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Requirements Engineering & Management

Core Activities – Negotiation

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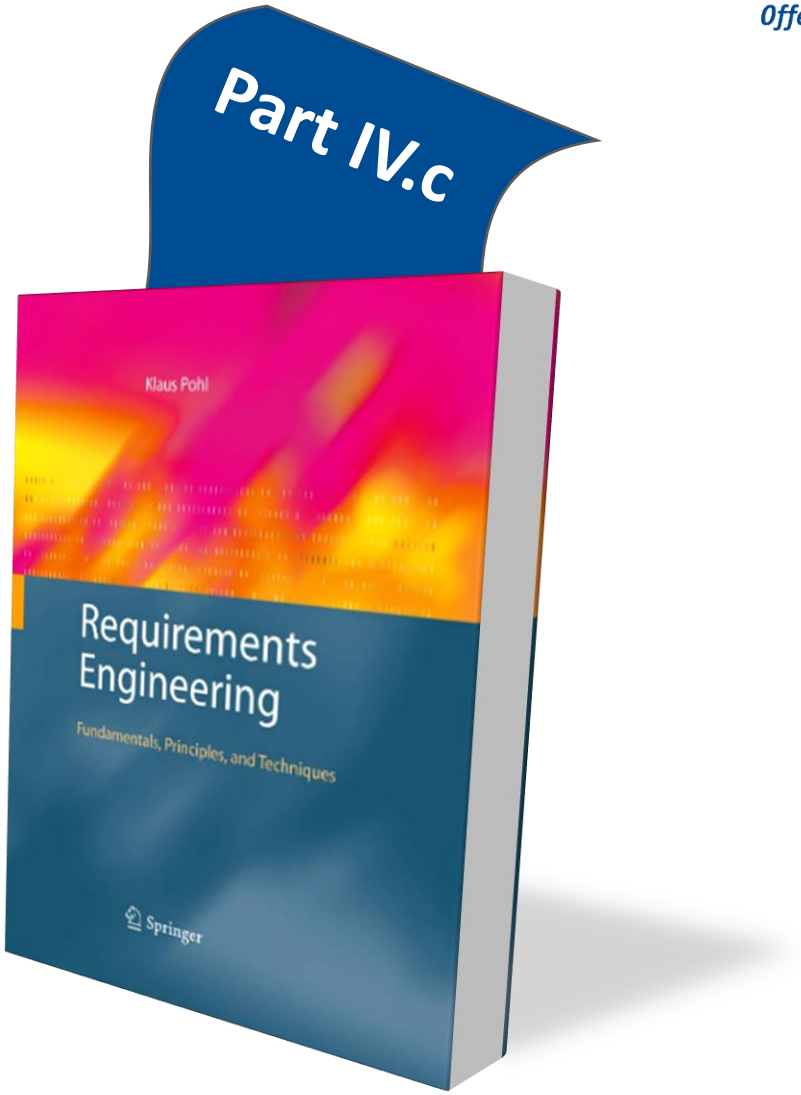
Requirements Engineering Framework

Corresponding Parts and Chapters in Textbook



Klaus Pohl: Requirements Engineering – Fundamentals, Principles, and Techniques.
Springer, Berlin Heidelberg, 2010.

Agenda

1. Introduction to Requirements Negotiation
2. Conflict Management
3. Conflict Resolution Strategies

1. Fundamentals

Motivation

- The system to be developed shall realize as many as possible **needs and wishes** of the different stakeholders.
- However, the needs and wishes **can be in conflict** or even **contradict each other**.
- Stakeholders may also have other conflicts – related to the requirements.
- **Unresolved conflicts** have **negative impact on** the requirements and thus on the **acceptance** of the system.
- During **conflict** resolution often **new ideas** and **innovative requirements** are developed.

Conflict Types

- **Subject matter conflict**: Divergent **factual needs** of stakeholders (e.g., regarding requirements of the system, context information etc.)
- **Data conflict**: Stakeholders have **contradictory interpretations** due to inconsistency or misunderstanding of requirements/data
- **Interest conflict**: Divergent personal **interests** and **motives** of stakeholders
- **Value conflict**: Divergent stakeholder **values** for assessing a subject
- **Relationship conflict**: Problems in the interpersonal relationships between stakeholders
- **Structural conflict**: Stakeholders have unequally balanced **power** and **influence**

[IREB Syllabus v.3.01; IREB Handbook v1.0.0]

Requirements Conflict

D A **requirements conflict** exists, if

1. A tangible **need** or **interest** of **stakeholders** (or groups of) **contradict** each other, or
2. Constraints (e.g. limited resources) restrict the realization of stakeholders **needs** and **interests**.

