr
Validate Requirements	2 days	Tue 07-09-11	Wed 07-09-12	9	Harry	4 800,00 kr
Architecture specification	10 days	Wed 07-09-05	Tue 07-09-18		Conny[80%];Harry[20%]	47 360,00 kr
Architecture Done	0 days	Tue 07-09-18	Tue 07-09-18	11		0,00 kr

Resource Planning

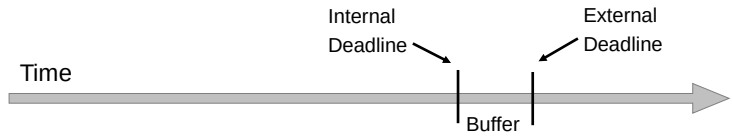
Total Estimated Time

		Resource Name	Work	Details	'07 Sep 24 S	M	T	W	T	F
		Unassigned	0 hrs	Work						
		Architecture L	*0 hrs*	Work						
		Buffer	*0 hrs*	Work						
		Implementatic	*0 hrs*	Work						
		Buffer	*0 hrs*	Work						
1		Harry	280,8 hrs	Work		8h	8h	8h	8h	8h
		Interview user	*4,8 hrs*	Work						
		User interface	*32 hrs*	Work						
		Validate Requ	*16 hrs*	Work						
		Architecture s	*16 hrs*	Work						
		Implement Da	*160 hrs*	Work		8h	8h	8h	8h	8h
		Integration tes	*12 hrs*	Work						
		System testin	*8 hrs*	Work						
		Fault correcti	*32 hrs*	Work						
2		Diana	532 hrs	Work		16h	16h	16h	16h	16h
		Training in J2	*200 hrs*	Work		8h	8h	8h	8h	8h
		Implement Bu	*200 hrs*	Work						
		Implement Us	*120 hrs*	Work		8h	8h	8h	8h	8h
		Integration tes	*12 hrs*	Work						
3		Sam	107,2 hrs	Work						
		Interview user	*11,2 hrs*	Work						
		Requirement	*40 hrs*	Work						

Over allocated

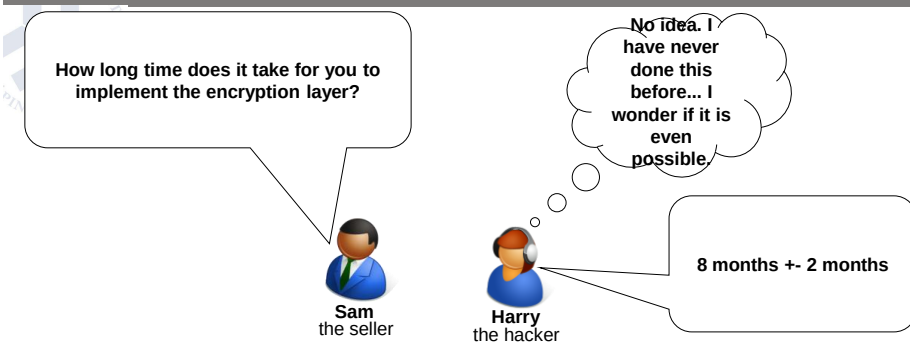
A key to success - buffer time

Buffer Time

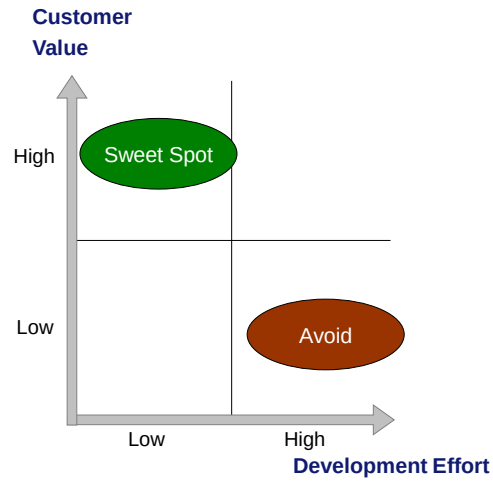


To who should you communicate the deadlines?

