Requirements Engineering
Lecture 3: Requirements Evaluation

S. Bruinsma
Sep-16

Fontys University of Applied Sciences

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Prepare presentation
Last name: H-K

Presentations

Beware: If 1 assignment = I, Report = mandatory

So: take notes!

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RENG in the news

EDITION: INTERNATIONAL | U.S. | MÉXICO | ARABIC

TV: CNNi | CNN en Español

Set edition preference

CNN

Home | Video | World | U.S. | Africa | Asia | Europe | Latin America | Middle East | Business | Wor

Reflected light from London skyscraper

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St Helena airport too windy to open

9 June 2016 Last updated at 19:21 BST

The opening of an airport on the British overseas territory of St Helena has been delayed indefinitely due to high winds.

The £285m project is being paid for by the Department for International Development and was due to open in May.

Relate

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Moment of
blast caught
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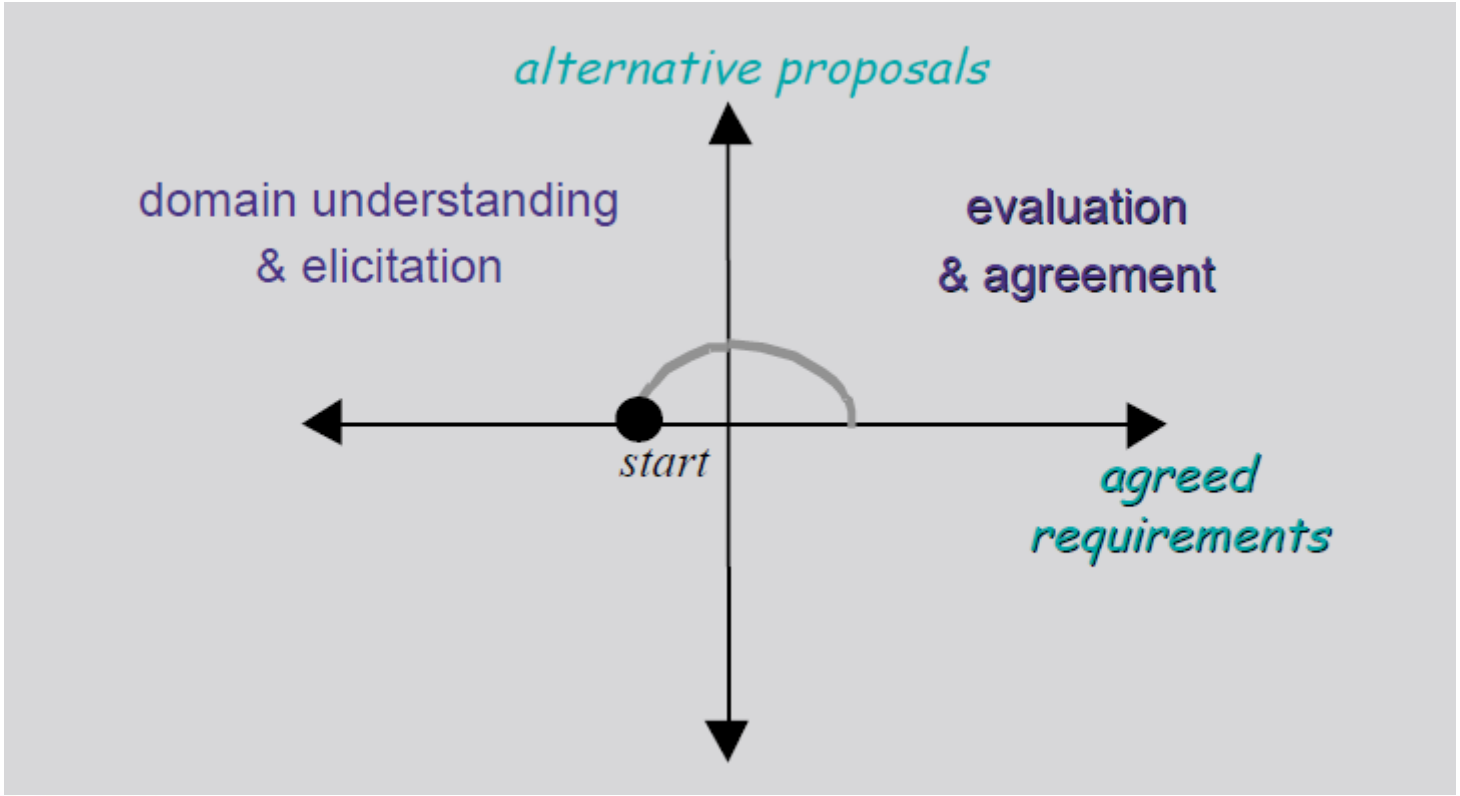
Requirements Evaluation



