A SYSTEMATIC LITERATURE REVIEW OF REQUIREMENTS PRIORITIZATION CRITERIA

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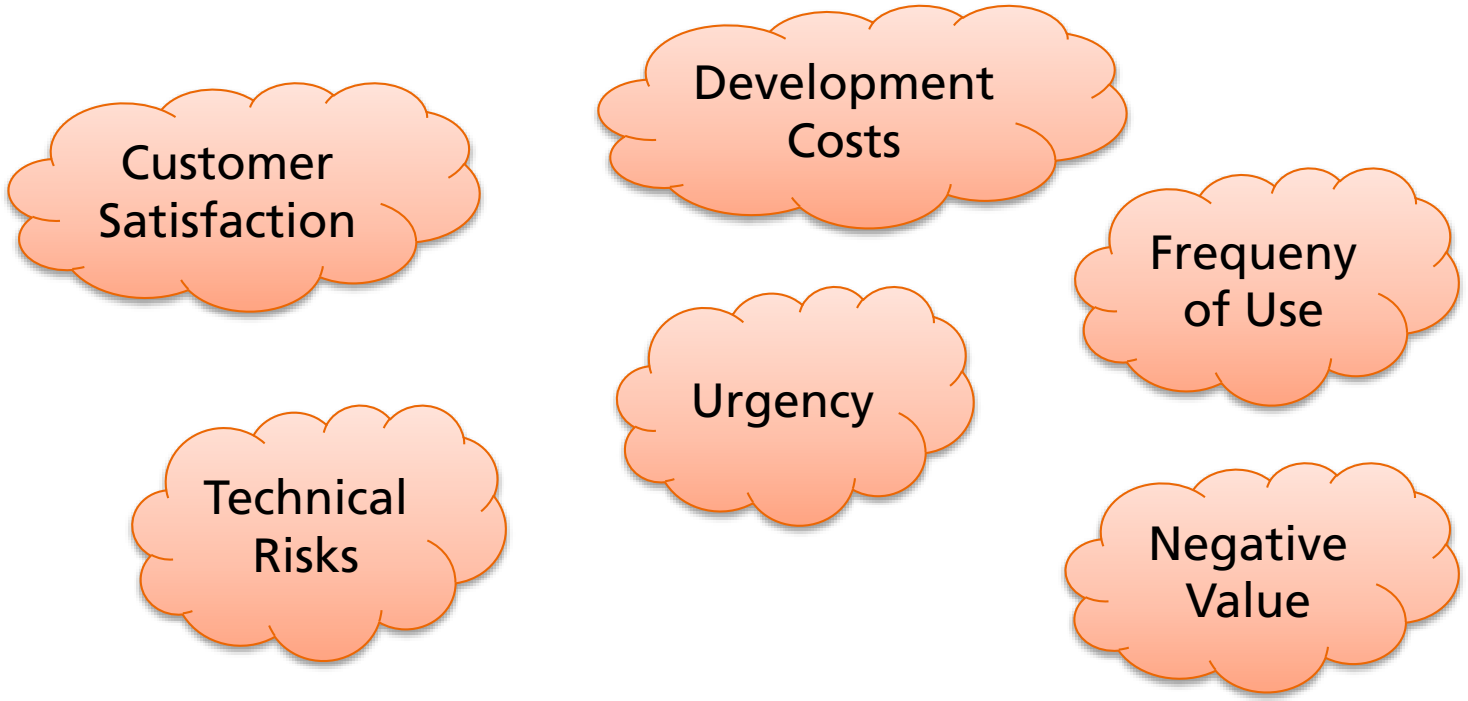

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A Definition…

Prioritization Criterion

A prioritization criterion is a characteristic mark relevant for a certain requirements type and that is used to make a judgment on a requirement concerning its priority.