Effort Estimation in reality

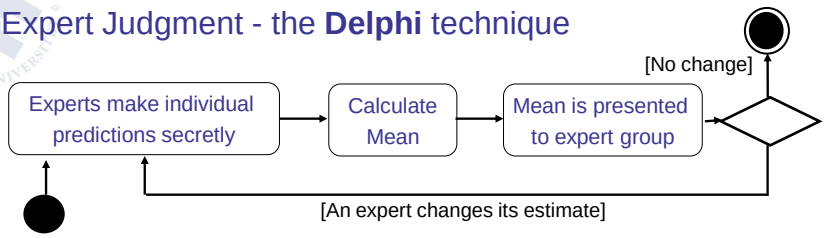


Prioritization of requirements



Effort Estimation

Expert Judgment - the **Delphi** technique



Algorithmic Methods - COCOMO and COCOMO II

COCOMO (Boehm, 1981)

- An formula where parameters are estimated using real projects.
- Input: No of code lines
- Output: Effort (time)

COCOMO II

- Takes into account changes in SE, such as component reuse, prototyping
- Other inputs than number of code lines. E.g. function-points (e.g. external in/out, user interactions, files)

Illustrating example, COCOMO

- Effort = C1 EAF (Size)^{P1}
  - Effort = number of staff months
  - C1 = scaling constant
  - EAF = Effort Adjustment Factor
  - Size = number of delivered, human produced source code instructions (KDSI)
  - P1 = exponent describing the scaling inherent of the process (0.91-1.23)

Illustrating example, COCOMO II

Predict maintenance size:

- Size = ASLOC *0.01*
  - Assessment and Assimilation (0-8) (effort to test other S/W)
  - Software Understanding (10-50) (low:good structure)
  - 0.4 * percentage of changed design
  - 0.3 * percentage of changed code
  - 0.3 * percentage of integrated external code

Algorithmic or parametric methods

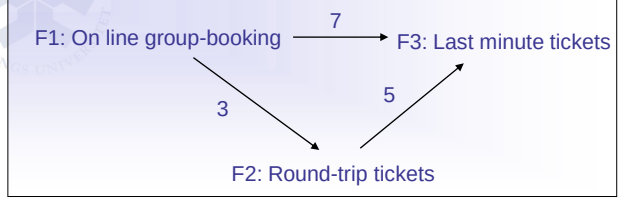
Pros:

- Based on empirical data
- Potential up to +/- 20 % accuracy
- No human bias

- Cons:
- Data collection planned and perfomed
- Expensive consultants
- Rapid change in technology

Relative importance – Analytical Hierarchy Process

1. Expert pairwise comparison



2. Comparison matrix

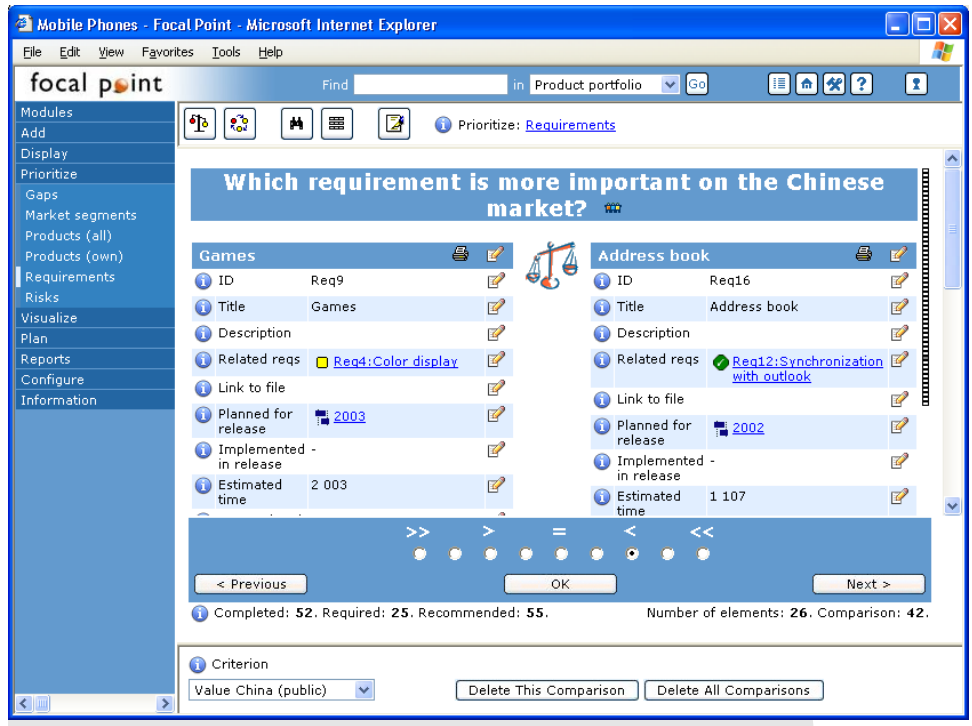
	F1	F2	F3
F1	1	1/3	1/7
F2	3	1	1/5
F3	7	5	1

