

# ACCURACY OF THE INITIAL BUDGET OF REDEVELOPMENT PROJECTS

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## Document details

Delft University of Technology  
Master Real Estate and Housing – P5  
27 January 2017

# PROGRAMME

13:45 – 14:15 Presentation

14:15 – 14:30 Questions

14:30 – 15:30 Grade

15:30 – 18:30 Bouwpub!

# CONTENT

## 1. WHY

Motivation & research background

## 2. HOW

Research methodology

## 3. WHAT

Research results and conclusion

# MOTIVATION



# MOTIVATION

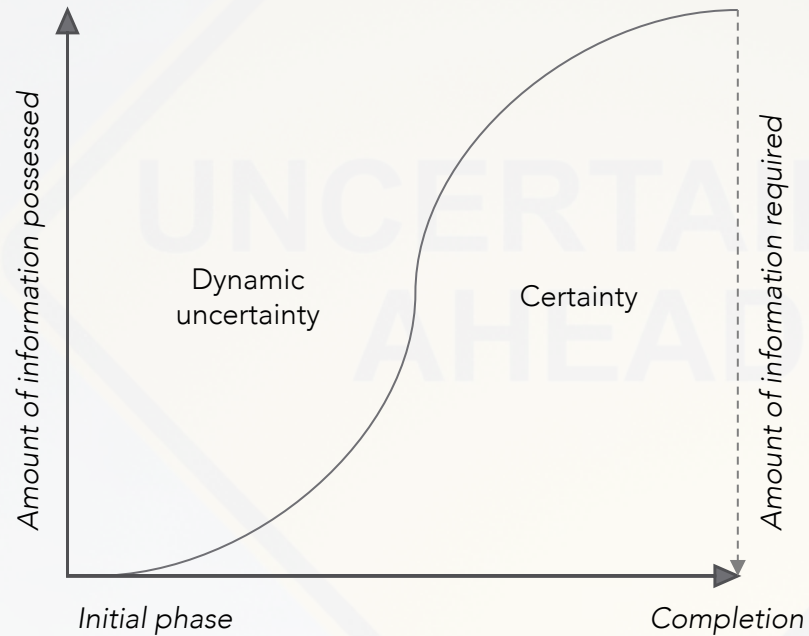


# UNCERTAINTY IN THE INITIAL PHASE

Nature of construction industry

Uncertainty vs information

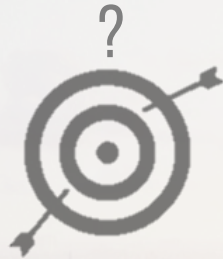
Accuracy of budget vs information  
Underestimated vs overestimated



# MAIN (PERSONAL) OBJECTIVES



*Current knowledge*



*Reasons for inaccuracies*



*Complexity of redevelopment*



*Costs vs revenues*



*Process vs budget*

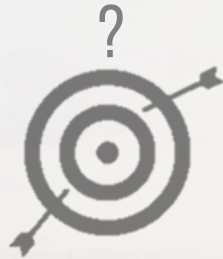


*Risk analysis*

# MAIN (PERSONAL) OBJECTIVES



*Current knowledge*



*Reasons for inaccuracies*



*Complexity of redevelopment*



*Costs vs revenues*



*Process vs budget*



*Risk analysis*



*Improvement of the accuracy*

# MAIN RESEARCH QUESTION

*Which **improvements** can be made in the redevelopment process, and in particular in the establishment of the budget **in the initial phase**, in order to **increase the accuracy** of budget estimations and to **diminish** the probability and effect of **risks**?*