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Motivation

- Prioritization often done on implicit criteria
  - Risk of wrong prioritization results
- Search for prioritization criteria time-consuming and laborious
  - Risk of missing important criteria
  - Risk of using unsuitable criteria
- No consolidated criteria collection available in the literature

- Goal:
  - Creation of consolidated model for
    - identification of suitable prioritization criteria &
    - identification of related literature references
  - in a time-saving manner

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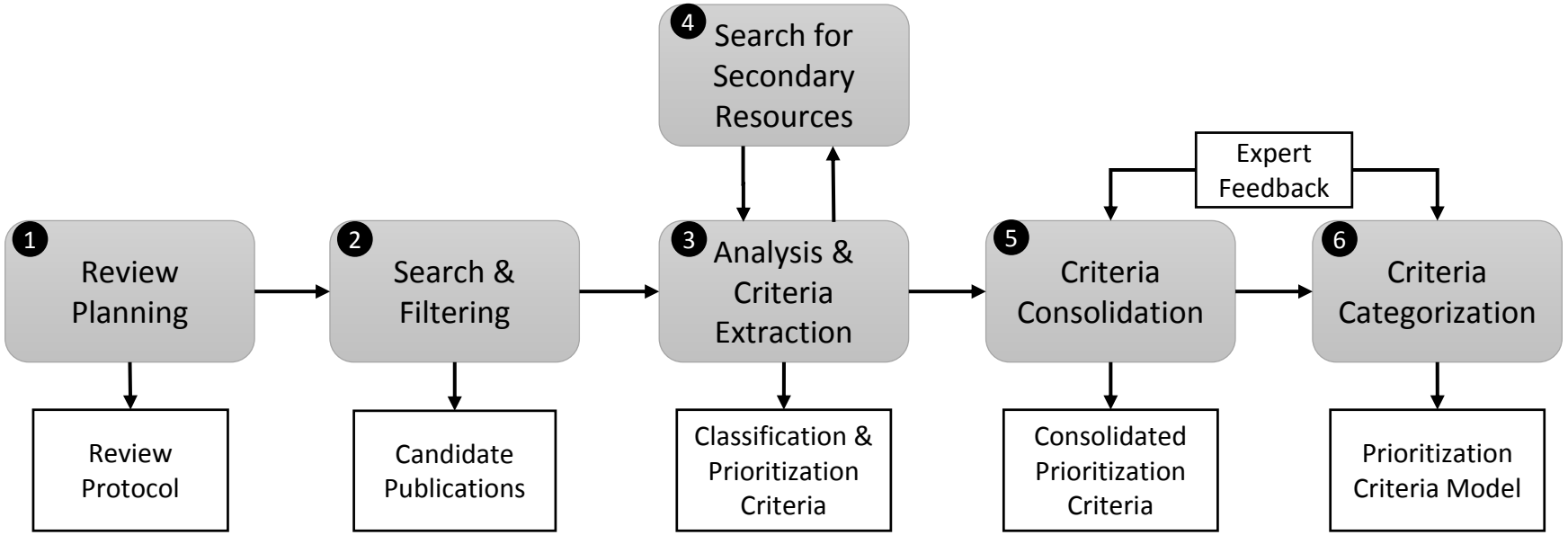
Prioritization Criteria Model: Research Approach



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Review Protocol (1/2)

Background	The survey is needed to build up a comprehensive base of prioritization criteria.
Research Question	Which prioritization criteria are discussed in requirements prioritization literature?
Search Strategy	Search string: (requirements AND (value OR criteria OR metrics OR attributes OR measures OR factors) AND (prioritization OR negotiation OR "release planning" OR "decision making")) Primary Resources: • Scopus • ACM • Already known literature Search Criteria: • Only computer science and related fields • All publication channels (e.g., conference and workshop proceedings, dissertations, books, journals etc.) • Search terms in Title, Abstract & Keywords • All types of publications: method papers, experience reports, case studies, long and short papers etc. Search Approach: 1. Search in the resources 2. Exclusion of non-fitting papers 3. Search for further papers in the reference list of the fitting papers if necessary

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Review Protocol (2/2)

Study Selection Criteria and Procedures	Exclusion Criteria: • Does not deal with software requirements prioritization or similar (e.g., construction material selection, prioritization in networks etc.) • Does not fit to the search terms (i.e., is listed in the search result, but does not include the search terms)
Study Quality Assessment Checklists and Procedures	Categorization in • Category 1: (Software) Requirements prioritization and negotiation approaches, release planning models (i.e., publications where a concrete approach is described) • Category 2: Non-methodological publications in the context of requirements prioritization (e.g., empirical studies and literature reviews)
Data extraction strategy	• For category 1 publications: 1. Search in the method description and extraction of all prioritization criteria used / proposed in the approach 2. Search in the remaining parts of the publication about further discussed criteria which are not used / part of the approach (but mentioned) • For category 2 publications: 1. Search in the publication and extraction of all discussed prioritization criteria • Categorization of the extracted prioritization criteria into criteria model
Synthesis of the extracted data	1. Consolidation of criteria (& identification of synonyms and homonyms) 2. Categorization of criteria