- Requirements conflicts can
  - affect all kinds of requirements artefacts,
  - be documented in one (or several) requirements artefacts.

Requirements Conflicts – Examples

A stakeholder demands the use of radar sensors for distance measurement.
Another stakeholder prefers the use of ultrasound sensors.

A stakeholder demands the use of a head-up display to display safety-relevant information to the driver.
Another stakeholder rejects this, because of possible distraction of the driver.

Stakeholder Conflict

D

A **conflict** between two or more stakeholders exists, if

1. there exists a **requirements conflict**, or
2. any **other needs and interests** not related to the system, are **incompatible**.

Definition

D The goal of the requirements negotiation is to

1. **Identify** conflicts
2. **Analyse** the conflict causes
3. **Resolve** the conflicts using appropriate strategies
4. **Document** the conflict resolution and the rationale

Use of Goals

- **Conflict identification**:
  - Try to identify conflicts at a **goal level first** – before dealing with conflicts on solution oriented requirements.
  - If a **conflict** about **solution oriented requirements** exists, **identify** the **goal(s) behind** the requirement and check if there is an agreement about the goal, or if a conflict about the goal exists.
- **Conflict resolution**:
  - Focus on the **resolution of conflicts about goals first**!
  - Many conflicts about solution-oriented requirements are in fact conflicts about associated goals.
  - **Evaluate alternative solutions** based on **goal satisfaction** or **dissatisfaction**. Chose an alternative, which satisfies most of the goals and causes the fewest conflicts.

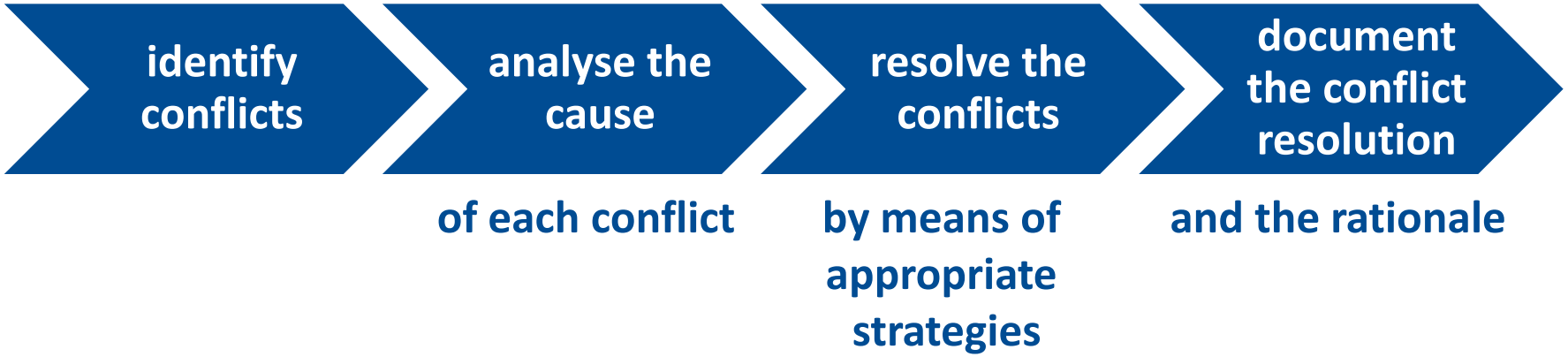
Use of Scenarios in Requirements Negotiation

- **Conflict analysis**:
  - To support a common understanding of the conflict, define **exemplary scenarios** in which the conflict occurs.
  - Identify **conflict causes** based on the scenarios.
- **Conflict resolution**:
  - **Develop** and discuss **different scenarios** in which the conflict is reduced (or even completely avoided).
  - **Evaluate** the scenarios.
  - **Decide** which scenario offers the **best solution**.

