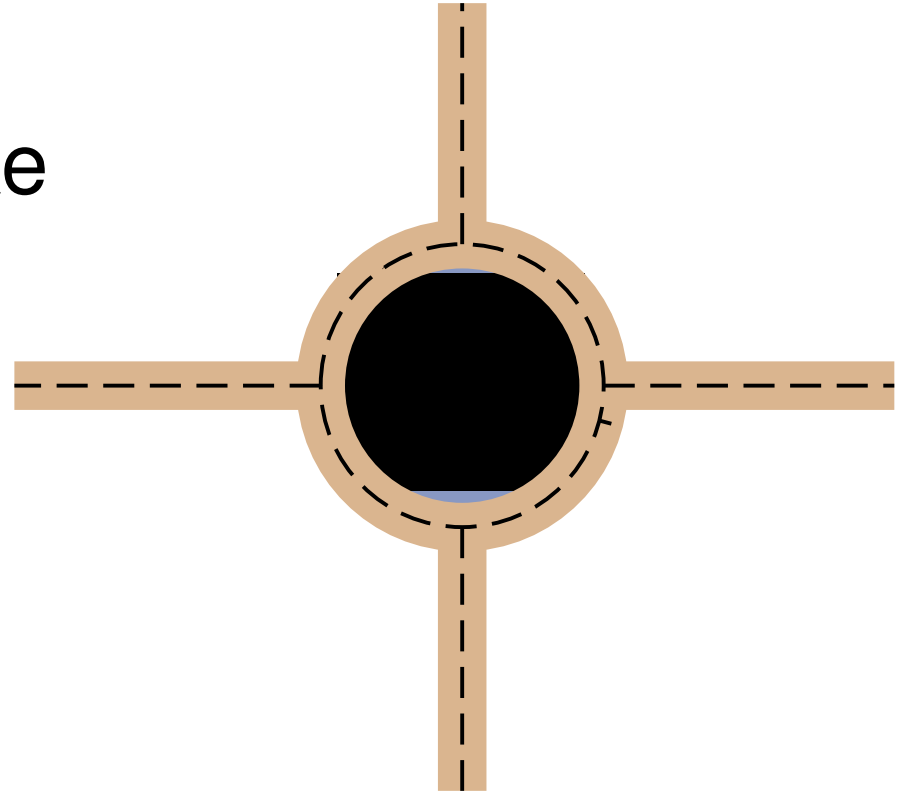
Improving Software Development Processes with Multicriteria Methods

Elena Kornyshova
Rébecca Deneckère
Camille Salinesi

CRI – Centre de Recherche en Informatique
Paris, France

Decision making

- Alternatives
- Choice to make



- Decision making guidance ?

Decision making: Guidance

- **Monocriterion Approach**
  - **Common technique**
  - **Easily resolved by optimisation**
  - **Problem : Doesn't reflect the situation complexity**

- **Multicriteria Approach**
  - **Set of criteria**
  - **More precise but more complex**
  - **MC Methods : MAUT, AHP, Outranking, Weighting and Fuzzy.**