Roadmap

- Inconsistency management
  - Types of inconsistency
  - Handling inconsistencies
  - Managing conflicts
- Risk analysis
  - Types of risk
  - Risk management (identification, assessment, reduction)
- Prioritisation
  - Value cost prioritization

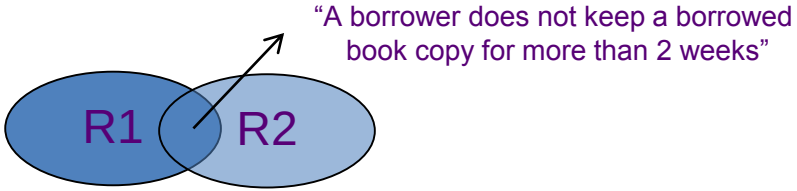
Types of inconsistency

- Terminology inconsistency
- Designation inconsistency
- Strong conflict
- Weak conflict or divergence

Weak conflict or divergence

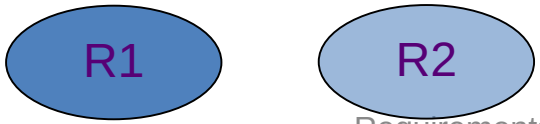
- Unsolvable in some cases:
  - Library Management System
    - Library staff: R1 *“a borrower should return a borrowed book copy within two weeks”*
    - Borrower: R2 *“a borrower should keep a borrowed book copy as long as she/he needs it”*

Might seem insolvable????



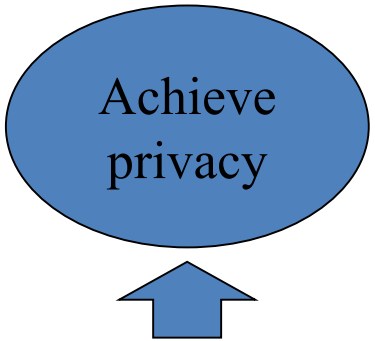
Strong conflict

- Unsolvable in all circumstances
  - Meeting Scheduler System
    - Meeting participant: R1 *“the constraints of a participant may not be disclosed to anyone else”*
    - Meeting initiator: R2 *“the meeting initiator should know the participants’ constraints”*
  - Building regulatory requirements:
    - Fire department: *Tiles in kitchens shall be rough*
    - Sanitary department: *Tiles in kitchens shall be smooth*



Win-Win negotiation – step 1

- Identify the personal (win) goals of the stakeholders

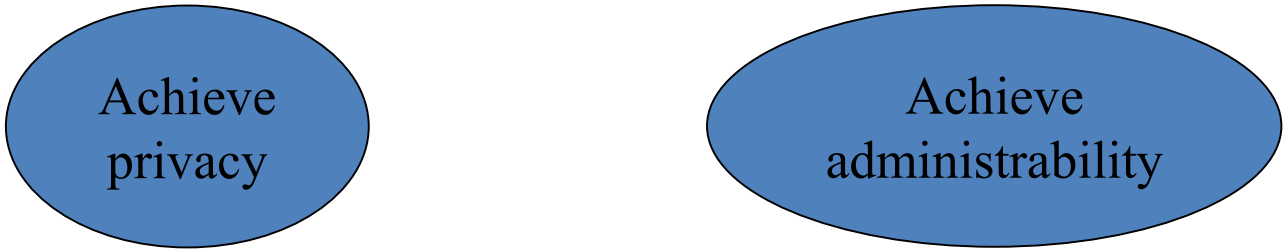


Meeting participant: R1 *"the constraints of a participant may not be disclosed to anyone else"*

Meeting initiator: R2 *"the meeting initiator should know the participants' constraints"*