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Classification

Category 1:

- (Software) Requirements prioritization and negotiation approaches and release planning models (i.e., publications where a concrete approach is described)
  - 61 Publications

Category 2:

- Non-methodological publications in the context of requirements prioritization (e.g., empirical studies and literature reviews)
  - 22 Publications

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Major Challenges

- Mostly no descriptions / definitions of criteria in the literature
  - Identification of synonyms and homonyms is hard
- No common usage of terms in the literature
  - „Implementation costs“ vs. „Development costs“
- Very different abstraction levels of criteria
  - „Market value“ vs. „Number of times use case appears in model“
- Usage of generic terms for criteria

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Threats to Validity

- Possibility of missed important publications
  - Not indexed in database
  - Not extracted during search
  - However, little impact on model expected
- False interpretation of criteria during consolidation
  - Inadvertent rejection of „false synonyms“
  - Counteract: not eliminating questionable criteria

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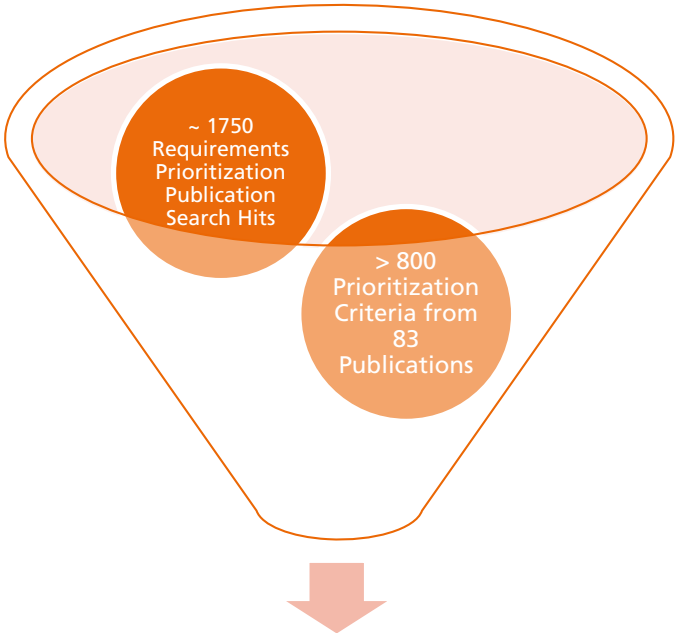
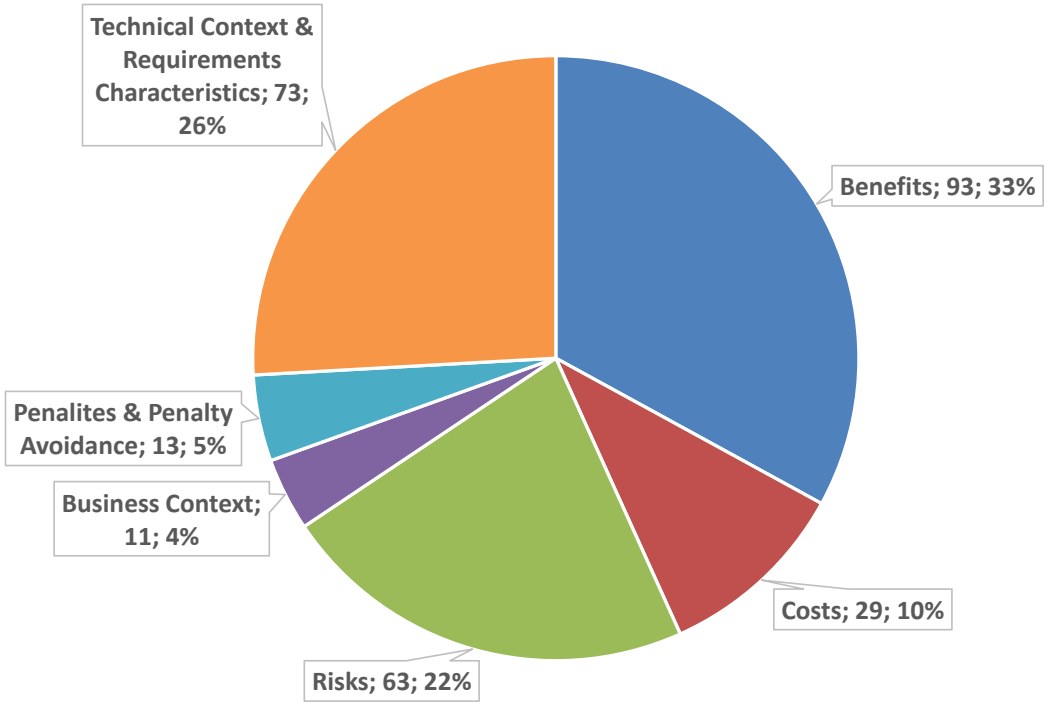
Prioritization Criteria Model: Some Facts



