

How to develop corporate real estate? A decision support tool for CREM



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ERES 28th June to 1st July 2017 Delft

1. Problem and research question

2. Methodology

3. Current state of research

4. Results from case study and questionnaire

5. Development of a decision support tool

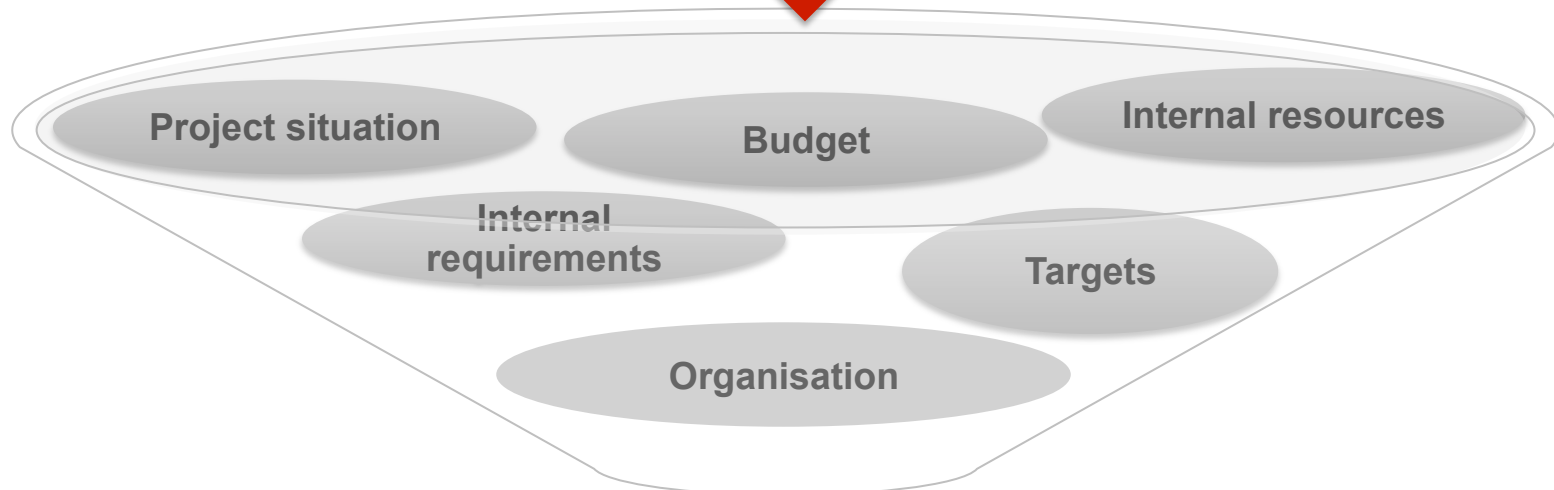
6. Next step and open questions

Real estate managers have to decide regularly between different procurement forms

New space demand

„Many European Companies currently own the freehold interests in most of their properties (e.g. Germany: 70%).“

„Real estate decisions often end up being some of the most complex a company can face.“



Decision-making process for a procurement form

?

Research questions

- What alternatives to property development are open to a company and how do they differ from each other?

- Which determinants have an influence on procurement decisions in companies' CREM?

- How should the corporate decision-making process specific to a project be structured for the selection of a suitable form of procurement?

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After the literature review there are 4 steps to develop a decision support tool

1. Literature review

- Different **forms of procurement**
- **Decision-making process** in CREM
- **Decision criteria and tools** in studies

Model of decision making

Case study

2. Data analysis

- Acquisition and analysis of **data material** like contracts, jour-fixe minutes, transcripts of meetings, project presentation

3. Interviews

- **Explorative survey** focused on objectives and framework of decision.making situation
- **26 semi-structured interviews**

4. Qualitative content-analysis

- **Software based approach** for analysing the interviews
- Formulate **decision criteria**

5. Onlinesurvey

- **Online survey with questionnaire** for revision of the formulated decision criteria

Development of a decision support tool for practice

Source: Paper is accepted and will be published in Journal of Construction Engineering and Project Management