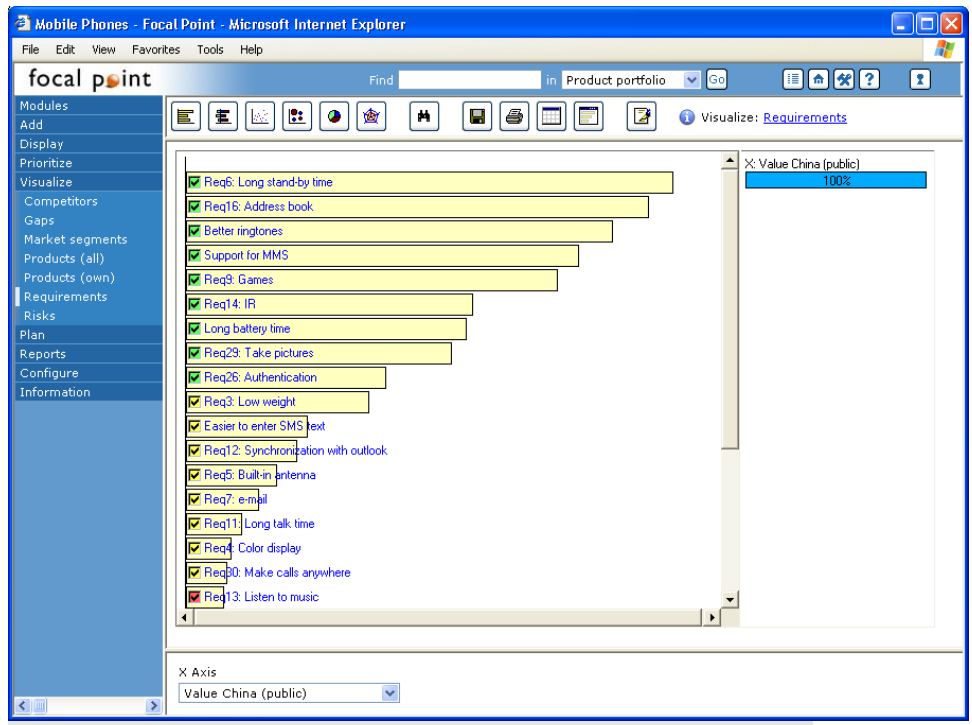
3. Calculate normalized eigenvector = relative importance