Win-Win negotiation – step 2

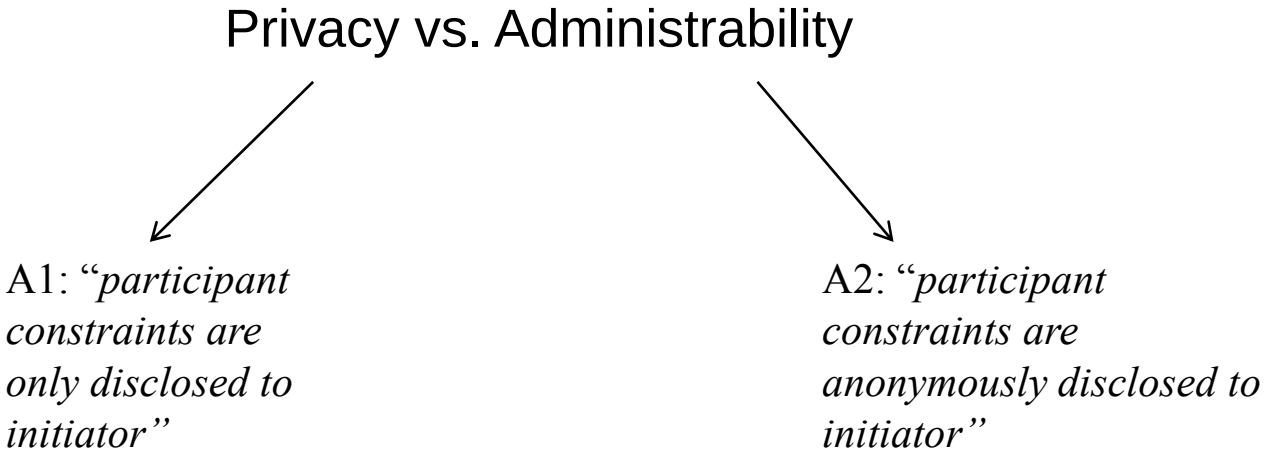
- Capture the differences between the win conditions



Privacy vs. Administrability

Win-Win negotiation – step 3

- Reconcile the differences with a mutually agreed set of alternatives with constraints and risks



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Risk!
What is a risk?
How would you identify a risk?
What types of risks?
How define the importance?
How to manage risks?

What is a risk?
Uncertain factor whose occurrence may result in loss of satisfaction of a corresponding objective

e.g. a passenger forcing doors opening while train moving
a meeting participant not checking email regularly

A risk has ….

- a **likelihood** of occurrence,

  one or more undesirable **consequences**

  e.g. passengers falling out of train moving with doors open
- Each risk consequence has ...
  - a **likelihood** of occurrence if the risk occurs (not to be confused with risk likelihood)
  - a **severity**: degree of loss of satisfaction of objective