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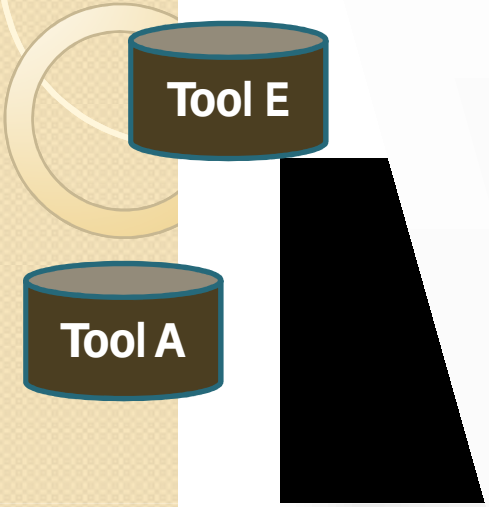
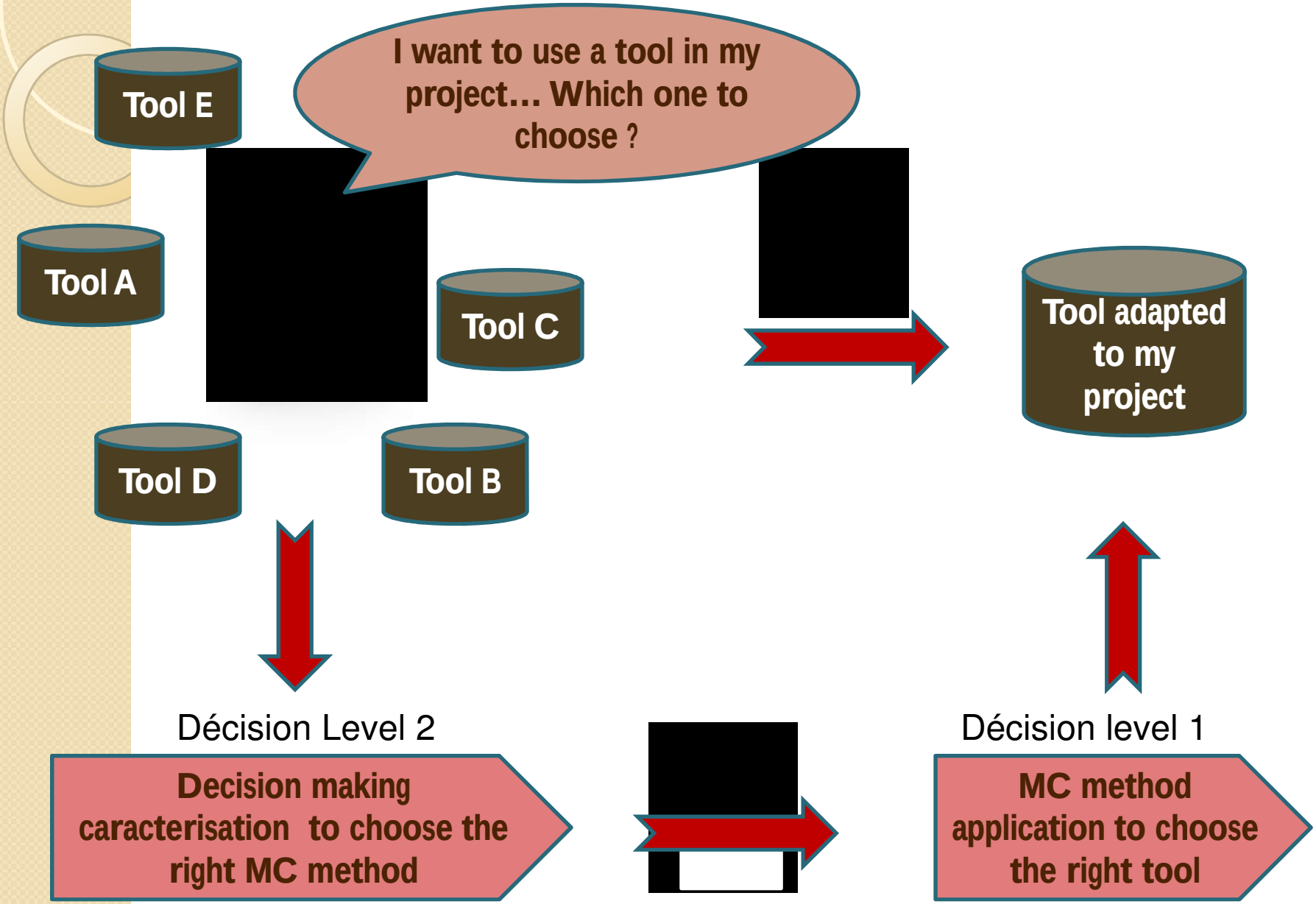


To choose the right tool[illegible]
→To apply multicriteria methods.