## LITERATURE RESEARCH



6 RESEARCH TOPICS

PROCESS CHARACTERISTICS  
REASONS FOR INACCURACY

## SURVEY RESEARCH



37 RESPONDENTS

ACCURACY INITIAL BUDGET  
REASONS FOR INACCURACY

## CASE STUDY RESEARCH



3 CASES

PROCESS, PLAN AND  
BUDGET DEVELOPMENT  
REASONS FOR INACCURACY

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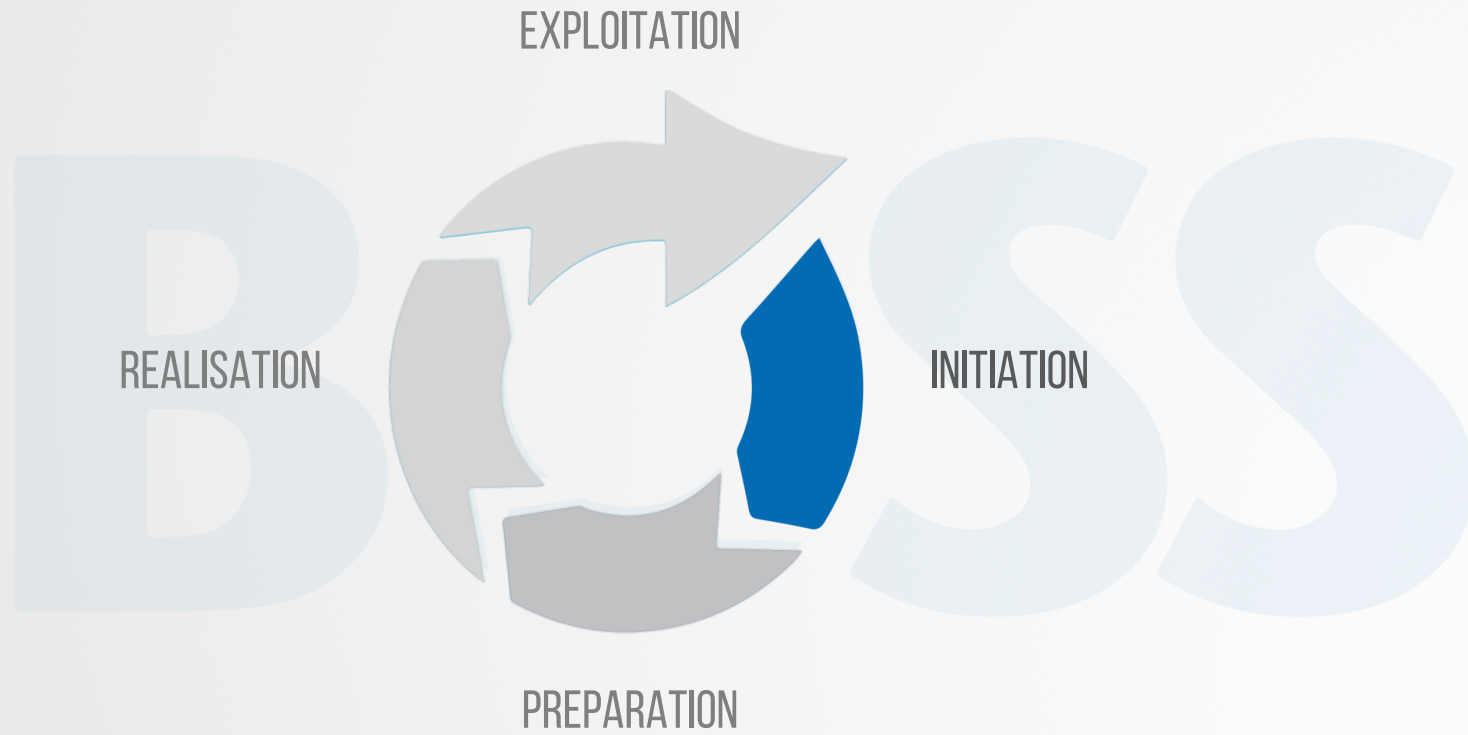


TRIANGULATION

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Theoretical framework

# (RE)DEVELOPMENT PROCESS



# INITIAL BUDGET: ESTIMATING METHOD

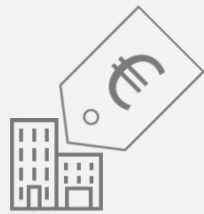


# INITIAL BUDGET: ESTABLISHMENT

Cost estimation

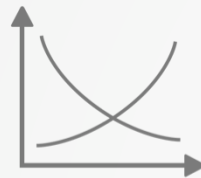


*Sketch design*



*Key figures*

Income estimation: BAR/NAR-method



*Market characteristics*



*Location characteristics*



*Building characteristics*



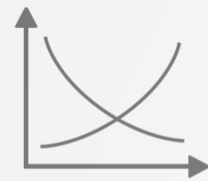
*Predictions*

# CAUSES OF COST INACCURACIES

|   |  |
|---|--|
| <b>Availability of information during the process</b><br><i>E.g. general lack of information; lack of information at tender stage; lack of information at briefing</i>  | <b>Design development</b><br><i>E.g. incomplete design at tender phase; initial design lacks details</i>   |
| <b>Availability of information about the existing building</b><br><i>E.g. lack of information about asbestos, structure, façade, soil, installations and other building components; condition of the building unknown (measurements, foundation, roof, materialisation)</i> | <b>Design brief</b><br><i>E.g. lack of detail or definition; client does not know what he/she wants</i>  |
| <b>Building characteristics</b><br><i>E.g. weak foundation; grid of building causes useless space; impossible to realise outdoor space; insufficient daylight for residential use; materials not fire resistant / rejected by fire department</i>                           | <b>Design team performance</b><br><i>E.g. designer's attitude; understanding of cost/value; inadequate cost control; designer's awareness as to areas of cost risk</i>                                 |
| <b>Claims</b><br><i>E.g. aggressive or claims conscious contractors; contractors risk pressure; late information release</i>  | <b>Organisation</b><br><i>E.g. poor preparation and planning</i>   |
| <b>Contractual factors</b><br><i>E.g. wrong contract used; wrong allocation of risk in contract document</i>  | <b>Project management</b><br><i>E.g. management of design, site, contractors and suppliers; lack of leadership; lack of value management; communication methods; management approach</i>               |
| <b>Commercial pressure</b><br><i>E.g. tight bidding conditions; corner cutting clients</i>  | <b>Psychological factors</b><br><i>E.g. optimism; cognitive bias; intuition; risk attitude</i>   |
| <b>Estimations / calculations</b><br><i>E.g. poor cost advises; poor risk analysis; wrong estimation of unforeseen costs</i>  | <b>Site conditions</b><br><i>E.g. unforeseen site conditions, restrictions, things that basically go wrong resulting in a more expensive construction method</i>                                       |
| <b>Legal factors</b><br><i>E.g. legislation unclear; impossible to meet requirements of municipality or zoning plan</i>   | <b>Strategic behaviour</b><br><i>E.g. deliberate cost underestimation; manipulation of estimations; no release of information</i>  |
| <b>People / project team</b><br><i>E.g. inexperience or not qualified team; relationship between actors; stubborn client</i>  | <b>Time limits</b><br><i>E.g. unrealistic time planning for design; delays due to slow decision making; insufficient time or budget to establish realistic budget; unrealistic construction period</i> |
| <b>Unforeseen interventions</b><br><i>E.g. changes in structure, facade, installations or other building components due to unforeseen situations</i>  | <b>External factors</b><br><i>E.g. changes in prices, indexes, inflation, legal factors or market trends</i>   |
| <b>Design changes</b><br><i>E.g. client driven design changes; design changes to maximise LFA/GFA ratio; design changes to maximise development potential</i>   |  |