Risk template

Back-up

Risk mitigation

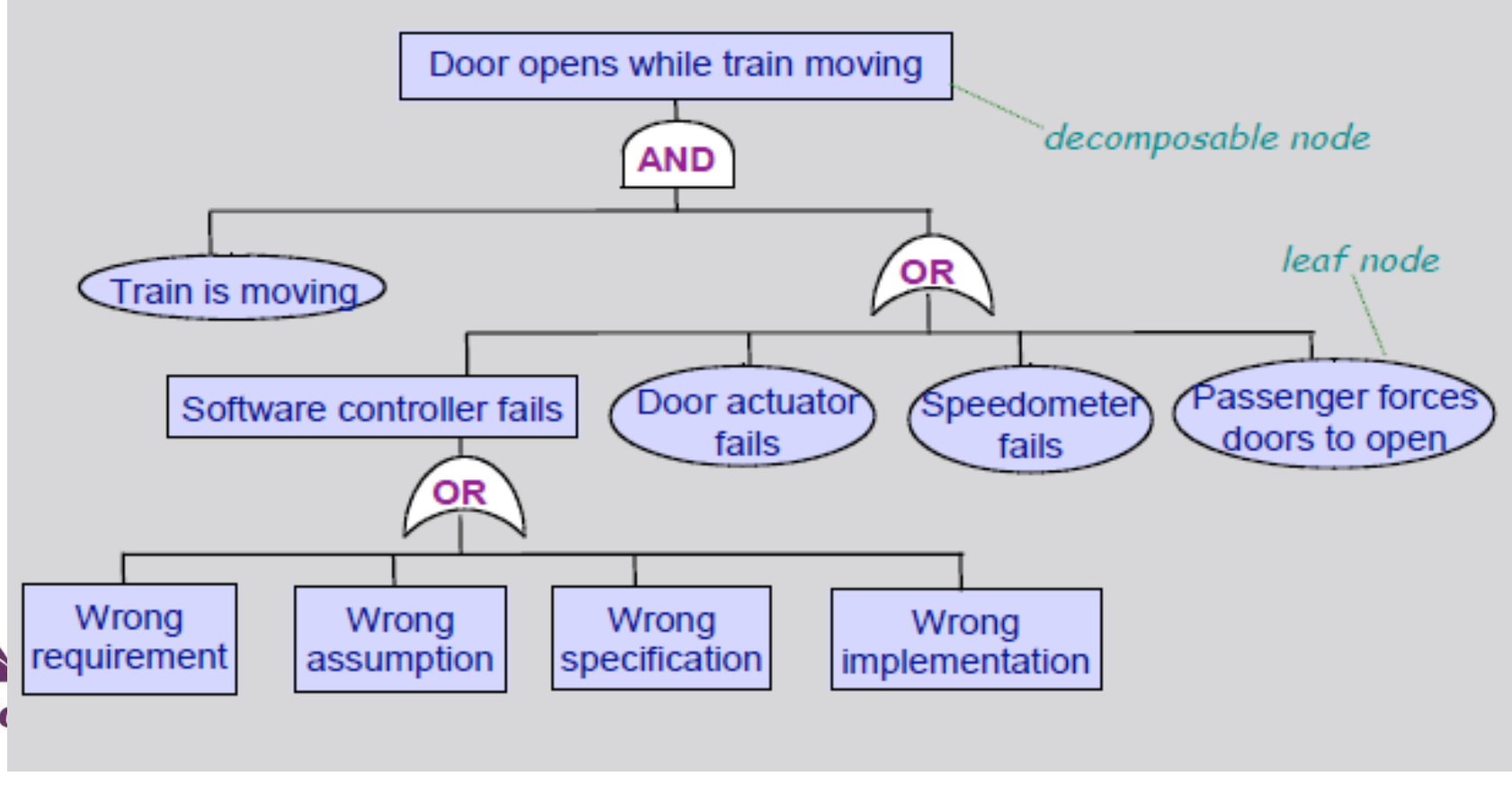
Mitigations are steps the team can take before the condition occurs, and each has one of three effects on the risk:

- **Reduce**: Risk reduction minimizes the risk's probability or its impact, or both. Ideally, a reduction method reduces probability or impact to zero, but this is not always possible.
- **Avoid**: Risk avoidance prevents the team from taking actions that increase exposure too much to justify the benefit.
- **Transfer**: Whereas the avoidance strategy eliminates a risk, the transference strategy often leaves the risk intact but shifts responsibility for it to another group to reduce the risk.

Contingency

A contingency is a step the team takes if the condition occurs or a trigger becomes true. The contingency plan documents the set of contingencies the team will use when reacting to a particular condition.

Risk tree


Door opens while train moving
decomposable node
AND
Train is moving
OR
leaf node
Software controller fails
Door actuator fails
Speedometer fails
Passenger forces doors to open
OR
Wrong requirement
Wrong assumption
Wrong specification
Wrong implementation

Risk assessment matrix

LIKELIHOOD	CONSEQUENCES				
	Catastrophic 5	Major 4	Moderate 3	Minor 2	Insignificant 1
Almost certain 5	10	9	8	7	6
Likely 4	9	8	7	6	5
Possible 3	8	7	6	5	4
Unlikely 2	7	6	5	4	3
Rare 1	6	5	4	3	2

+ Easy to use

- Limited conclusions: coarse-grained, subjective estimates, likelihood of consequences not considered