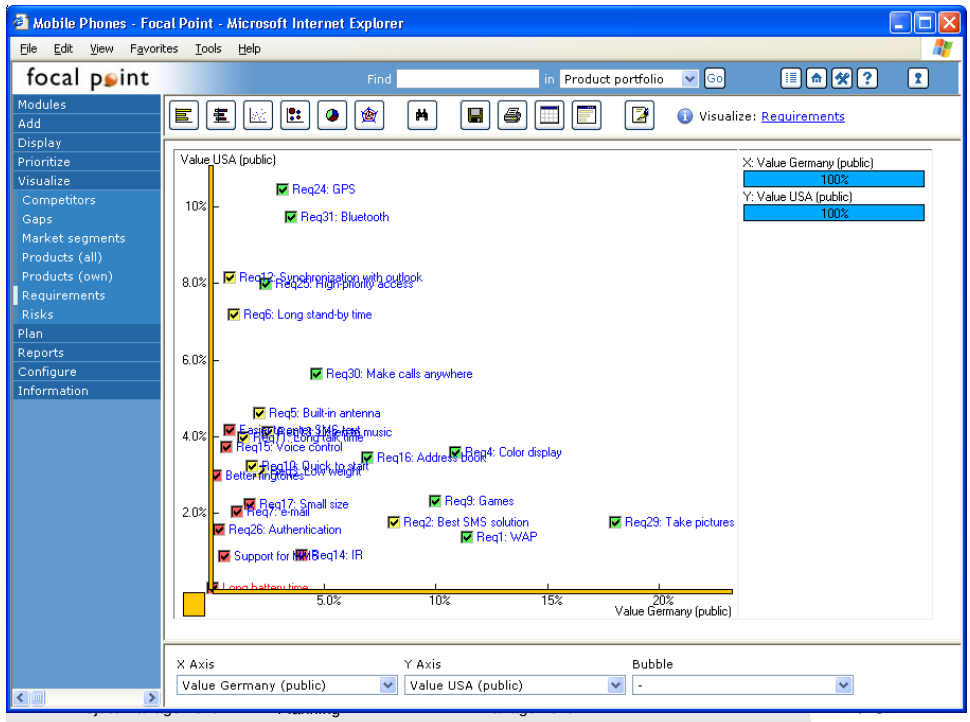
Approximation:

F1		0.083
F2	=	0.193
F3		0.724

For enthusiasts: http://www.boku.ac.at/mi/ahp/ahptutorial.pdf


Mobile Phones - Focal Point - Microsoft Internet Explorer
File Edit View Favorites Tools Help
focal point
Find in Product portfolio Go
Modules
Add
Display
Prioritize
Gaps
Market segments
Products (all)
Products (own)
Requirements
Risks
Visualize
Plan
Reports
Configure
Information
Prioritize: Requirements
Which requirement is more important on the Chinese market?
Games
ID Req9
Title Games
Description
Related reqs Req4:Color display
Link to file
Planned for release 2003
Implemented in release -
Estimated time 2 003
Address book
ID Req16
Title Address book
Description
Related reqs Req12:Synchronization with outlook
Link to file
Planned for release 2002
Implemented in release -
Estimated time 1 107
>> > = < <<
< Previous
OK
Next >
Completed: 52. Required: 25. Recommended: 55.
Number of elements: 26. Comparison: 42.
Criterion
Value China (public)
Delete This Comparison
Delete All Comparisons


Mobile Phones - Focal Point - Microsoft Internet Explorer
File Edit View Favorites Tools Help
focal point
Find in Product portfolio Go
Modules
Add
Display
Prioritize
Visualize
Competitors
Gaps
Market segments
Products (all)
Products (own)
Requirements
Risks
Plan
Reports
Configure
Information
Visualize: Requirements
Req6: Long stand-by time
Req16: Address book
Better ringtones
Support for MMS
Req9: Games
Req14: IR
Long battery time
Req29: Take pictures
Req26: Authentication
Req3: Low weight
Easier to enter SMS text
Req12: Synchronization with outlook
Req5: Built-in antenna
Req7: e-mail
Req11: Long talk time
Req4: Color display
Req30: Make calls anywhere
Req13: Listen to music
X: Value China (public)
100%
X Axis
Value China (public)



AHP usage

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Pros:

- Multiple criteria
- Simple comparison
- Fast
- Gives values on rational scale

Cons:

- Grows quadratically
- Relative values only
- Though chains of inconsistency
- Hard to add new alternatives
- Needs a tool

