SENG 471

Software Requirements Engineering

Prioritizing Requirements

Why Prioritize Requirements?

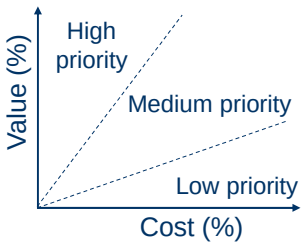
- Planning SW development → all requirements in a SRS
  - enough time, budget or resources
  - different releases (stages)
- Basics of prioritization → each group of requirements
  - importance, cost, risk
  - must include, should exclude, nice to have
- Challenges of prioritization→ dependences, conflicts

Prioritization Approaches

- Priority classification
  - Assign each group of requirements to a priority classification
  - Examples: high, medium, low
- Cost-value Approach
  - Prioritize requirements using ROI
- Others approaches
  - Quality Function Deployment (QFD)
  - Total Quality Management (TQM)
  - WIN-WIN

Cost-Value Approach - AHP

- Calculate return on investment (ROI)
  - For each group of requirements
  - The cost-value tradeoff
- Analytic Hierarchy Process (AHP)
  1. Relative value: a pair-wise comparison of values by stakeholders.
  2. Relative cost: a pair-wise comparison of costs by SE.
  3. ROI graph: to determine priority (SE and stakeholders)



AHP - 1. Relative value

	R1	R2	R3	R4
R1	1	1/3	2	4
R2	3	1	5	3
R3	1/2	1/5	1	1/3
R4	1/4	1/3	3	1

normalise columns

	R1	R2	R3	R4
R1	0.21	0.18	0.18	0.48
R2	0.63	0.54	0.45	0.36
R3	0.11	0.11	0.09	0.04
R4	0.05	0.18	0.27	0.12

sum the rows

	sum	sum/4
R1	1.05	0.26
R2	1.98	0.50
R3	0.34	0.09
R4	0.62	0.16

result

R1 – 26% of the value
R2 – 50% of the value
R3 – 9% of the value
R4 – 16% of the value

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If the cost of each group of requirements is known, how to get its relative cost ????

AHP - 2. Relative cost

Same process to determine relative cost as relative value, if the cost for each group of requirements is UNKNOWN.

- Create n x n matrix (n groups of requirements)
  - For element (x,y) in the matrix enter:
    - 1 (equal cost), 3, 5, 7, or 9
    - 2,4,6,8 if compromise needed
  - For (y,x) enter the reciprocal.
- Estimate the eigenvalues:
  - Normalize the columns
  - Sum the rows
- Result: the estimated % of total cost of the project

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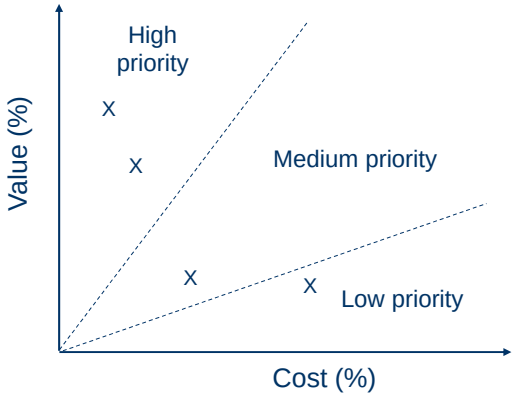
AHP - 3. ROI graph

- Plot ROI graph



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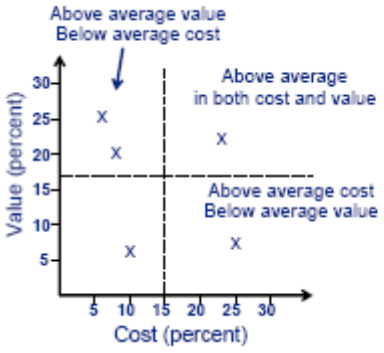
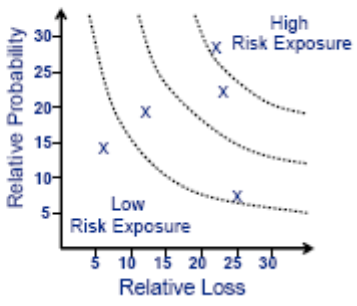
Other Selections





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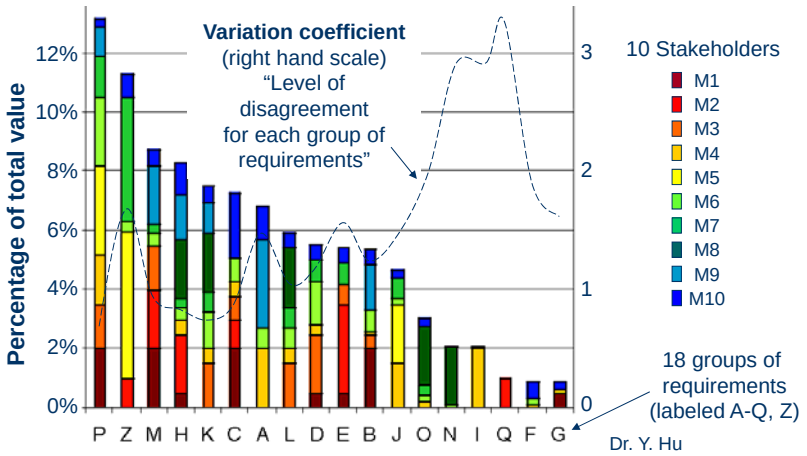
Case Study