Risk assessment

Risk exposure for risk r with independent consequences c:

$$\text{Exposure}(r) = \sum_C \text{Likelihood}(c) \times \text{Severity}(c)$$

Classroom assignment

- Calculate the risk exposure (probable loss) for a mortgage portfolio:
  - Risk: Probability of Default (PD)
  - Severity risk: Loss Given Default (LGD)

PD	Mortgage sum	LGD
0,1	300.000	30.000
0,02	450.000	25.000
0,5	125.000	15.000
0,01	95.000	70.000
	970.000	**140.000**

Classroom assignment 7

- Calculate the risk exposure for:
  - Risk: Door open while train is moving
  - Likelihood risk: 0,02

Consequence	Likelihood consequence
Loss of life	0,1
Serious injuries	0,3
Train car damaged	0,4
reputation	0,7

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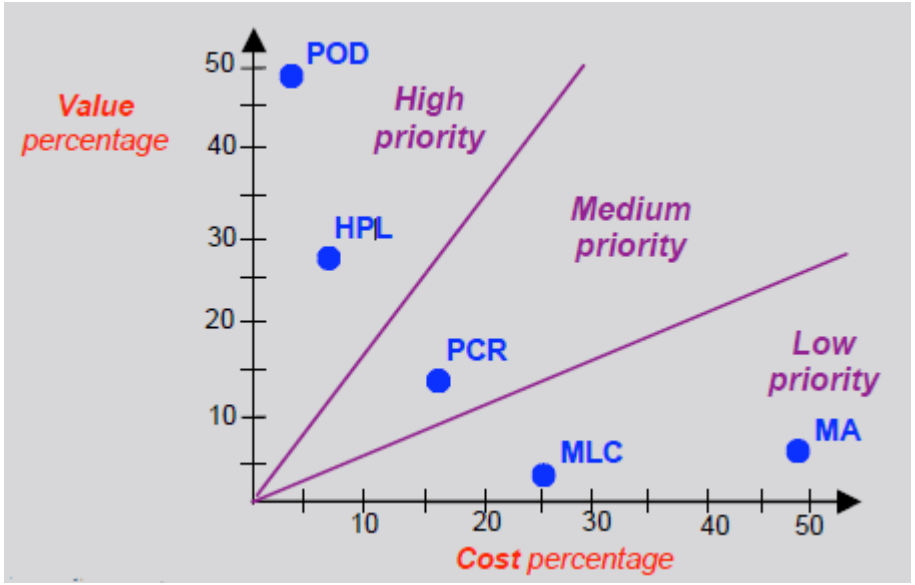
Requirements prioritization

- Why?
- How recorded?

Value – Cost prioritisation

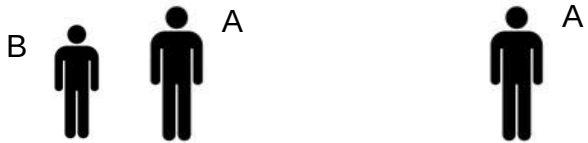


- For each req: Three steps:
  1. Estimate Value
  2. Estimate Costs
  3. Plot contributions

POD – Produce optimal dates
HPL – Handle preferred locations
PCR – Parameterize Conflict resolution
MLC – Multi lingual communication
MA – Provide meeting assistant

How to estimate relative cost and value?

- Pairwise comparison:
- Traditional method calculate the **cost** by money spent
  - slow, vague, and various in many factors
- Prioritization based on **relative** value rather than **absolute** assignments
  - Fast, accurate, and trustworthy



You can easily tell **A** is taller than **B**, but it is difficult to tell what **A**'s height is.

Step 1:Compare requirements pairwise (value)

- Scale for comparing R_i's contribution to value to R_j's:
  1: contributes equally *7* : contributes very strongly more
  3: contributes slightly more *9* : contributes extremely more
  5 : contributes strongly more
- In comparison matrix, $R_{ji} = 1 / R_{ij}$ $(1 \leq i, j \leq N)$

Crit: **value**	Produce optimal date	Handle preferred locations	Parameterize conflict resolution strategy	Multi-lingual communication	Meeting assistant
Produce optimal date	1	3	5	9	7
Handle preferred locations	1/3	1	3	7	7
Parameterize conflict resolution strategy	1/5	1/3	1	5	3
Multi-lingual communication	1/9	1/7	1/5	1	1/3
Meeting assistant	1/7	1/7	1/3	3	1