Derived from 20 sources

# CAUSES OF INCOME INACCURACIES



*Market characteristics*



*Location characteristics*



*Building characteristics*



- General level of prosperity
- Population changes
- Qualitative change
- Rent as proportion of income or margin
- Competitive demand
- Limitation of supply



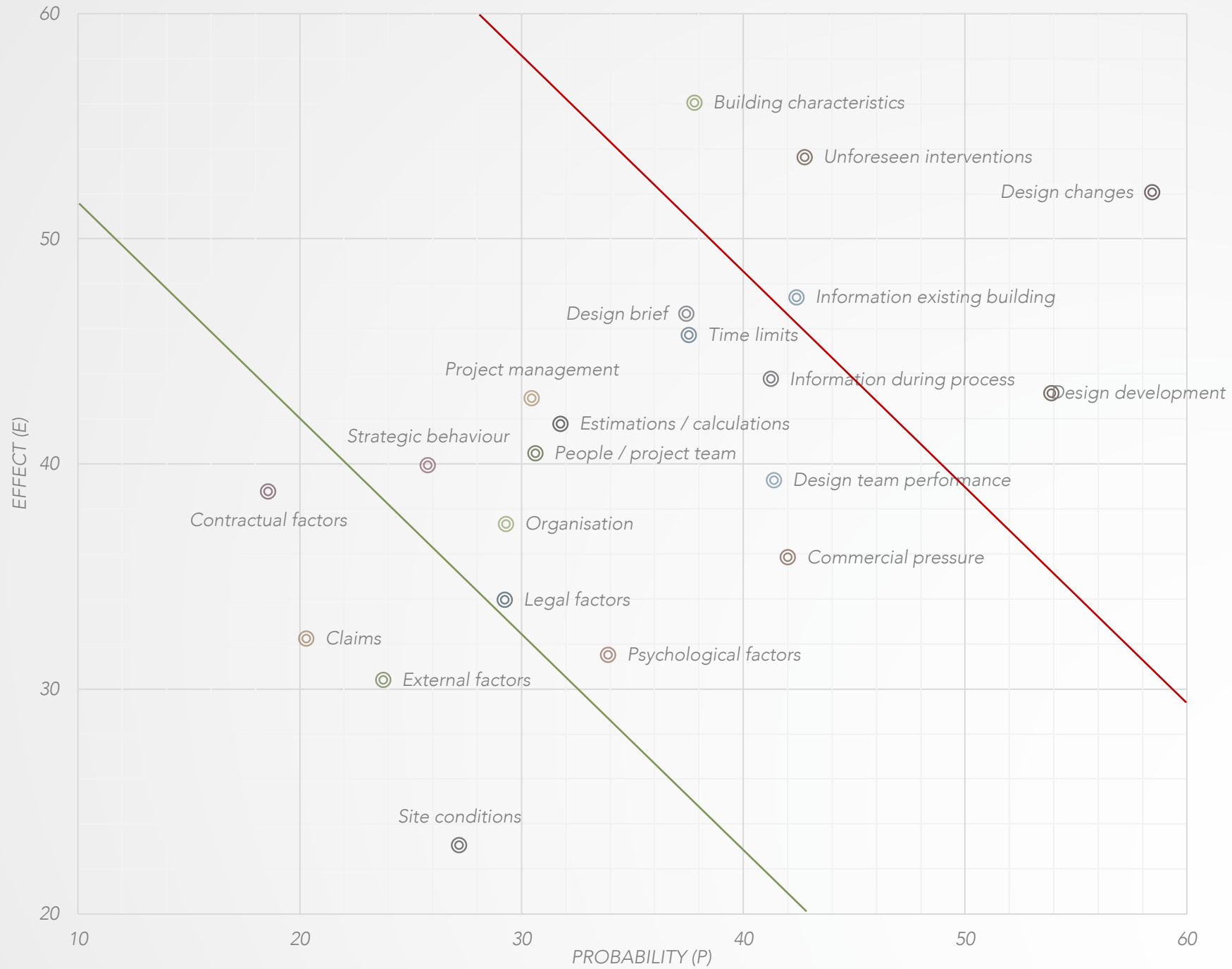
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Survey research