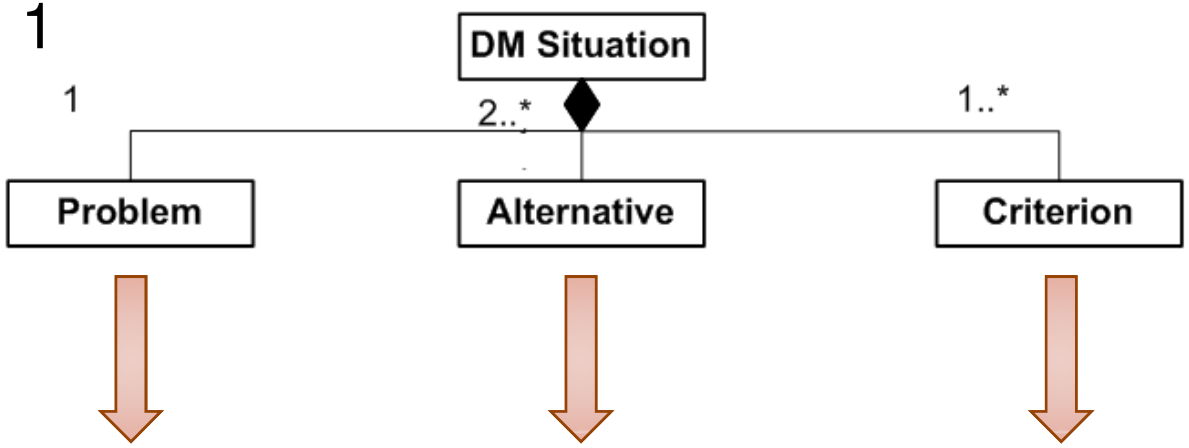
Problem : it exists a lot of MC methods. Which one is the best for my problem?
→We have to identify correctly the decision to make in order to use the right MC method.