Step 2: Normalize matrix

- Criterion distribution = eigenvalues of comparison matrix
  - 2.a Normalize columns: $R'_{ij} := R_{ij} / \sum_i R_{ij}$
  - 2.b Average accross lines: Contrib (R_i, Crit) = $\sum_j R'_{ij} / N$

The result:

	Produce optim. date	Handle preferred locations	Param. conflict resolution strategy	Multi-lingual communication	Meeting assistant	Relative value
Produce optimal date	0.56	0.65	0.52	0.36	0.38	**0.49**
Handle preferred locations	0.19	0.22	0.31	0.28	0.38	**0.28**
Parameterize conflict resolution strategy	0.11	0.07	0.10	0.20	0.16	**0.13**
Multi-lingual communication	0.06	0.03	0.02	0.04	0.02	**0.03**
Meeting assistant	0.08	0.03	0.03	0.12	0.05	**0.07**

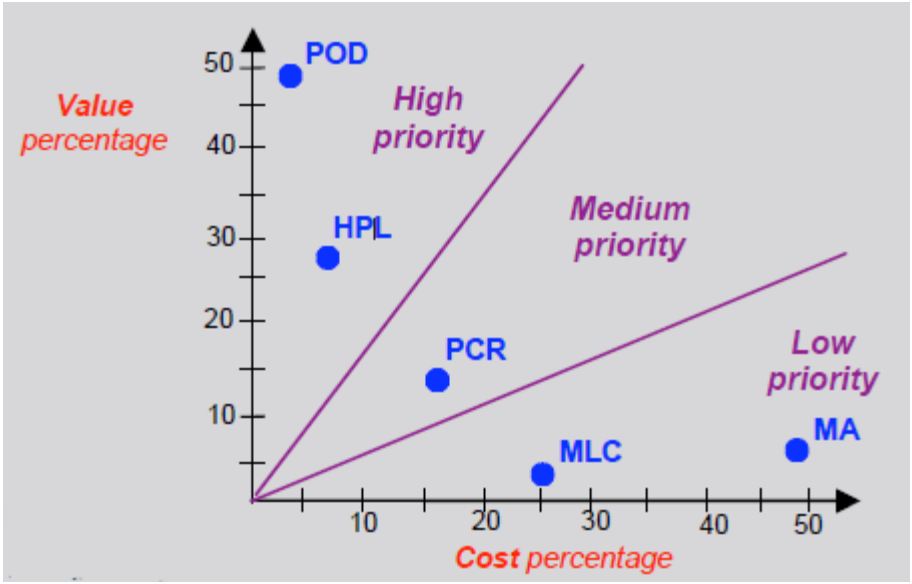
Calculation

1,00	3,00	5,00	9,00	7,00
0,33	1,00	3,00	7,00	7,00
0,20	0,33	1,00	5,00	3,00
0,11	0,14	0,20	1,00	0,33
0,14	0,14	0,33	3,00	1,00
1,79	**4,62**	**9,53**	**25,00**	**18,33**

1. **The comparison matrix**
2. **Sum the columns**
3. **Divide cells by sum**
4. **Sum the rows**
5. **Divide the sums by N (5)**

0,56	0,65	0,52	0,36	0,38	**2,48**	**0,495**
0,19	0,22	0,31	0,28	0,38	**1,38**	**0,276**
0,11	0,07	0,10	0,20	0,16	**0,65**	**0,131**
0,06	0,03	0,02	0,04	0,02	**0,17**	**0,034**
0,08	0,03	0,03	0,12	0,05	**0,32**	**0,064**

Plotting contributions on value-cost diagram



- Redo the steps for the costs
- Visualize value/cost contributions on diagram partitioned in selected priority levels

POD – Produce optimal dates
HPL – Handle preferred locations
PCR – Parameterize Conflict resolution
MLC – Multi lingual communication
MA – Provide meeting assistant

Assignment 8
Create value cost diagram:

See separate document

Assignment 9
Case:

Make a mock-up of the user interface of the case assigned to you

For next week

- Upload no later than Thursday 17.00 the completed assignments 7, 8 and 9
- Presents and discusses (3-5 min) the solutions to the assignments:

  Lastname(s): L-P

- Read chapter 3 of: van Lamsweerde

Assignment 10 (after next weeks interviews)
Case:

Create the 2nd chapter in the SRS

1) Product perspective
2) Product Functions (Use cases)
3) User Characteristics
4) Constraints → e.g. regulations, HW and resource limitations
5) Assumptions and dependencies

Questions?