2. Conflict Management

Four Sub-Activities of Requirements Negotiation

The goal of the negotiation activity is to



Identifying Conflicts

- Conflicts **may surface during all requirements engineering activities**.
- **Conflicts** are often **not easy to detect**:
  - Pay attention during all RE activities to detect and document (possibly latent) conflicts.
  - Similar conflicts should be consolidated (e.g. different conflicts about the same goal or requirement).
- **Actively search** for conflicts and make them **explicit**!

Identifying Conflicts – Involve the Right Stakeholders

- Conflict detection requires involvement of stakeholders
  - from all **relevant parts of the requirements engineering context** (all system and development context perspectives)
  - in all **requirements engineering activities**.

- **Conflicts** will remain **undetected**, if relevant **stakeholders** are not involved

Analysing Conflicts

- A conflict can have **several causes**.
- For each conflict:
  - **Identify all reasons** behind the conflict
  - Identify the **conflict types** for each cause
  - Surface the factors impacting the conflicts:
    - **Dividers** have a **negative effect** on stakeholder relationships (i.e., further divide stakeholders)
    - **Connectors** can have a **positive effect** on stakeholder relationships (i.e., pull people together)
- **Conflict resolution** depends on the conflict type.

based on [Pohl and Rupp 2015, Moore 2014]

Resolving Conflicts

Three potential “results”:

- **Win-Lose:**
  Some stakeholders achieve their goals at the expense of other stakeholders.
- **Lose-Lose:**
  None of the conflicting stakeholders achieves their goals.
- **Win-Win:**
  All conflicting stakeholders achieve their goals completely or partially.

Creating a win-win situation provides **confidence among the stakeholders** and increases their **willingness to make a compromise**.

based on [Boehm and Ross 1989]

Achieving Win–Win Resolutions (1)

(1) Understand how stakeholders want to win

- What considers a stakeholder as benefit?
- **Correct understanding** of what stakeholders consider a benefit **facilitates establishing win-win situation**.
- **Incorrect understanding** of what stakeholders consider as a benefit **hinders win-win situations**!
- **Putting yourself in the other stakeholders' position** improves understanding of their viewpoints.

based on [Boehm and Ross 1989]

Achieving Win–Win Resolutions (2)

(2) Raise adequate expectations

- **Unrealistic expectations** of the system **make win-win situations difficult**.
- **Joint discussion** about stakeholders' expectations to **identify** (or if necessary alter) **wrong** or **unrealistic expectations**.
- Expectations shall be defined based on **objective criteria**.
- Expectations shall be **oriented towards experience** (e.g. benchmarks, expert knowledge).

based on [Boehm and Ross 1989]

Resolution Strategies – Overview

- **Negotiation**
  - The conflicting parties agree on a solution by means of negotiation.
- **Creative solution**
  - The original viewpoints of the conflicting parties are discarded and a new, creative solution is developed that harmonize the viewpoints of all conflicting parties.
- **Decision**
  - A higher authority makes a decision in favour of one conflicting party.
- **Product differentiation**
  - Consider the conflicting viewpoints as variants to be realised in different product versions.

More details follow in the next section!

based on [Masters and Albright 2002]

Document Conflict Resolutions

- Document **conflicts** and **their resolution**
  - to **ensure traceability** of positions and arguments
  - to **avoid** that achieved **resolutions are forgotten**!
  - to **facilitate** their **consideration in subsequent** requirements engineering (development) **activities**.
- Document **detected but not yet resolved conflicts** in a TODO-List

3. Conflict Resolution Strategies

Resolution Strategies – Overview

1. **Negotiation**
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2. **Creative solution**
   - The original viewpoints of the conflicting parties are discarded and a new, creative solution is developed that harmonize the viewpoints of all conflicting parties.
3. **Decision**
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4. **Product differentiation**
   - Consider the conflicting viewpoints as variants to be realised in different product versions.

based on [Masters and Albright 2002]