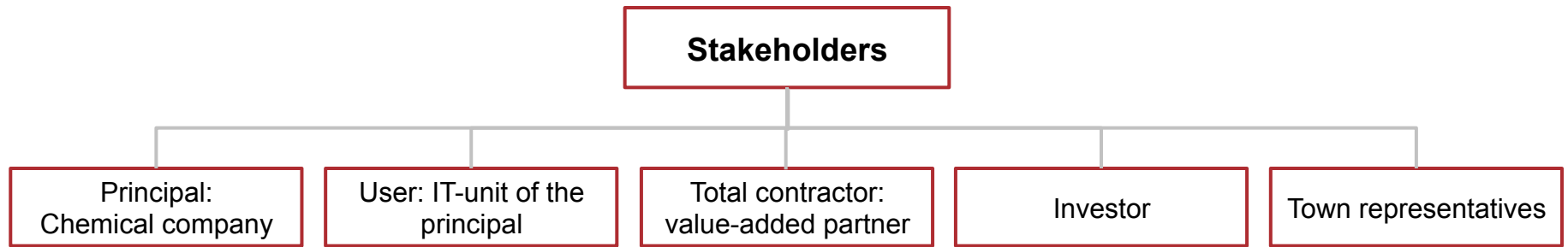
Case study: Project development of an office building

Project details:

- Office building for an IT-unit of a chemical company
- 1,500 working places
- 38,000 m² total floor area
- Project volume: € 70m
- Project term: 2 years

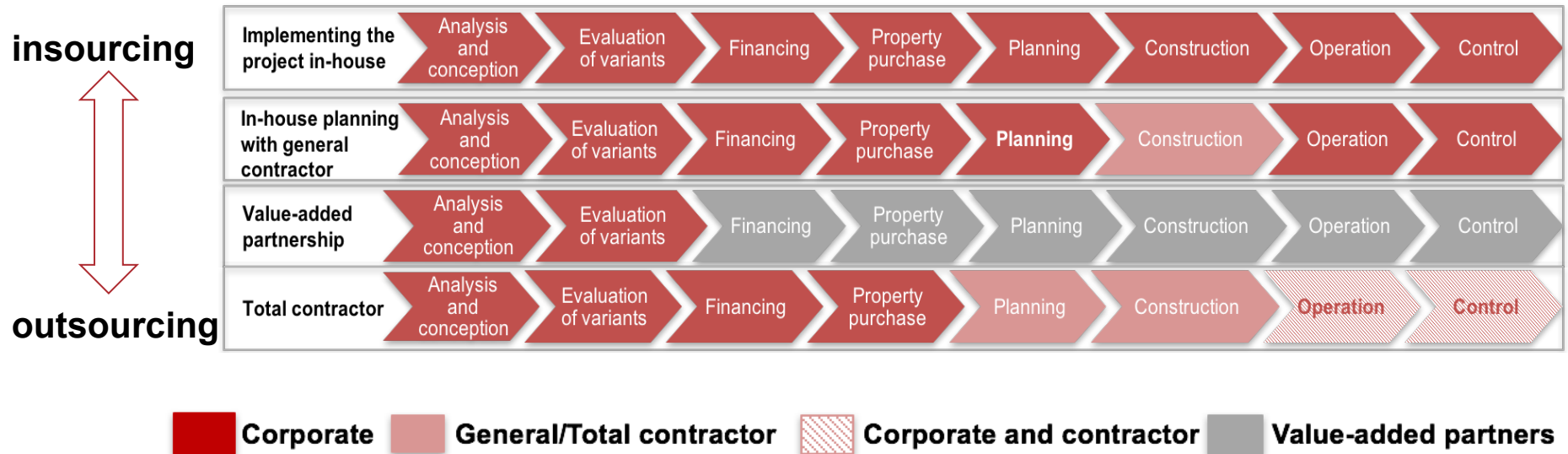
Project targets:

- Life-cycle approach
- Modern, functional and energy-efficient offices



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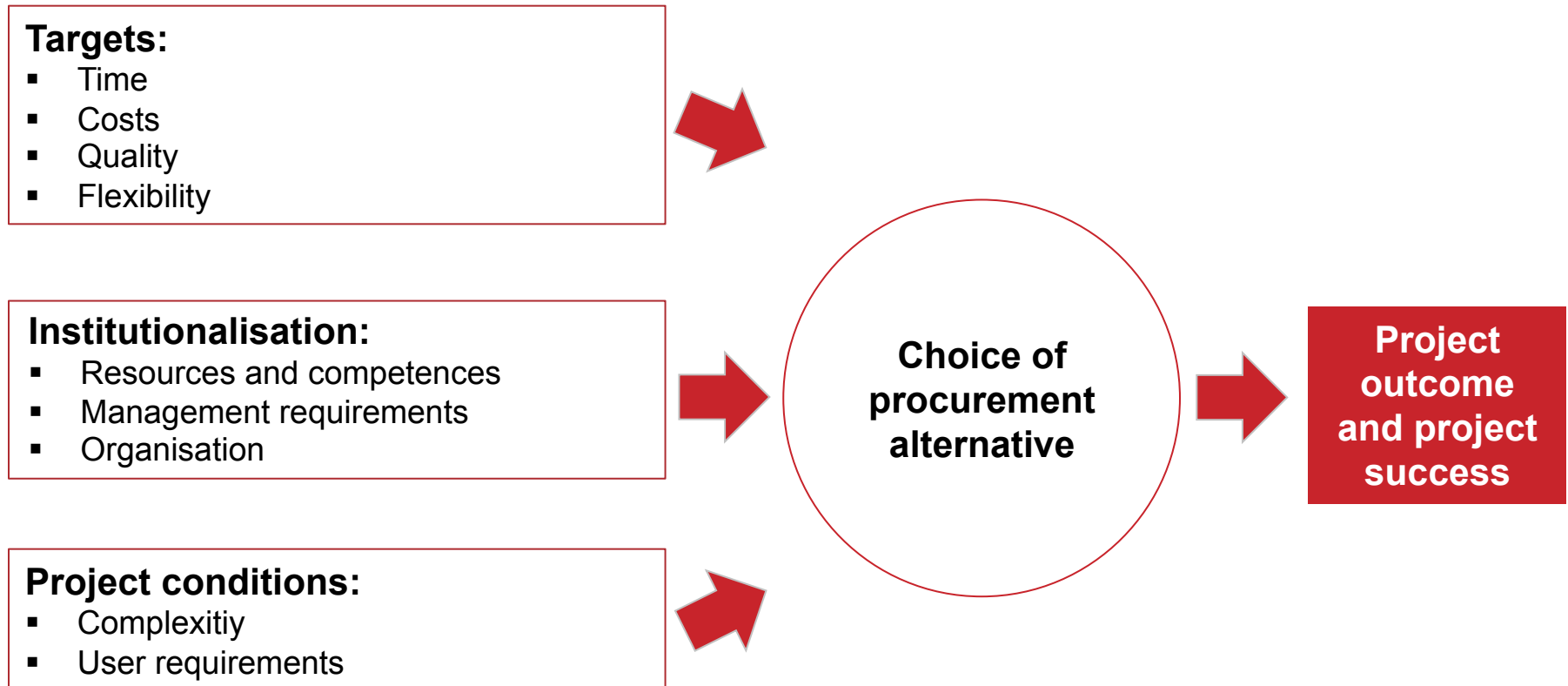
There are various differences between the allocation of responsibility in procurement forms



Objectives and influence factors in property development – an excerpt from literature

Source	Objectives	Influence factors
Asson (2002)	Reducing costs, increasing productivity, high customer satisfaction	
Bajec (2010)		Own core competence and core activity
Cánez (2000)	Increasing responsiveness and quality, time certainty, procurement costs	Limited internal resources, limited availability of in- house technologies, lack of specialist staff, high complexity
Cox (1997)	Aspired degree of control	Internal resources, internal skills
Love (1998)	Speed of planning and construction, certainty of costs and timing, flexibility to requests for changes, quality, risk allocation, clear responsibilities, price competition and resolution of conflicts	
McIvor (2008)	Reducing production and transaction costs	The necessary resources or capabilities internally
Ng (2002)	Speed, certainty of timing and price, level of quality, flexibility, responsibility and influence, complexity, price competition, risk allocation, design, investment costs/budget	Complexity, special management requirements
Padillo (1999)	Maximising strategic competitive performance, maximising management performance, minimising procurement risk, maximising financial performance	