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Example Risk template

Instructions:
Use this sample spreadsheet as a template to detail the complete set of identified risks for a product, situation, event, etc. For explanation of each column, rest your cursor over the column heading for the pop-up comment to appear.
This spreadsheet displays sample risks associated with a company's plan to reorganize their IT department.

Master Risks List - Contoso

Project: IT Reorganization (ITREORG010)

Sources of Risk: People, Process, Technology, Environmental Factors

Modes of Failure: Performance, Capability, Security, Cost

List Last Reviewed: 4/3/2007

SOURCE OF RISK	DOWNSTREAM EFFECT	RISK CONDITION	EXPLANATION	OPERATIONAL CONSEQUENCES	BUSINESS EFFECT	PROBABILITY	INITIAL IMPACT	EXPOSURE	MITIGATION	CONTINGENCY	TRIGGER	LAST UPDATE	TEAM MEMBER ASSIGNED	ACTIONS	STATUS	MODIFIED PROBABILITY	MODIFIED IMPACT	EXPOSURE
Process	Performance Cost	**Present service desk process inefficiencies could lead to increased cost to support current IT services.**	Field office support is not a coordinated effort with centralized help desk functions. Often field support professionals respond to and resolve incidents without those incidents being recorded and a knowledge base being populated.	Without a comprehensive, shared knowledgebase of incidents, problems and resolutions, redundant incident and problem management activity will be performed throughout the support organization.	Extended service outages and inadequate communications regarding status of resolutions will further alienate the customer from IT. This will enforce the view of IT as not being aligned with the needs of the business. The perceived value of the services provided by IT will be diminished.	70%	5	3,5	Implement MOF Incident and Problem management processes. Coordinate second and third line support groups.	Allocation of excessive resources to accommodate firefighting reactive issues. Bear the costs of increased support activities and staff.	Continual firefighting. Repeated problems occur. Uncoordinated and recurring changes. Poor meantime to resolution.		Team A	Probability has decreased due to the implementations of MOF-based incident and problem management processes. Original probability will be kept in the Master Risk List and Risk Knowledge Base for historical purposes.	Open	40%	5	2
People	Performance Capability	**Changes implemented by one IT group could negatively affect systems and services delivered to other IT groups.**	Although change management exists within some groups, a common formal change management process does not exist across all IT groups. Additionally, some changes, when reviewed at the weekly status meeting, have not been properly assessed for impact to all groups.	Lack of commitment to a standard set of operational processes will lead to business units that fail to trust each other. Frustration between IT groups will occur as systems under the responsibility of one group will be affected by others.	Service disruptions caused by failed changes will interrupt business functions. Additionally, failure to communicate planned downtime of mission-critical services to users and the help desk before service interruptions occur will result in reduced trust in IT. This lack of trust will force the business to wonder about the value of the current IT operations and force them to think about outsourcing IT functions.	65%	5	3,25	A standard formalized and communicated MOF-based change management process will be implemented across all IT groups.	Assign additional resources to reactive problem management. Communication to customers and end-users in a prompt, descriptive, and meaningful manner can reduce the negative effect on customer satisfaction.	Information gathered during project status meetings and operations management reviews regarding process and service outages indicate that this risk is currently being actualized at some level.		Team B	Probability has decreased due to the implementation of MOF-based change management processes. Original probability will be kept in the master risks list and risk knowledge base for historical purposes.	Open	35%	5	1,75
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What?, if, then?