Expert judgment – Planning Poker

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- Each developer has a set of cards, usually with values: 0, ½, 1, 2, 3, 5, 8, 13, 20, 40, 100, ”don’t know”
- Values translate into days or “points”
- Requirement and user story is described
- All developers picks a card
- All disclose their cards
- Discussion, time-boxed, lowest and highest estimator start.
- New estimation round

Enthusiasts: http://www.planningpoker.com/

Planning poker

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Pros:

- Each participant make own decision
- All participants are active
- Participants get deeper knowledge
- Iterative work
- Consensus based final estimate
- Fun

Cons:

- Need of tools for distributed projects
- The orderer of the project needs to take consequences
- Risk of over-rating confidence when too little information is present

Part III
Risk Management

What is a risk?

Something that can eliminate full success of the project

Examples:

Staff turnover - Experienced team members will leave the project

Requirement change - Significant requirements will change late in the process.

Size underestimated - The size project was larger then expected

Kinds of risks

General ⟷ Project Specific

"A team member gets sick"

"There is a risk that the project gets delayed"

"The delivery of the development hardware environment is delayed."

"Anders needs to visit his family, since his father is dying."

Direct ⟷ Indirect

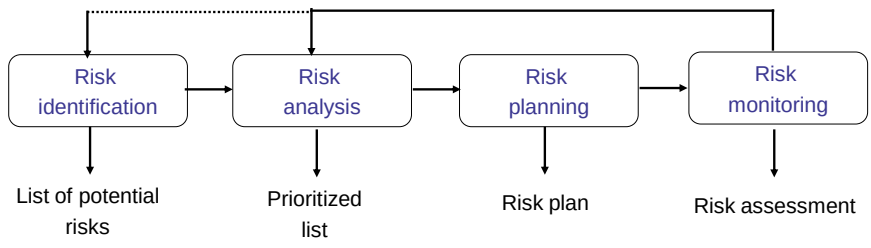
The project has great control

"The Windows platform will not scale"

Risk where the project has little control

"The servers will stop running due to an earthquake"

What is risk management?



"What can go wrong"

"How bad is it"

"What shall we do with it"

"Has the probability changed?"

1. Risk Identification

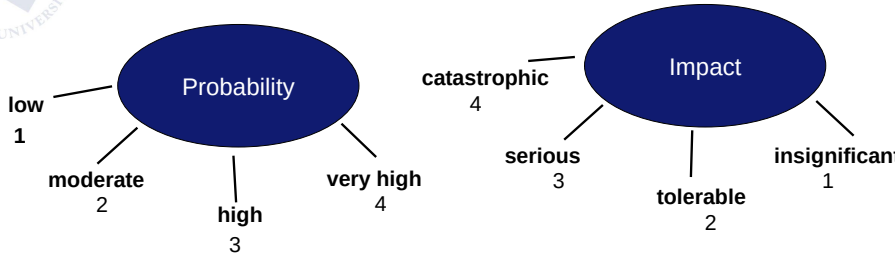
Brainstorming with the whole team for 10 minutes.

What can go bad?!?

Types of risks

- *Technology risks* -
  Hardware/software technology used for development, e.g. using Java
- *People risks* -
  people in the development team
- *Organizational risks*
- *Tools risks* -
  Risks with the current tool used
- *Requirements risks* -
  Changes in customer requirements
- *Estimation risks* -
  Wrong project estimations