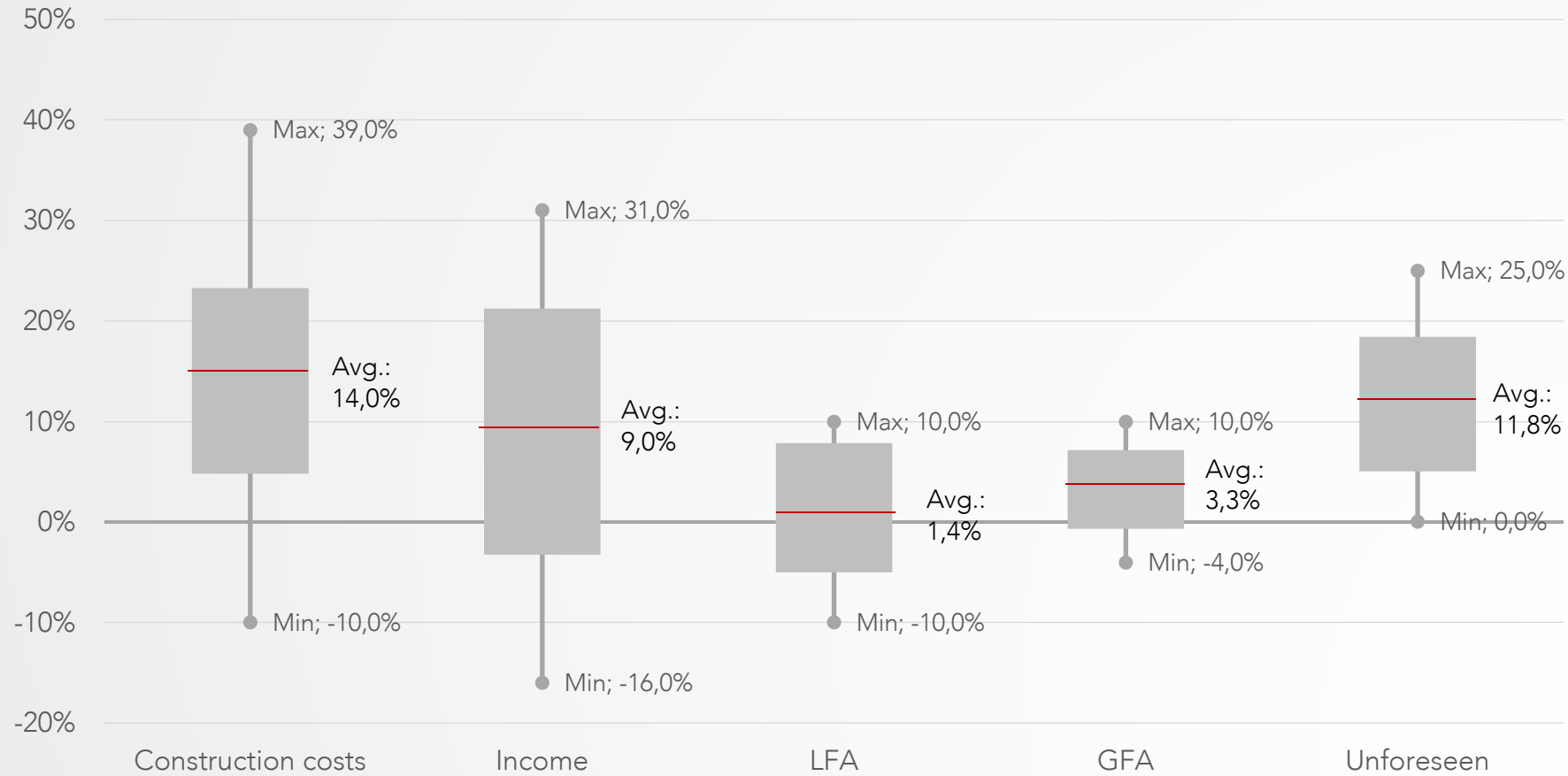
# SURVEY

- Aim: main causes and accuracy
- Criteria: anonymous and minimal effort
- Non-probability sampling
  - Convenience sampling
  - Snowball sampling





# ACCURACY INITIAL BUDGET



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Case study research

# CASE STUDIES

- Aim: deeper understanding
- Data collection
  - Semi-structured interviews
  - Content analysis
  - Questionnaire
- 3 cases
- Case criteria and units of analysis





CASE 1

---

**'LEMON BUILDINGS'**  
RANDSTAD



CASE 2

---

**'SECOND BUILDING'**  
RANDSTAD



CASE 3

---

**ZUSTERFLAT**  
DELFT

## CASE 1

---

### 'LEMON BUILDINGS'

LOCATION: RANDSTAD  
 ACQUISITION: 2014 Q3  
 SIZE: 6.300 M2 AND 14.800 M2

| Building 1         | Initial budget | Last budget | Deviation |
|--------------------|----------------|-------------|-----------|
| Construction costs | € 7,3 mil.     | €15,6 mil.  | +114%     |
| Total investment   | € 20,7 mil.    | € 26,5 mil. | +28%      |



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## DESIGN CHANGES

STRATEGIC BEHAVIOUR &  
 PSYCHOLOGICAL FACTORS

## DELAYS

UNFORESEEN SITUATIONS  
 DUE TO MISSING BUILDING INFORMATION

## CASE 1

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| Construction costs   | € 7,3 mil.     | €15,6 mil.  | +114%     |
| Total investment     | € 20,7 mil.    | € 26,5 mil. | +28%      |
| Rental income / year | € 1,4 mil.     | € 2,8 mil.  | +100%     |
| Exit value           | € 20,1 mil.    | € 47 mil.   | +134%     |

## INCREASED MARKET DEMAND

LOWER MARKET RISK

HIGHER RENTAL INCOME

HIGHER QUALITY &amp; MORE FLOOR AREA

# CASE 1

## 'LEMON BUILDINGS'

LOCATION: RANDSTAD  
 ACQUISITION: 2014 Q3  
 SIZE: 6.300 M2 AND 14.800 M2





## CASE 3

---

### ZUSTERFLAT

LOCATION: DELFT  
LEASE AGREEMENT: 2013 Q4  
SIZE: 5.973 M2

|                    | Initial budget | Realised    | Deviation |
|--------------------|----------------|-------------|-----------|
| Construction costs | € 1,16 mil.    | € 0,95 mil. | -17,7%    |
| Total investment   | € 1,72 mil.    | € 1,22 mil. | -29,3%    |