The decision for a procurement form depends on different factors



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Interview results: 15 decision criteria can be classified in four categories

Control system

- Transfer of time risks to the contractor
- Transfer of cost risks to the contractor
- Transfer of quality risks to the contractor
- Reduction of interfaces
- Creating transparency in the project with clear communication and sufficient information

Target system

- Amount of the investment
- Amount of the life cycle costs
- Intent of a functional proposal
- Intent of a detailed proposal

Framework

- Position of the building is onside
- The corporate will be owner of the building
- The corporate will rent the building

Organisational structure

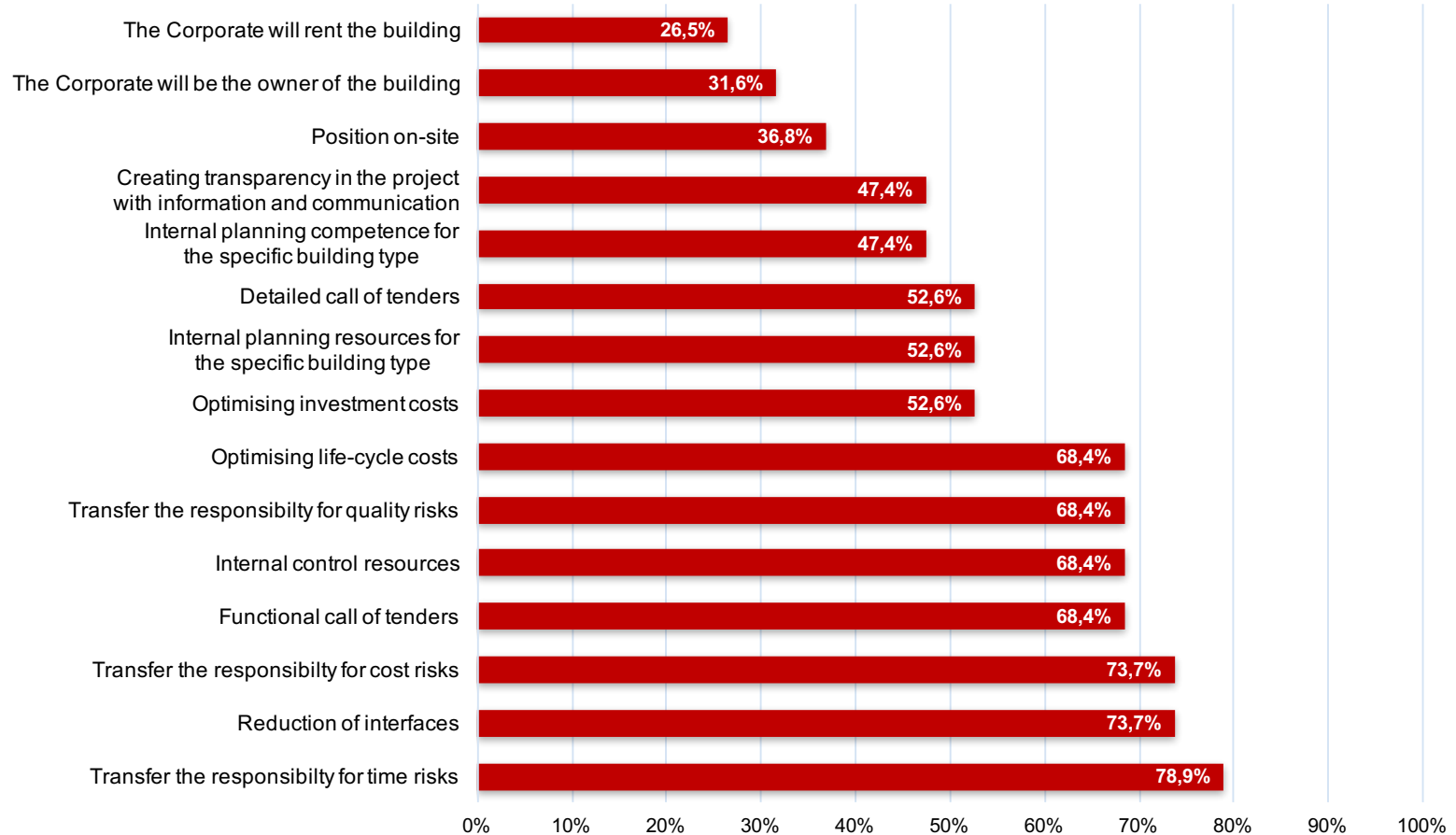
- Availability of planning resources
- Availability of control resources
- Planning competence for the specific building