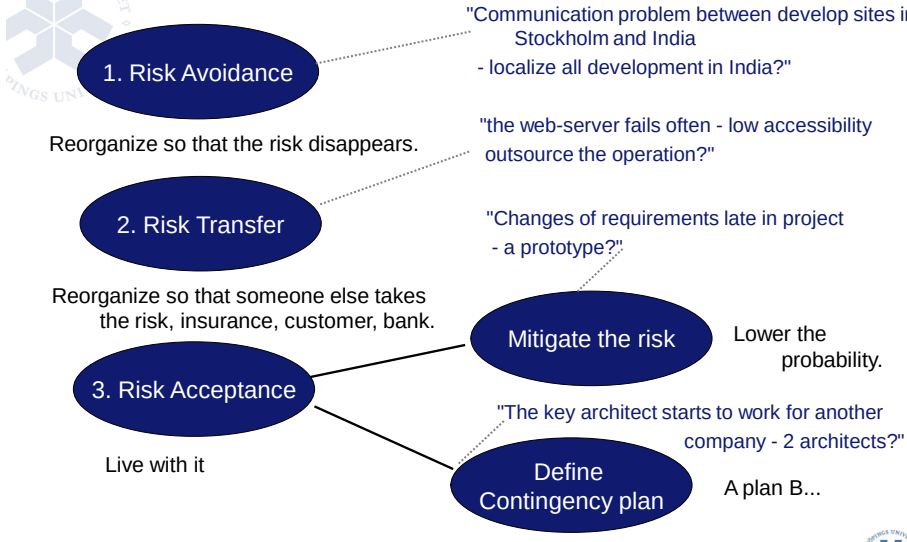
2. Risk Analysis



Probability x Impact = Risk Magnitude Indicator

Sort list after risk magnitude

3. Risk Planning



Example

Analyze

No	Risk Description	Probability	Impact	Risk Factor
1	During implementation it is discovered that the new web-platform cannot talk to the legacy database system	Moderate (2)	Serious (3)	6

Plan

Avoid risk Do not introduce a new web-platform. Use the existing platform.
Transfer risk Sign a contract with a contractor, who guarantees access to the system.
Accept risk
Mitigate Create a prototype early in the process. Solve issues before implementation phase
Contingency plan Transfer the whole old legacy database system to a modern DBMS.

Make the risks useful

Part IV

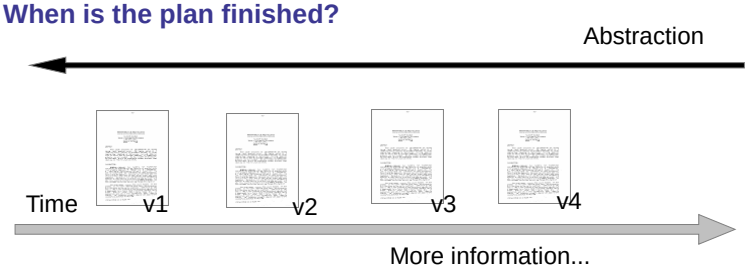
Communication and Documentation

The Project Plan

Why a project plan?

- Tool for the project manager
- Communication medium between project members and other stakeholders
- **What** should be done, **when** and by **who**

When is the plan finished?



The Project Plan - Content

Project Description

- Background to the project
- Relevant constraints (budget etc.)
- Project Goal
- Start and expected end date.

Project Organization

- Roles
- Knowledge / skill
- Communication and reports

Risk Management

- Risks, Probability and Impact
- Mitigation and Contingency plan

Time and Resource Plan

- Milestones
- Tollgates
- Deliverables
- Activities
- Resources

Training Plan

- Needed knowledge and skills.
- Who needs what? Budget?

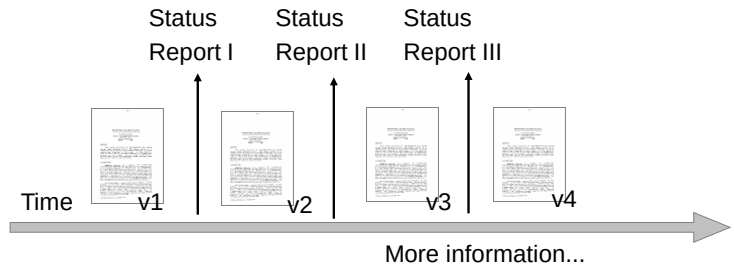
Change and configuration management

(In larger projects, this part is a document of its own.)

Project Status Reports

Content of a status report?

- Summary - current status
- What has happened since last report
- What happens next (both in long and short term)
- Problems and risks



Finally, never underestimate...

... a project Kick-off