Example

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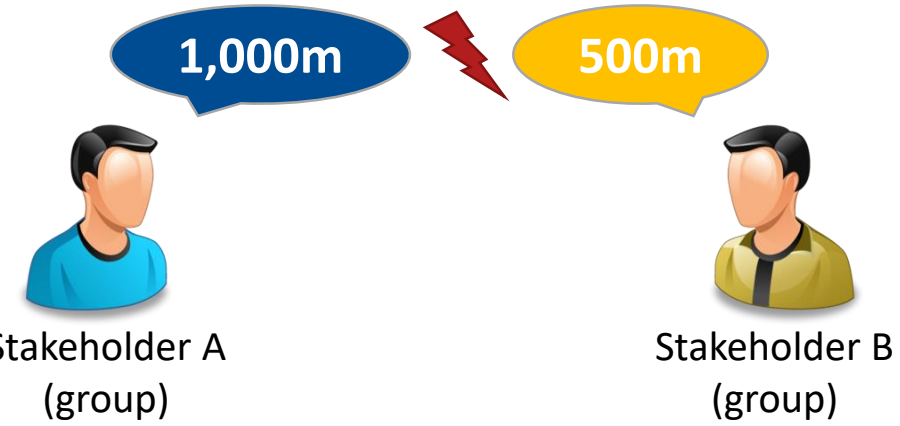
Initial situation:

- The car safety system shall be equipped with radar technology in order to monitor the traffic ahead of a car.
- There is a **conflict** among **two groups** of stakeholders **regarding the distance** up to which the radar sensor shall monitor the traffic in front of the car.



- **All four conflict resoulution strategies can be applied!**

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1. Negotiation Strategy (1)

- Resolve a conflict by **exchanging information**, **arguments**, and opinions.
- Conflict is resolved if either
  - one **viewpoint is accepted** or
  - a **solution** which ranges **between the different viewpoints is found and accepted**.

⊕ All conflicting parties are considered

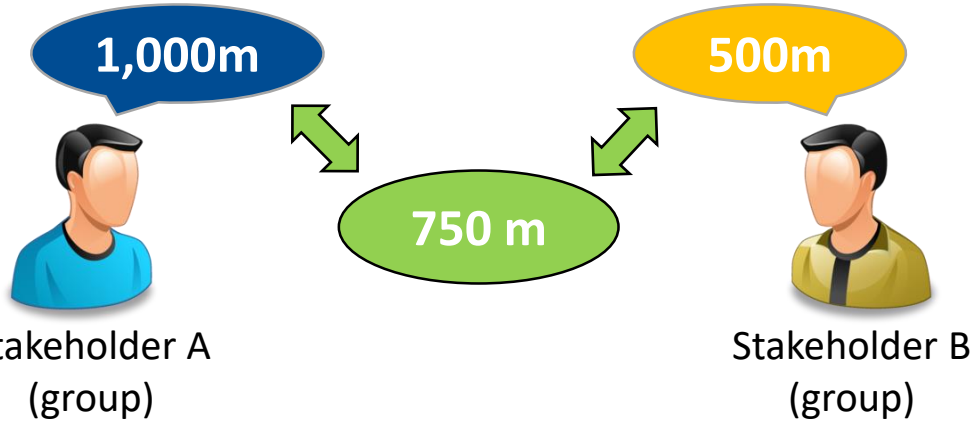
⊕ Win-win situation is created

⊖ Negotiation can be very time-consuming

⊖ Compromise may not be the best solution from an objective viewpoint

1. Negotiation Strategy (2)

The stakeholders discuss with each other and resolve the conflict by agreeing on a detection range of 750m.



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2. Creative Solution Strategy (1)

- Resolve a conflict by **discarding the old viewpoints**.
- Develop a **new viewpoint acceptable** to all conflicting parties. The new solution is independent of the previous viewpoints!