Prioritization Criteria Model

Around 280 Criteria
in six major categories and
31 subcategories
from 83 publications



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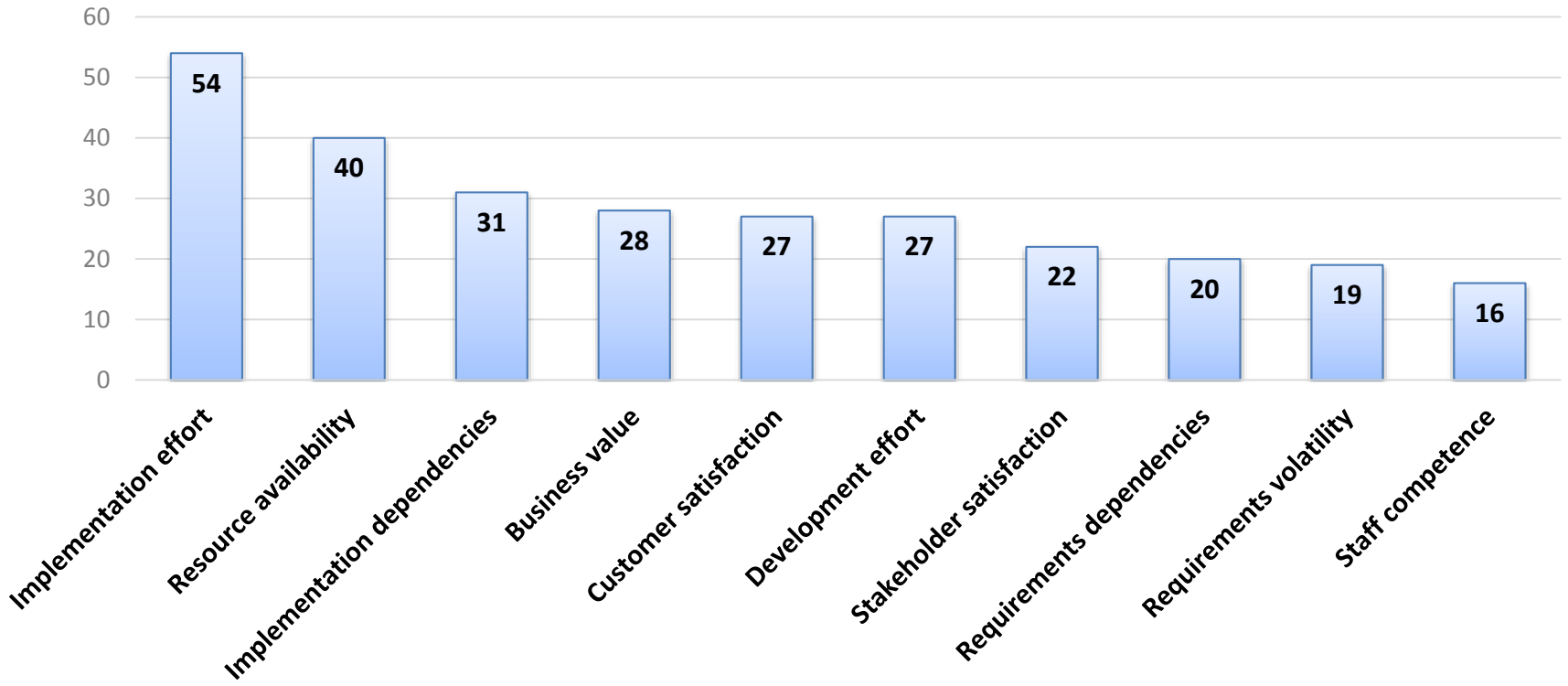
Prioritization Criteria Model: Some Facts