## CASE 3

---

### ZUSTERFLAT

LOCATION: DELFT  
LEASE AGREEMENT: 2013 Q4  
SIZE: 5.973 M2

|                    | Initial budget | Realised    | Deviation |
|--------------------|----------------|-------------|-----------|
| Construction costs | € 1,16 mil.    | € 0,95 mil. | -17,7%    |
| Total investment   | € 1,72 mil.    | € 1,22 mil. | -29,3%    |

DESIGN OPTIMISATIONS

PROJECT MANAGEMENT

TIME LIMITS

ESTIMATIONS / CALCULATIONS

LOWER QUALITY / MORE REUSE



## CASE 3

---

### ZUSTERFLAT

LOCATION: DELFT  
LEASE AGREEMENT: 2013 Q4  
SIZE: 5.973 M2

|                      | Initial budget | Realised    | Deviation |
|----------------------|----------------|-------------|-----------|
| Construction costs   | € 1,16 mil.    | € 0,95 mil. | -17,7%    |
| Total investment     | € 1,72 mil.    | € 1,22 mil. | -29,3%    |
| Rental income / year | € 352.500      | € 430.300   | +22%      |

## DESIGN OPTIMISATIONS

ATTITUDE TOWARDS RISKS

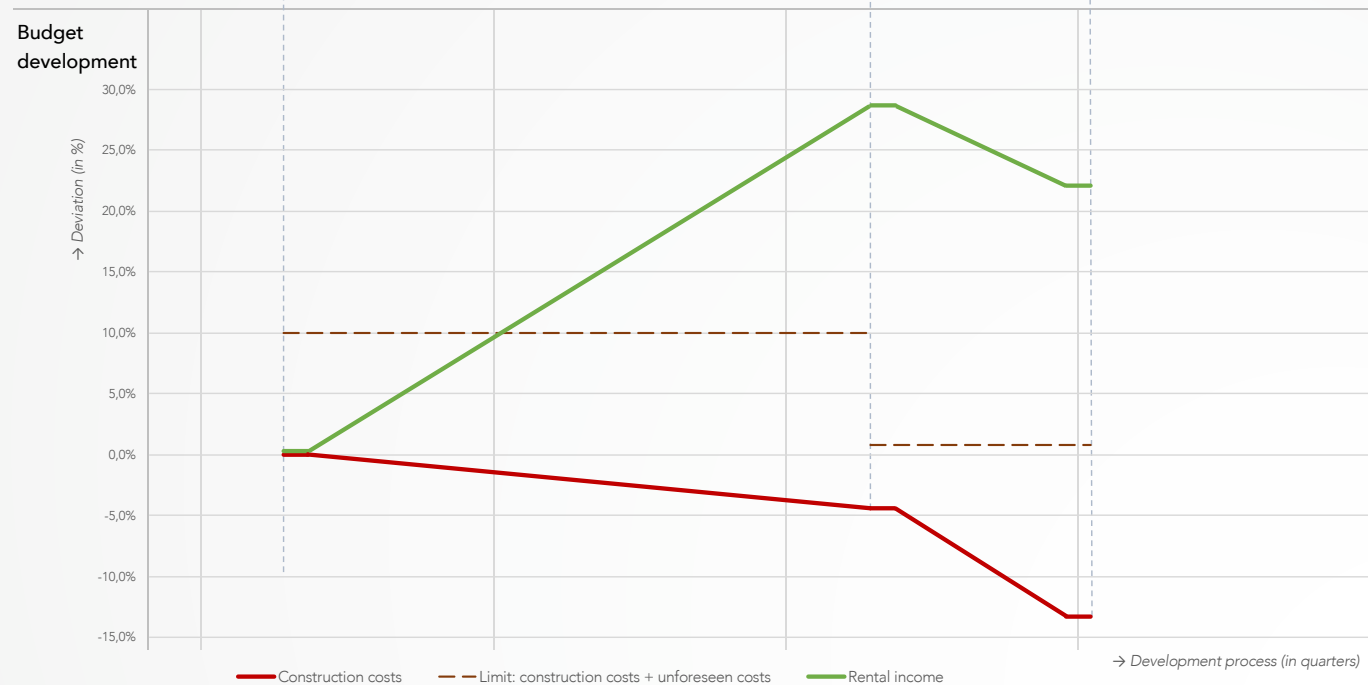
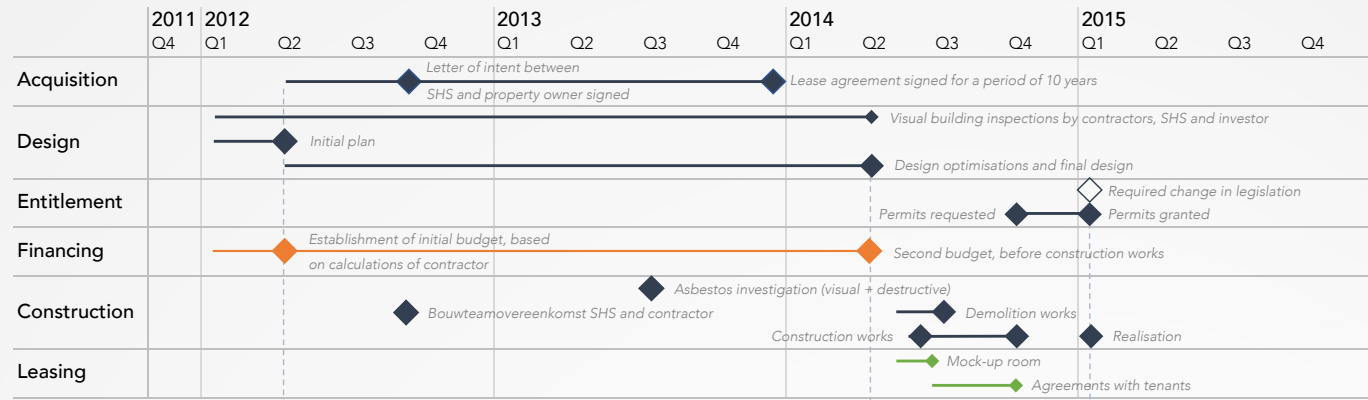
ESTIMATIONS / CALCULATIONS