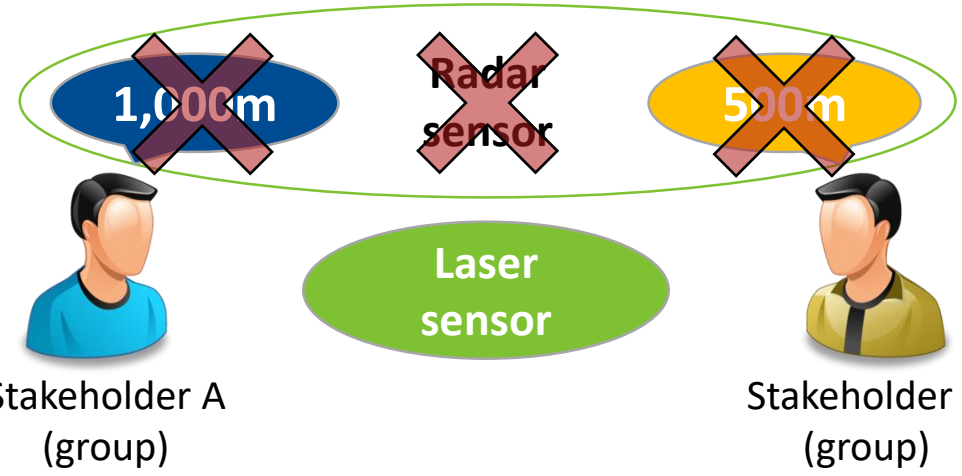
⊕ All conflicting parties are winners

⊖ Negotiation can be very time-consuming

⊖ New solutions may influence other requirements

2. Creative Solution Strategy (2)

- Stakeholder B argues for 500 meter distance because a 1000 meter distance measurement by radar sensor would cause higher costs. If a 1000 meter distance measurement would not lead to an increase in costs, he would prefer a 1000 meter distance measure.
- By equipping the car with a laser sensor instead of a radar sensor the detection range is increased to 1000 meter without causing additional costs.



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3. Decision Strategy (1)

- Conflict is resolved by a **decision-maker** (generally a higher authority), based on the present circumstances.
  - Decision which viewpoint should be adopted for the system.
- Decision-maker may even be involved in the conflicting parties himself.
- **Alternative: Voting by all stakeholders**.

⊕ Quick resolution (no long discussions)

⊕ Avoid consuming too many resources

⊖ Need for a decision-maker

⊖ Other viewpoints might be ignored

⊖ Negatively influence the motivation of ignored stakeholders

3. Decision Strategy (2)

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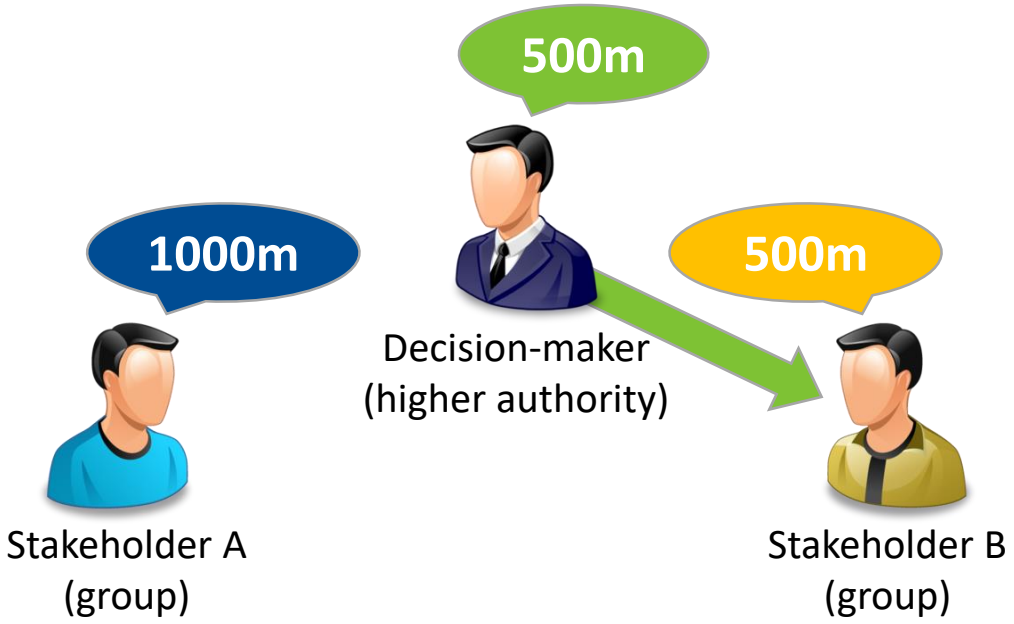
As the conflict exists between two groups of developers, the client is involved as a higher authority. The client decides that the detection range shall be 500m.