Around 60% of criteria only mentioned one time

Around 80% of criteria mentioned less than four times

Number of mentions of Top 10 criteria ~= 50% of number of mentions of all other criteria



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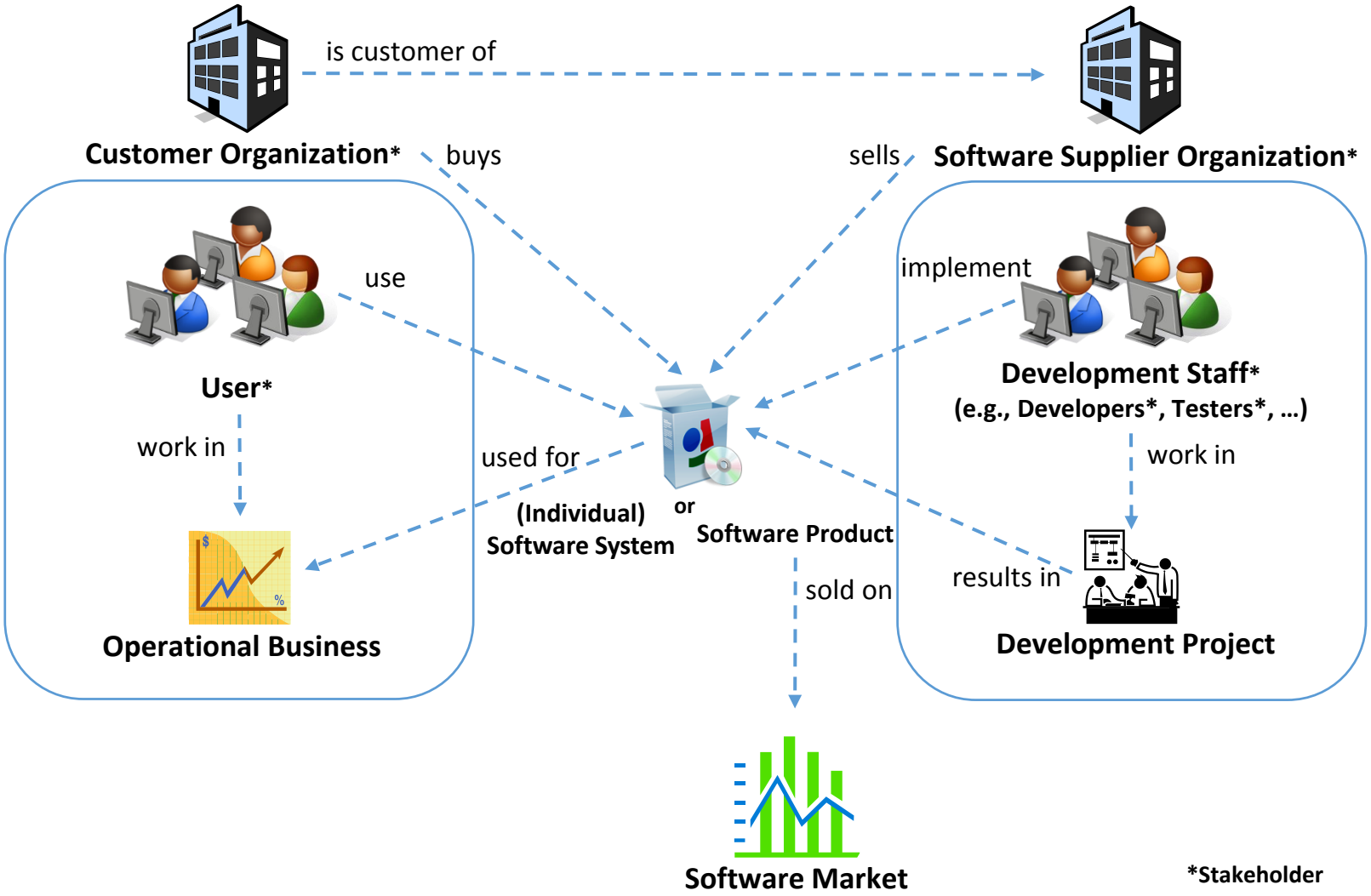
Terminology