Decision-Making:Two Levels

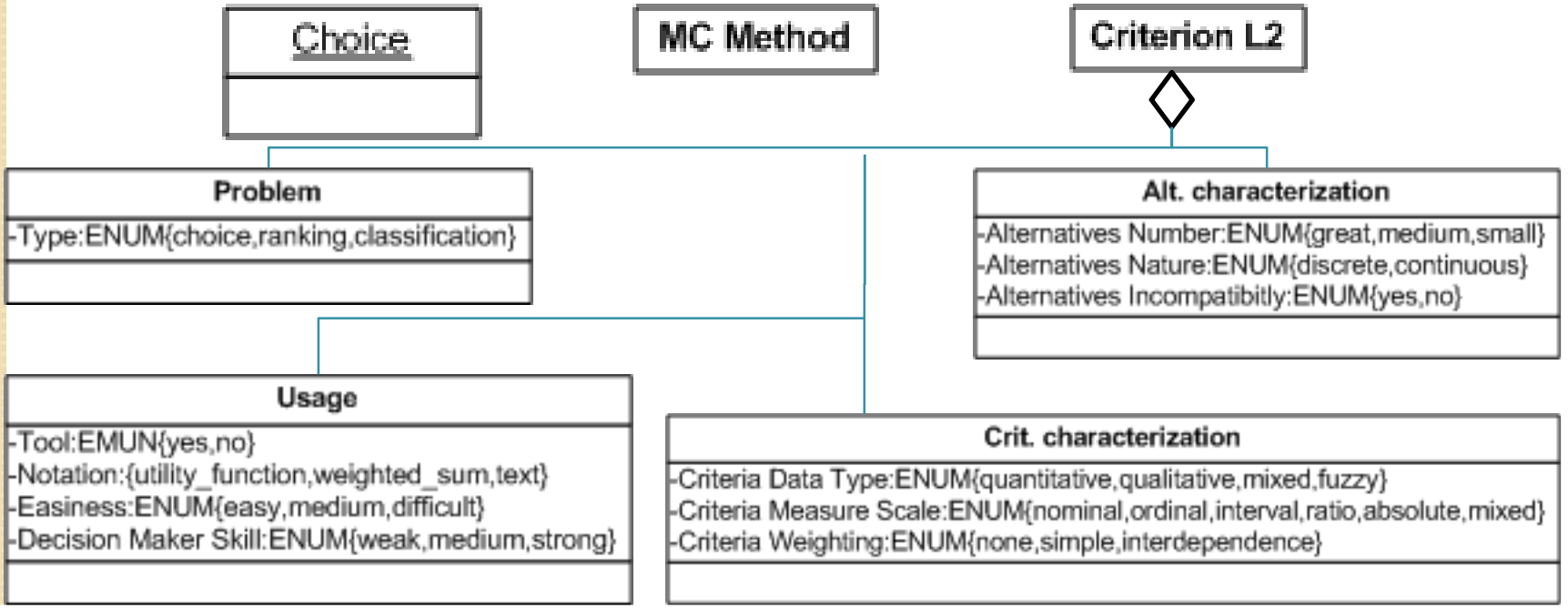


Decision-Making Model

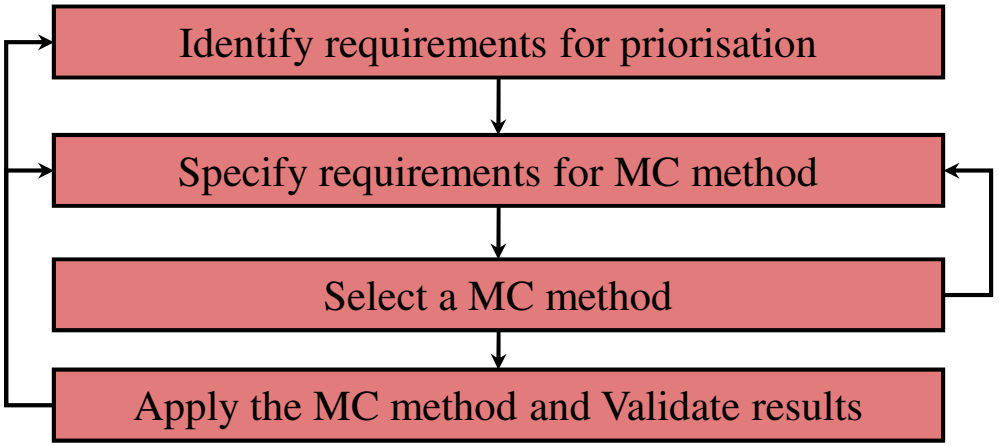
Level 1



Level 2

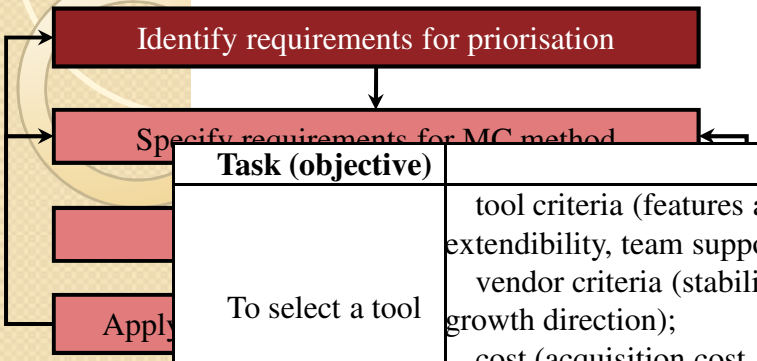


Multicriteria Methods Integration Process (McMIP)



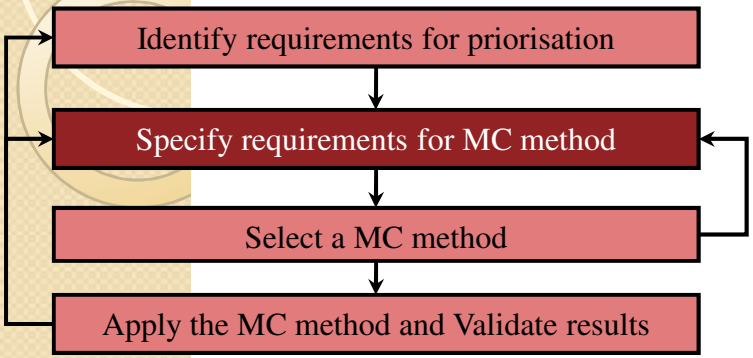
- Application examples (Rational Unified Process)