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4. Product Differentiation Strategy (1)

- Conflict is resolved by utilising the paradigm of **software product line engineering**
- Conflicting requirements and views are considered **variants** of the same system
- All stakeholders can be satisfied by their own **individual system variant**.
- **Application not suitable in all projects, since severe restrictions hold!**

⊕ Win-win situation is created

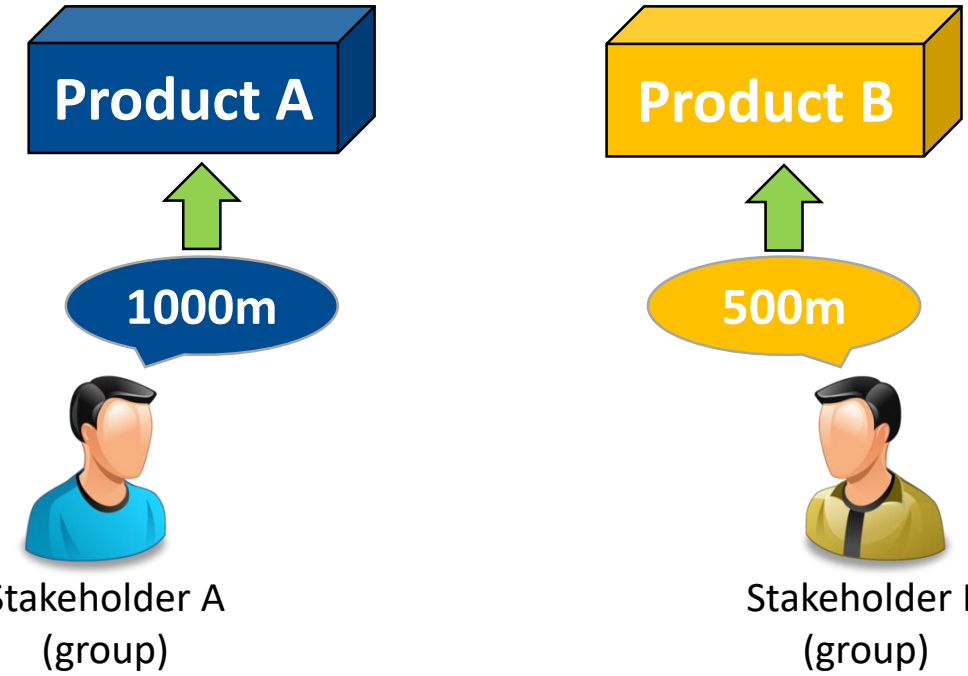
⊖ In many cases not applicable

⊖ Requires familiarity with software product line engineering

⊖ Typically requires significant additional effort (cost, time etc.)

4. Product Differentiation Strategy (2)

Both solutions (i.e., two different ranges of 1,000 m and 500 m) are considered as variants of the variation point “detection range”. Two products are developed, which deliberately differ in this regard, so that both solutions are actually implemented.



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Suitability for Conflict Types

	Negotiation	Creative solution	Decision	Product Differentiation
Subject matter conflict	suitable	conditionally suitable	not suitable	suitable
Data conflict	suitable	suitable	conditionally suitable	not suitable
Interest conflict	suitable	suitable	suitable	conditionally suitable
Value conflict	conditionally suitable	suitable	conditionally suitable	suitable
Relationship conflict	suitable	suitable	not suitable	not suitable
Structural conflict	not suitable	conditionally suitable	suitable	not suitable

Literature

[Boehm and Ross 1989] B. Boehm, R. Ross: Theory-W Software Project Management – Principles and Examples. IEEE Transactions on Software Engineering, Vol. 15, No. 7, 1989, pp. 902-916.

[Moore 2014] C. Moore: The Mediation Process – Practical Strategies for Resolving Conflicts. 4th edition, Jossey-Bass, San Francisco, 2014.

[Pohl and Rupp 2015] K. Pohl, C. Rupp: Requirements Engineering Fundamentals – A Study Guide for the Certified Professional for Requirements Engineering Exam. 2nd edition. Rocky Nook, Santa Barbara, 2015.

Literature for Further Reading

[Gause and Weinberg 1989] D.C. Gause, M. Weinberg: Exploring Requirements – Quality for Design. Dorset House, New York, 1989.

[Masters and Albright 2002] M. Masters, R. Albright: The Complete Guide to Conflict Resolution in Workspace. American Management Association, New York, 2002.

[Sutcliffe 2002] A. Sutcliffe: User-Centered Requirements Engineering – Theory and Practice, Springer, London, 2002.

Image References

[1] Licensed by http://www.iconshock.com/

[2] Provided by Microsoft Office

Legend

Definition

Example

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Vielen Dank für Ihre Aufmerksamkeit

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