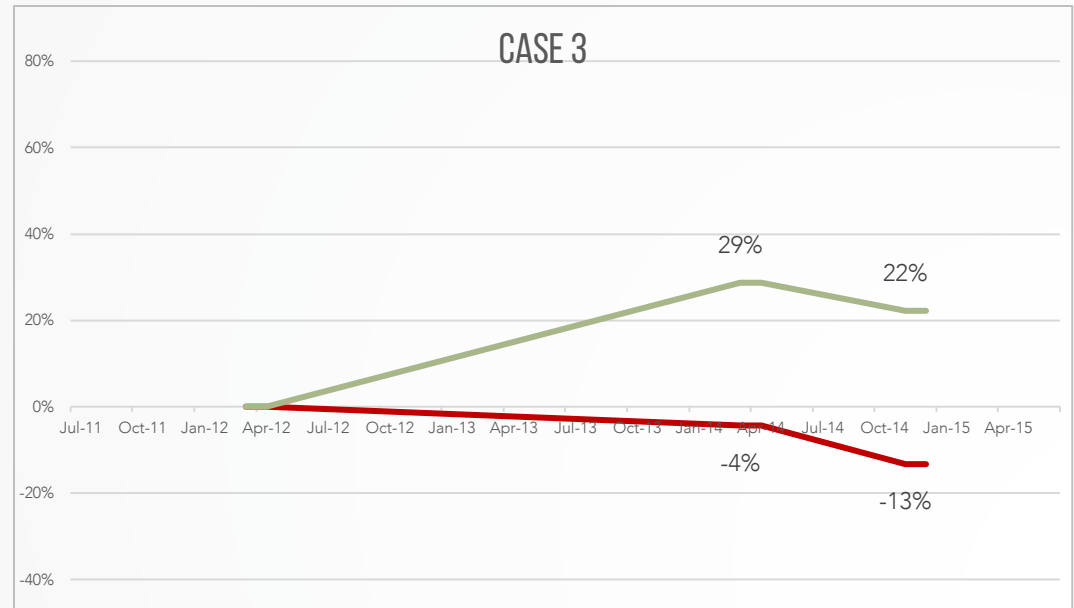
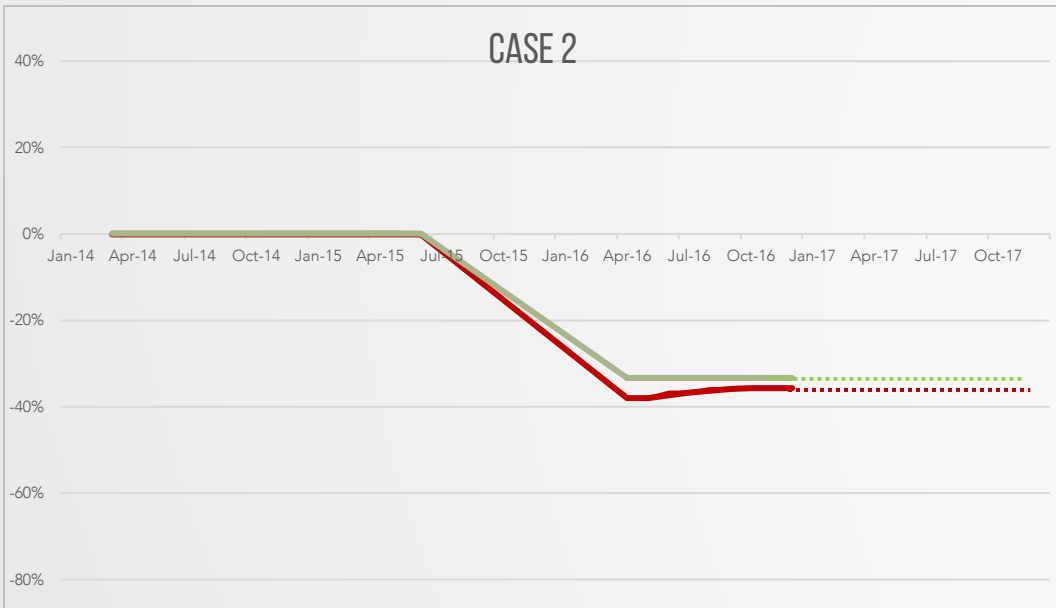
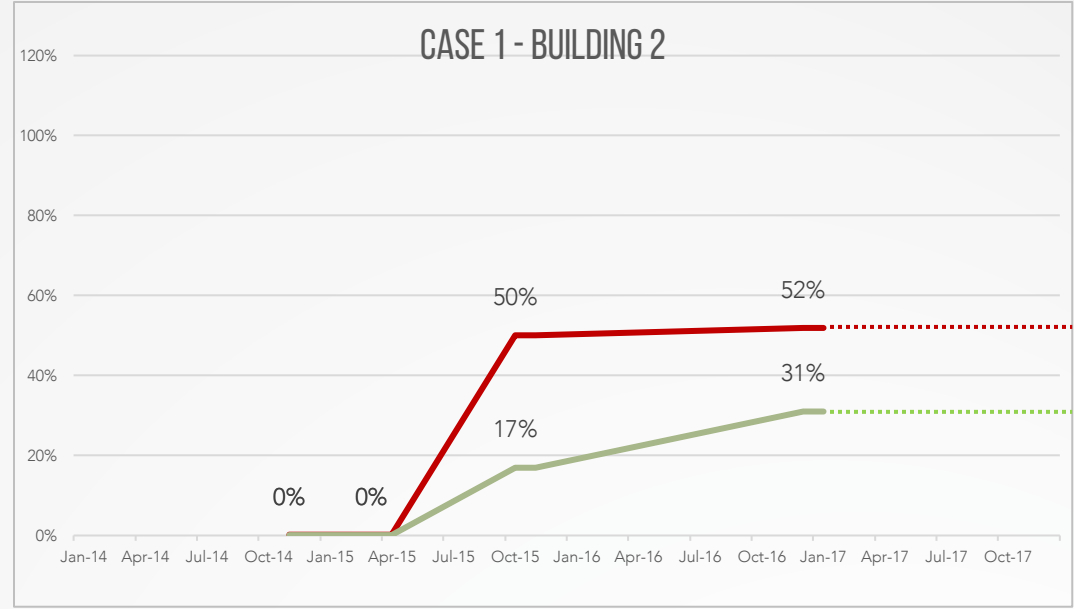
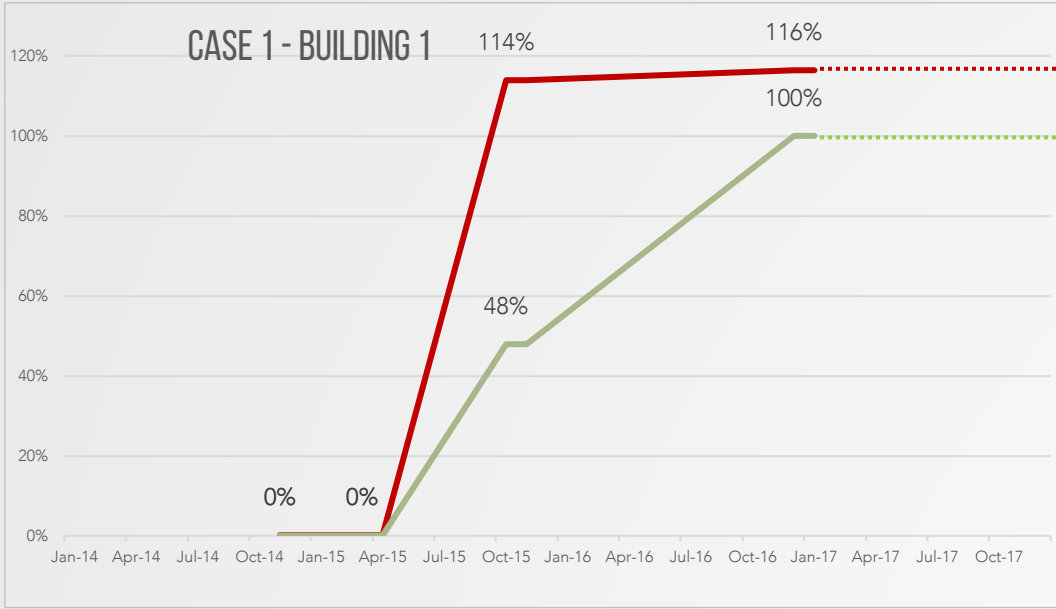