*Stakeholder

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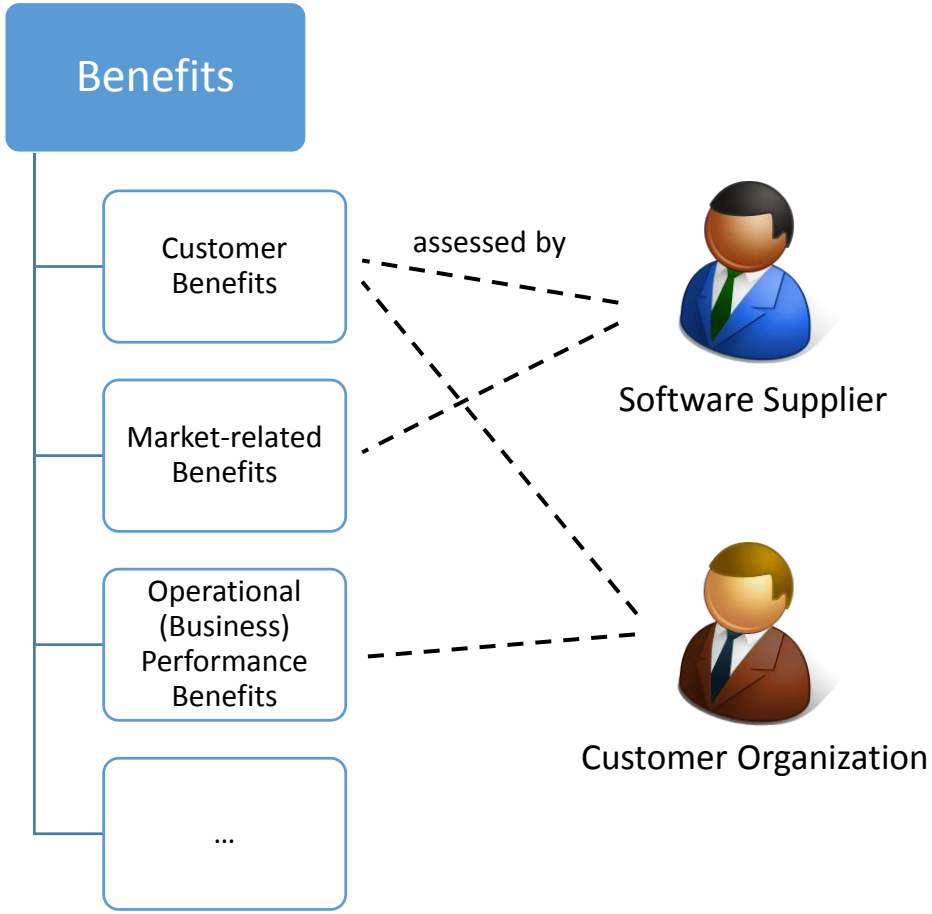
Perspectives on the Model