Additional input from group discussions

- A consistent BIM process for digitisation
- Transfer of the security risks to the contractor

Questionnaire results: Many criteria are important for decision makers in CREM

Percentage of respondents with relevant or very relevant



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The decision making process can be structured hierarchically

Decision problem

Choice of procurement form

Dominance criteria

Long-term programmable usage requirements

Availability of internal resources

Framework

Position on-site

Criteria

Using internal resources

Transfer of the full responsibility for risks

Creating transparency in the project

Optimising cost factors

Determining degree of details

Sub-criteria

Internal planning resources
Internal control resources

Time risks
Cost risks
Quality risks
Safety risks

Reduction of interfaces
Informations and communication
BIM for linked digitisation

Life-cycle costs
Investment costs

Functional call of tenders
Detailed call of tenders

Alternatives

Implementing the project in-house

In-house planning with general contractor

Total contractor

Value-added partnership

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With which method could the decision-making process be performed?

Decision problem

Choice of procurement form

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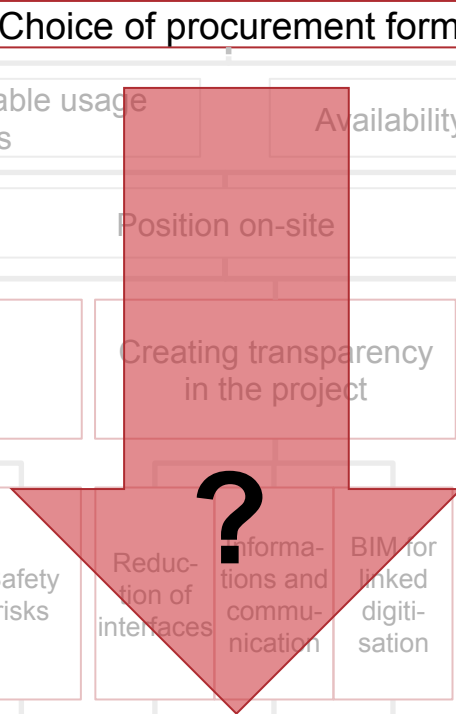
Alternatives