	A	B	C	D	E	F
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2	**Master Risks List - Contoso**				**Sources of Risk:** People, Process, Technology, Environmental Factors	
3	**Project: IT Reorganization (ITREORG010)**				**Modes of Failure:** Performance, Capability, Security, Cost	
4						
5						
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Probability, impact, mitigation, contingency, trigger

PROBABILITY	INITIAL IMPACT	EXPOSURE	MITIGATION	CONTINGENCY	TRIGGER
80%	5	4	Establish an additional external vendor relationship for temporary or permanent hardware acquisition suitable for lab environment. Utilize virtual machines within available hardware to simulate additional hardware.	Examine cost of delay to production implementation. Borrow equipment currently being utilized for other lower priority purpose. Notify operations staff of significant change procedure to copy production environment to test environment.	Frequent monitoring of requisition process shows no progress to hardware arrival.
20%	5	1	Maintain regular communication with all project managers and project sponsors.	Aggressively train and go through knowledge transfer. Adjust deployment schedule as necessary.	Personnel involved with project turnover or Contoso financial situation greatly changes.

Current status

List Last Reviewed: 4/3/2003

LAST UPDATE	TEAM MEMBER ASSIGNED	ACTIONS	STATUS	MODIFIED PROBABILITY	MODIFIED IMPACT	EXPOSURE
	Team A	Probability has decreased due to new relationship with Vendor X. This will allow the rapid acquisition of necessary hardware, if needed. Original probability will be kept in the master risks list and risk knowledge base for historical purposes.	Open	30%	5	1,5
		Probability has increased due to project team member changes. Original probability will be kept in the master risks list and risk knowledge				

Fontys

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SOURCE OF RISK	DOWNSTREAM EFFECT	RISK CONDITION	EXPLANATION	OPERATIONAL CONSEQUENCES	BUSINESS EFFECT	PROBABILITY	INITIAL IMPACT	EXPOSURE	MITIGATION	CONTINGENCY	TRIGGER	LAST UPDATE	TEAM MEMBER ASSIGNED	ACTIONS	STATUS	MODIFIED PROBABILITY	MODIFIED IMPACT	EXPOSURE
Process	Performance Cost	**Present service desk process inefficiencies could lead to increased cost to support current IT services.**	Field office support is not a coordinated effort with centralized help desk functions. Often field support professionals respond to and resolve incidents without those incidents being recorded and a knowledge base being populated.	Without a comprehensive, shared knowledgebase of incidents, problems and resolutions, redundant incident and problem management activity will be performed throughout the support organization.	Extended service outages and inadequate communications regarding status of resolutions will further alienate the customer from IT. This will enforce the view of IT as not being aligned with the needs of the business. The perceived value of the services provided by IT will be diminished.	70%	5	3,5	Implement MOF Incident and Problem management processes. Coordinate second and third line support groups.	Allocation of excessive resources to accommodate firefighting reactive issues. Bear the costs of increased support activities and staff.	Continual firefighting. Repeated problems occur. Uncoordinated and recurring changes. Poor meantime to resolution.		Team A	Probability has decreased due to the implementations of MOF-based incident and problem management processes. Original probability will be kept in the Master Risk List and Risk Knowledge Base for historical purposes.	Open	40%	5	2
People	Performance Capability	**Changes implemented by one IT group could negatively affect systems and services delivered to other IT groups.**	Although change management exists within some groups, a common formal change management process does not exist across all IT groups. Additionally, some changes, when reviewed at the weekly status meeting, have not been properly assessed for impact to all groups.	Lack of commitment to a standard set of operational processes will lead to business units that fail to trust each other. Frustration between IT groups will occur as systems under the responsibility of one group will be affected by others.	Service disruptions caused by failed changes will interrupt business functions. Additionally, failure to communicate planned downtime of mission-critical services to users and the help desk before service interruptions occur will result in reduced trust in IT. This lack of trust will force the business to wonder about the value of the current IT operations and force them to think about outsourcing IT functions.	65%	5	3,25	A standard formalized and communicated MOF-based change management process will be implemented across all IT groups.	Assign additional resources to reactive problem management. Communication to customers and end-users in a prompt, descriptive, and meaningful manner can reduce the negative effect on customer satisfaction.	Information gathered during project status meetings and operations management reviews regarding process and service outages indicate that this risk is currently being actualized at some level.		Team B	Probability has decreased due to the implementation of MOF-based change management processes. Original probability will be kept in the master risks list and risk knowledge base for historical purposes.	Open	35%	5	1,75
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