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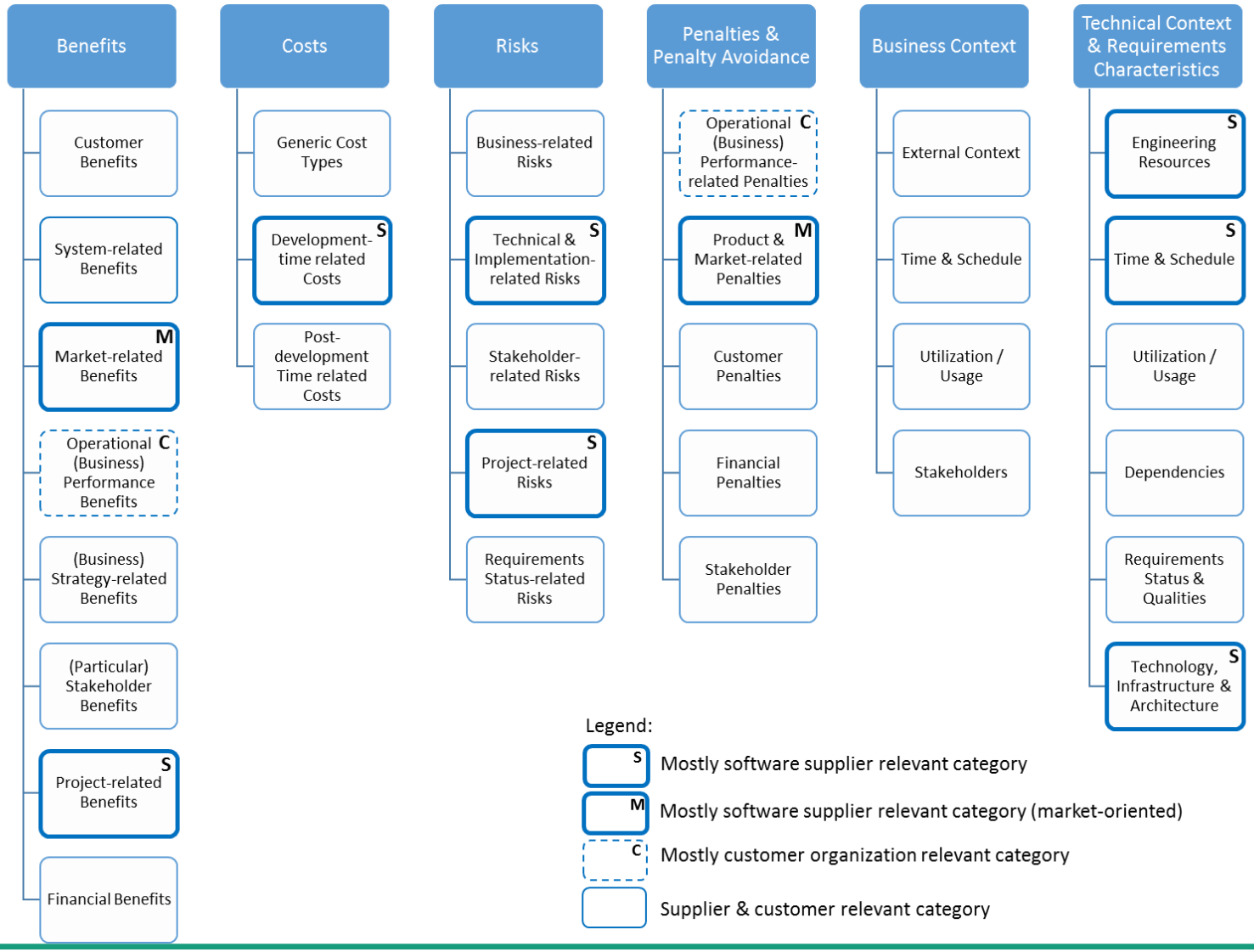
Model Overview & „Navigation“



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Model Excerpt from Category „Benefits“

Customer Benefits
- Customer value / satisfaction / preference
  - Efficiency gains for customer
  - Competitive gains for customer
  - Intermediary satisfaction

System-related Benefits
- Product / system value
  - Linkage to overall system goals
- Product / system quality
  - Ease of use / convenience
  - Scalability
  - Sustainability of solution
  - Changeable solution
  - Uniform solution
  - Performance
  - Stability
  - Security
  - Integrity
  - Availability
  - Testability
  - Accuracy

(Particular) Stakeholder Benefits
- Personal preference & stakeholder priority / preference / value / satisfaction / desire
  - End user value / satisfaction
  - Value creation for developer
  - Relevance to stakeholders' goals
- Fit with skills / training

Financial Benefits
- Financial benefit / revenue
  - Return on investment (ROI)

Market-related Benefits
- (Product) Market value
- Customer loyalty / retention
- Marketability / ability to sell
- New business potential / product and service enhancement
  - Additional customer sales
  - Extra cost customer will spend
- Market percentage
- Competitiveness
  - Creation of competitive advantage
  - Status of competitors with respect to the requirement
  - Innovativeness
- Market technology trends
- Brand protection
- (Feature) Influence on buying decision
- Resalable solution
- (Long term) Product strategy
- Fit with / effects on other products

(Business) Strategy-related Benefits
- Strategic alignment / suitability to business strategy
  - Importance / contribution to business goals
  - Criticality to mission success
- Long term strategic value / strategic benefit
- Tactical usefulness