Implementing the project in-house

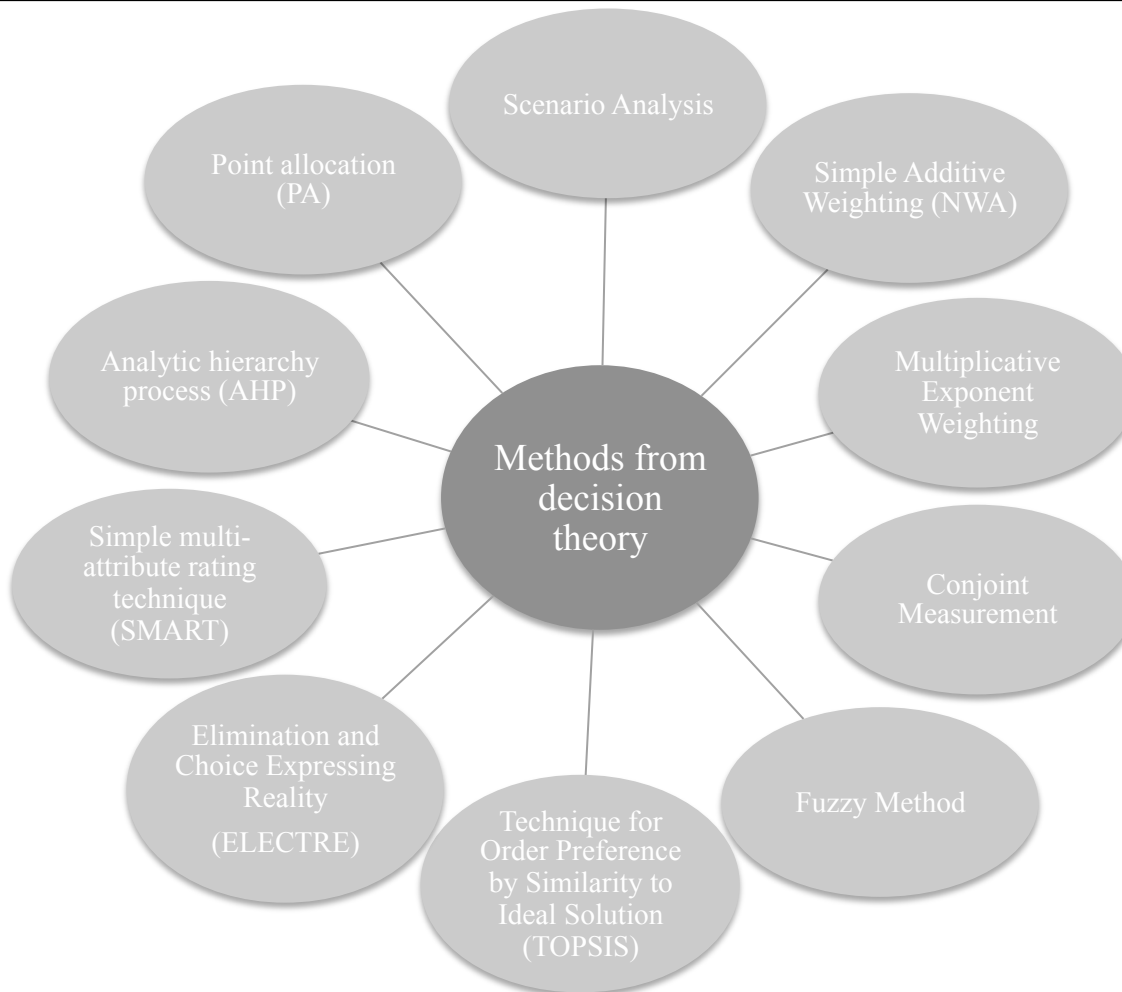
In-house planning with general contractor

Total contractor

Value-added partnership



There are different methods for the decision-making process



Specific requirements:

- Multiple criteria decision-making (MCDM) problem
- 15 different criteria need to be considered
- Individual prioritisation of the criteria should be allowed (depending on corporate objectives, etc.)
- The application should be transparent for the user (the CREM)

The method selection result: a combination of two methods

Method	Reason for/against exclusion
Simple Additive Weighting	Difficult distribution of 100 per cent across the 15 criteria
Multiplicative Exponent Weighting	Difficult distribution of 100 per cent across the 15 criteria
Conjoint Measurement	New alternatives can not be created
Fuzzy Method	Not necessary in this context
Analytic hierarchy process	Using this method enables a consistent, integrated weighting of all the criteria
TOPSIS	Using this method for evaluation is transparent and suitable in connection with AHP for prioritisation
ELECTRE	Lack of transparency for the user
SMART	Lack of transparency for the user
Point allocation	Difficult distribution of 100 per cent (100 points) across the 15 criteria
Scenario Analysis	Highly complex, particularly because of the multiplicity of scenarios required to accord with the different criteria

Three steps for using the decision support tool

1.

- **Dominance criteria**
- Checking if an alternative could be excluded because of such a criteria

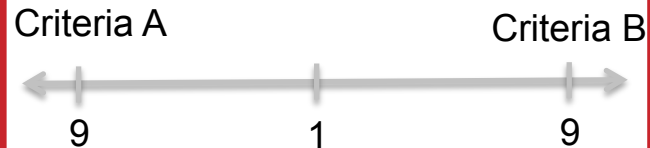
Are there internal resources?

yes

no

2.