## CASE 3

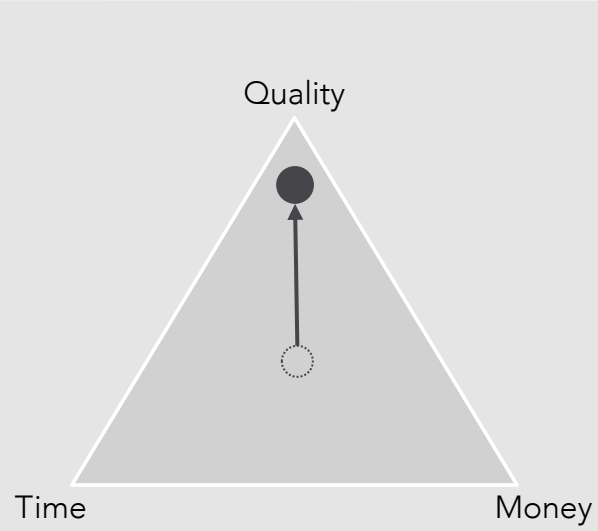
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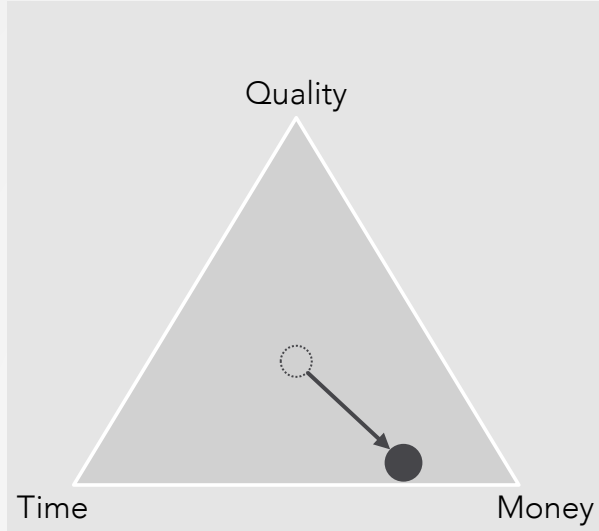