Project-related Benefits
- Project value
  - Relevance to project success
  - Importance wrt. / contribution to overall release goal
  - Release theme
  - Feature contribution to project vision
- Synergy effects by combining tasks

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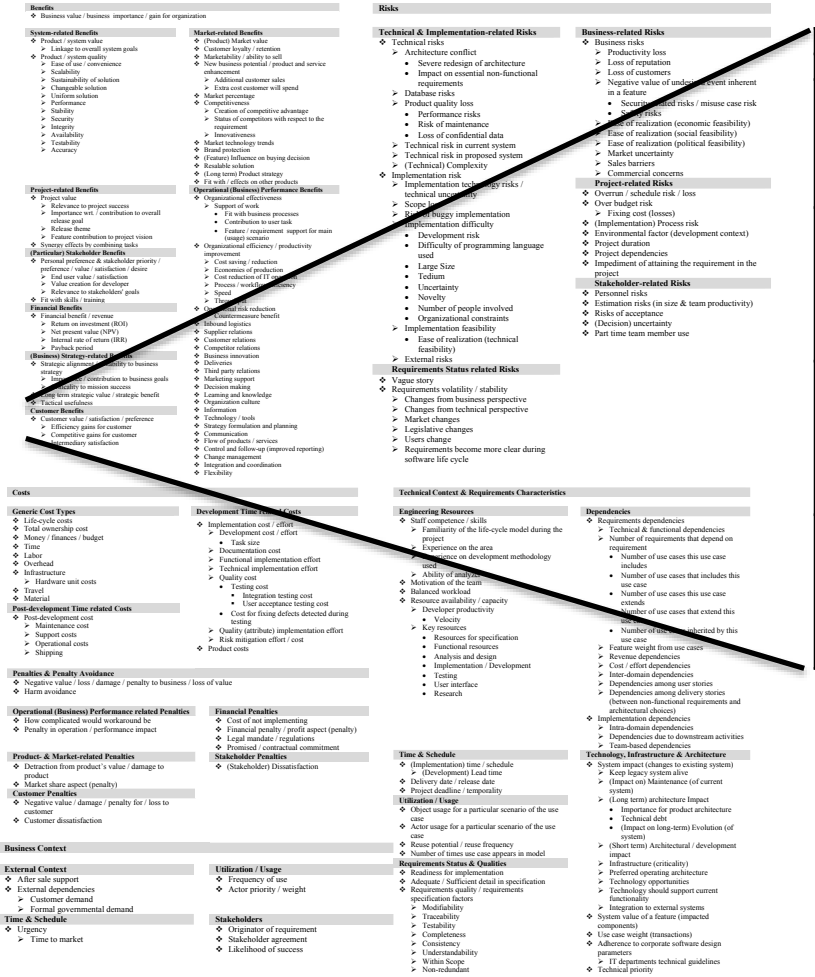
Prioritization Criteria Model: Criteria Description



Customer Benefits			
Criterion	References	Interpretation	Ex. Metric
❖ Customer value / satisfaction / preference	[1] [2] [4] [6] [7] [8] [9] [10] [11] [13] [14] [17] [24] [30] [35] [43] [46] [47] [49] [51] [54] [62] [63] [65] [66] [71] [80]	The benefit to the customer of any kind, if the requirement is implemented.	Qualitative
➢ Efficiency gains for customer	[40]	The gains for the customer in terms of efficiency [40] in its processes, if the requirement is implemented.	E.g., average time savings in [hours]
➢ Competitive gains for customer	[40]	The gains for the customer in terms of competitiveness [40] on the market, if the requirement is implemented.	Qualitative
➢ Intermediary satisfaction	[5] [11]	The satisfaction of intermediaries (such as local resellers or consultants) if the requirement is implemented [11].	Qualitative

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Conclusion & Outlook

- Literature references and additional information can be found in
  - Riegel, N.: Prioritization Criteria Collection and Literature Sources. IESE-Report, 048.14/E
  - http://publica.fraunhofer.de/documents/N-311309.html
- In the meantime, model was already customized for IS / business-process-driven development domain
- Domain industry expert survey was conducted for evaluation with respect to prioritization effectiveness and efficiency
  - „Importance“ & „Ease of Assessment“ for each criterion
  - General benefits of the model

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Thank you for your Attention!

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