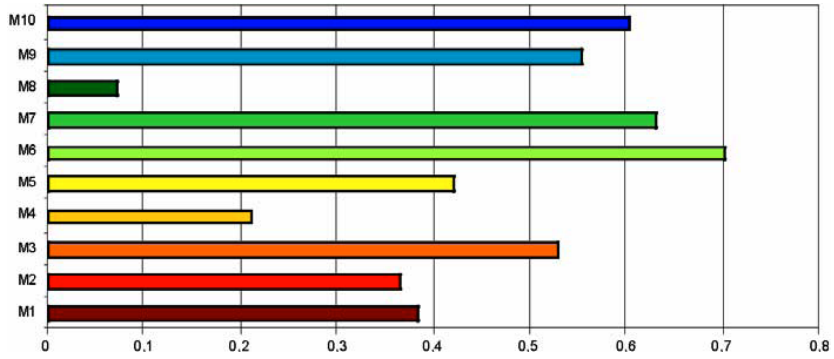
- 10 stakeholders
- 18 groups of requirements
- Each stakeholder prioritized the requirements
- Ranked the priorities
- Studied how the different stakeholders voted and the resulting priority ranking

Visualizing - Value by Stakeholders



Visualizing - Stakeholder Satisfaction

- Graph showing correlation between stakeholders' priorities and the requirements' priorities



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Weighting Stakeholders

- Value stakeholders differently
  - credibility
  - size of constituency represented
- Weight stakeholders' priorities
  - Assign a weight to each stakeholder

$$\sum_{k=1}^{m} w_k = 1$$

  - Compute priority of each stakeholder

$$p_i = \sum_{k=1}^{m} w_k p_{ik}$$

p_i is the priority of requirement i
w_k is the weight of stakeholder k
p_{ik} is the priority of stakeholder k on requirement i
m is the number of stakeholders

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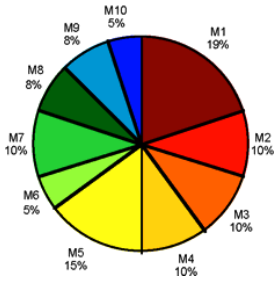
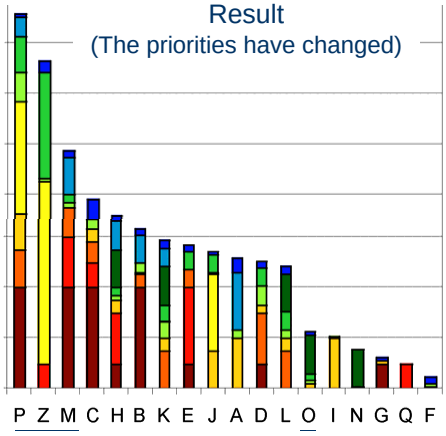
Weighting Stakeholders (cont'd)

- Weight each stakeholder





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Conflict Resolution - Basics

- Defining conflict:
  - In RE, focus typically is on logical inconsistency:
    - Conflict is a divergence between goals - there is a feasible boundary condition that makes the goals inconsistent
    - Conflict may occur between individuals, groups, organizations, or different roles played by one person
- Resolution method:
  - Three types of resolution method can be distinguished:
    - Co-operative (or collaborative) methods, which include negotiation and education;
    - Competitive methods, which include combat, coercion and competition;
    - Third Party methods, which include arbitration and appeals to authority.

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Conflict Resolution - Approaches

- Negotiation
  - is collaborative exploration:
    - participants attempt to find a settlement that satisfies all parties as much as possible.
  - also known as:
    - integrative behavior
    - constructive negotiation
  - distinct from:
    - distributive/competitive negotiation
- Competition
  - is maximizing your own gain:
    - no regard for the degree of satisfaction of other parties.
    - but not necessarily hostile!
  - Extreme form:
    - when all gains by one party are at the expense of others
- Third Party Resolution
  - participants appeal to outside source
    - the rule-book, a figure of authority, or the toss of a coin.
    - can occur with the breakdown of either negotiation or competition as resolution methods.
  - types of third party resolution
    - judicial: cases presented by each participant are taken into account
    - extra-judicial: a decision is determined by factors other than the cases presented (e.g. relative status of participants).
    - arbitrary: e.g. toss of a coin

Recap

- Objectives
- Methods – AHP
- Case study
- Conflict resolution