Identify requirements for priorisation



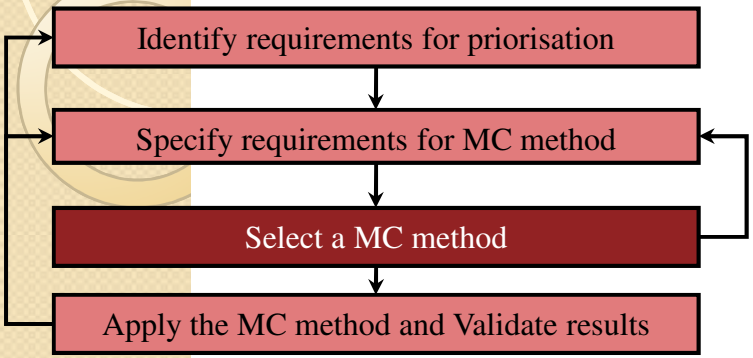
Task (objective)	Criteria	Proposed method
To select a tool	tool criteria (features and functions, integration, applicability, extendibility, team support, usability, quality, performance, maturity); vendor criteria (stability, support availability, training, availability, growth direction); cost (acquisition cost, implementation cost, maintenance cost)	importance of each feature or function: ranking following the next scale: must, nice, not required; tool and vendor criteria: 5-grade scale; costs: low, medium, high
To prioritize risks	deviation of schedule from plan; deviation of effort from plan; deviation of cost from plan; likelihood of occurrence; risk exposure; risk magnitude; type: {direct, indirect}; resource: {organization, funding, people, time, business risks, technical risks, scope risks, technological risks, external dependency risks, schedule risks}	ranking according to the risk exposure; risk magnitude may be calculated in addition.
To prioritize use cases	benefit of the scenario to the stakeholders: {critical, important, useful}; architectural impact of the scenario: {none, extends, modifies}; risks to be mitigated: {performance, availability of a product, suitability of a component}; completion of the coverage of the architecture; demonstration to the user	selection following the architectural significance: substantial architectural coverage, specific architectural point, delicate architectural point.

Specify requirements for MC method



MC methods requirements	Tools	Risks	Use cases
Operations			
Retain problem type	choice	ranking	choice
Calculate alternatives number	medium	great	great
Retain alternatives nature	discrete	discrete	discrete
Retain criteria data type	quantitative	mixed	mixed, fuzzy
Retain weighting type	Yes, simple		
Usage			
Tool			yes
Easiness	easy		
Skills	week		

Select a MC method



Case	Tools					Risks					Use cases				
MC method	**MAU**	**AHP**	**Out.**	**Wei.**	**Fuz.**	**MAU**	**AHP**	**Out.**	**Wei.**	**Fuz.**	**MAU**	**AHP**	**Out.**	**Wei.**	**Fuz.**
Retain problem type	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Calculate alternatives number	1	0	1	1	1	1	0	1	1	1	1	0	1	1	1
Retain alternatives nature	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Retain criteria data type	1	1	1	1	0	1	1	1	0	0	0	0	0	0	1
Retain weighting type	1	1	1	1	1										
Tool											0	1	1	1	1
Easiness	0	1	0	1	0										
Skills	0	0	0	1	0										

1 - MC method matches requirement

0 - MC method does not match requirement

- selected MC method

- requirement is not expressed

Conclusion

- **Results:**
  - A more scientific approach of the priorisation guidance
  - Integration of multicriteria methods to choose the best alternative in each situation
  - Illustration with RUP examples (Rational Unified Process).

- **Research Perspectives:**
  - Improving the signatures to better select MC methods;
  - Developing a tool to offer a systematic guidance;
  - Defining MC methods as a method fragment to allow their integration into existing methodologies;
  - Exploring the issue of adapting DM methods to the situation at hand.

Questions