- **Prioritisation with AHP (Analytical Hierarchy Process)**
- Paired comparison of all (sub)criteria
- Calculation of the relative weights
- Scale:



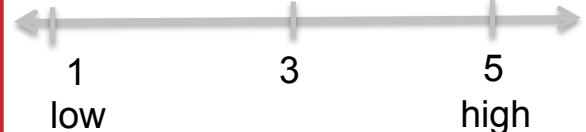
A is much more important

B is much more important

3.

- **Evaluation of the alternative procurement forms with TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)**
- The evaluation has to be set up for one time only

▪ Scale:



1. Some alternatives can be excluded by answering questions regarding dominance criteria



Question 1: For procurement of corporate real estate you have to decide between ownership and rental. Is your usage requirement and type of usage predictable for at least 5 years?

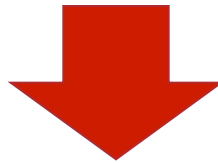
yes no

Question 2: For real estate development there are many different kinds of human resources necessary. Are resources for planning with the required competences available in your company?

yes no

Question 3: In many companies there are specific restrictions for working on-site. Is your project situated on-site?

yes no



Some alternatives are excluded

(for example if there are no resources for planning in the company the project can not be implemented in-house)

2. The prioritisation takes place in a paired comparison of the criteria

Use of internal resources	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transfer the responsibility for risks
Use of internal resources	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Creating transparency of procedures
Use of internal resources	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Optimising costs
Use of internal resources	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Determining degree of detail

Scale	Importance/Relevance
1	Equally important
3	Somewhat more important
5	More important
7	Much more important
9	Extremely important
2,4,6,8	Intermediate values

3. The evaluation of the alternatives by using TOPSIS

	Implementing the project in-house	In-house planning with general contractor	Total contractor	Value-added partnership
Use of internal planning resources	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○
Transfer the responsibility for time risks	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○
Optimising the investment costs	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○
...	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○	1 2 3 4 5 ○ ○ ○ ○ ○

Scale	Suitability
1	Not suitable
2	Rather not suitable
3	Rather suitable
4	Suitable
5	Very good suitable

Finally the alternatives must be weighted up with looking on the efficiency measurements

$$\underline{V} = \begin{bmatrix} v_{11} & v_{12} & \dots & v_{1j} & \dots & v_{1m} \\ \dots & \dots & & \dots & & \dots \\ v_{i1} & v_{i2} & \dots & v_{ij} & \dots & v_{im} \\ \dots & \dots & & \dots & & \dots \\ v_{n1} & v_{n2} & \dots & v_{nj} & \dots & v_{nm} \end{bmatrix} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & w_j r_{1j} & \dots & w_m r_{1m} \\ \dots & \dots & & \dots & & \dots \\ w_1 r_{i1} & w_2 r_{i2} & \dots & w_j r_{ij} & \dots & w_m r_{im} \\ \dots & \dots & & \dots & & \dots \\ w_1 r_{n1} & w_2 r_{n2} & \dots & w_j r_{nj} & \dots & w_m r_{nm} \end{bmatrix}$$

w = weighting
 r = value for suitability
 v_j^+ = best value for suitability for criteria j
 v_j^- = worst value for suitability for criteria j

Distance measure „Best-case“

$$S_i^+ = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^+)^2}$$

Distance measure „Worst-case“

$$S_i^- = \sqrt{\sum_{j=1}^m (v_{ij} - v_j^-)^2}$$



Efficiency measure

$$C_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad \text{with} \quad 0 \leq C_i \leq 1 \quad \forall i = 1, \dots, n$$



Decision-making by comparing the efficiency measures

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Next step ...



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Extended survey to analyse the context and importance of identified criteria in the decision-making process of insourcing or outsourcing



Thank you for your attention!

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Open questions



Information to our research center and other research projects

<http://real-estate-research.org/>

Sources

Some figures are taken from the article: **Dörr, A.; Pfnür, A.** „How to develop corporate real estate? A decision support tool for CREM“ accepted for publishing in *Journal of Construction Engineering and Project Management*

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