CASE 1

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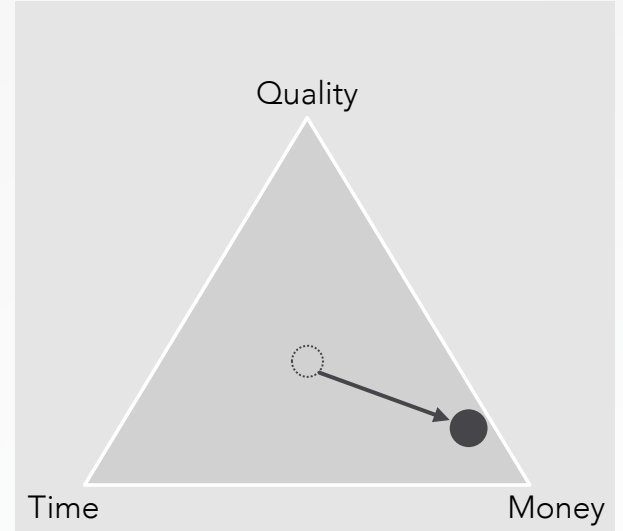
'LEMON BUILDINGS'  
RANDSTAD



CASE 2

---

'SECOND BUILDING'  
RANDSTAD



CASE 3

---

ZUSTERFLAT  
DELFT

---

Conclusion

# ACCURACY INITIAL BUDGET

|                       | Literature                       | Survey (n=26) |
|-----------------------|----------------------------------|---------------|
| Construction costs    | <i>Underestimated</i>            | <b>+14%</b>   |
| CC / m2               | <i>Underestimated</i>            | -             |
| Income                | -                                | <b>+9%</b>    |
| Floor area (lettable) | -                                | <b>+1,4%</b>  |
| Floor area (gross)    | -                                | <b>+3,3%</b>  |
| Unforeseen            | <i>Higher than<br/>new-built</i> | <b>11,8%</b>  |

# ACCURACY INITIAL BUDGET

|                       | Literature                   | Survey (n=26) | Case 1-1 | Case 1-2 | Case 2 | Case 3 |
|-----------------------|------------------------------|---------------|----------|----------|--------|--------|
| Construction costs    | <i>Underestimated</i>        | <b>+14%</b>   | +114%    | +50%     | -39%   | -18%   |
| CC / m2               | <i>Underestimated</i>        | -             | +65%     | +47%     | -14%   | -18%   |
| Income                | -                            | <b>+9%</b>    | +100%    | +31%     | -33%   | +22%   |
| Floor area (lettable) | -                            | <b>+1,4%</b>  | +14%     | +2%      | -25%   | 0%     |
| Floor area (gross)    | -                            | <b>+3,3%</b>  | +29%     | +3%      | -28%   | +11%   |
| Unforeseen            | <i>Higher than new-built</i> | <b>11,8%</b>  | 10%      | 10%      | 3%     | 10%    |

# CAUSES FOR INACCURACIES

| Variables           | Literature               | Survey (n=37)  | Case 1   | Case 2  | Case 3  |
|---------------------|--------------------------|--|--|---|---|
| <b>Main reasons</b> | <i>Various, unranked</i> | <ol style="list-style-type: none"> <li>1. <b>Design changes</b></li> <li>2. <b>Design development</b></li> <li>3. <b>Unforeseen interventions</b></li> <li>4. <b>Building characteristics</b></li> <li>5. <b>Missing building information</b></li> </ol> | <ul style="list-style-type: none"> <li>• <i>Design changes / brief</i></li> <li>• <i>Strategic behaviour / psychological reasons</i></li> <li>• <i>Unforeseen interventions due to missing building information</i></li> <li>• <i>Estimations / calculations</i></li> <li>• <i>External factors</i></li> </ul> | <ul style="list-style-type: none"> <li>• <i>Design changes / brief</i></li> <li>• <i>Unforeseen interventions due to:</i> <ul style="list-style-type: none"> <li>• <i>Legal aspects</i></li> <li>• <i>External</i></li> <li>• <i>Missing building information</i></li> </ul> </li> <li>• <i>Estimations / calculations</i></li> </ul> | <ul style="list-style-type: none"> <li>• <i>Design changes</i></li> <li>• <i>Project management</i></li> <li>• <i>Time limits</i></li> <li>• <i>Estimations / calculations</i></li> </ul> |

JACKSON, 2002

**COMMERCIAL DEVELOPMENTS**

114 RESPONDENTS



MAIN REASON:  
**DESIGN CHANGES**

FLYVBJERG ET AL., 2007

**PUBLIC WORKS (INFRASTRUCTURE)**

181 PROJECTS



MAIN REASON:  
**STRATEGIC BEHAVIOUR**

JACKSON, 2002

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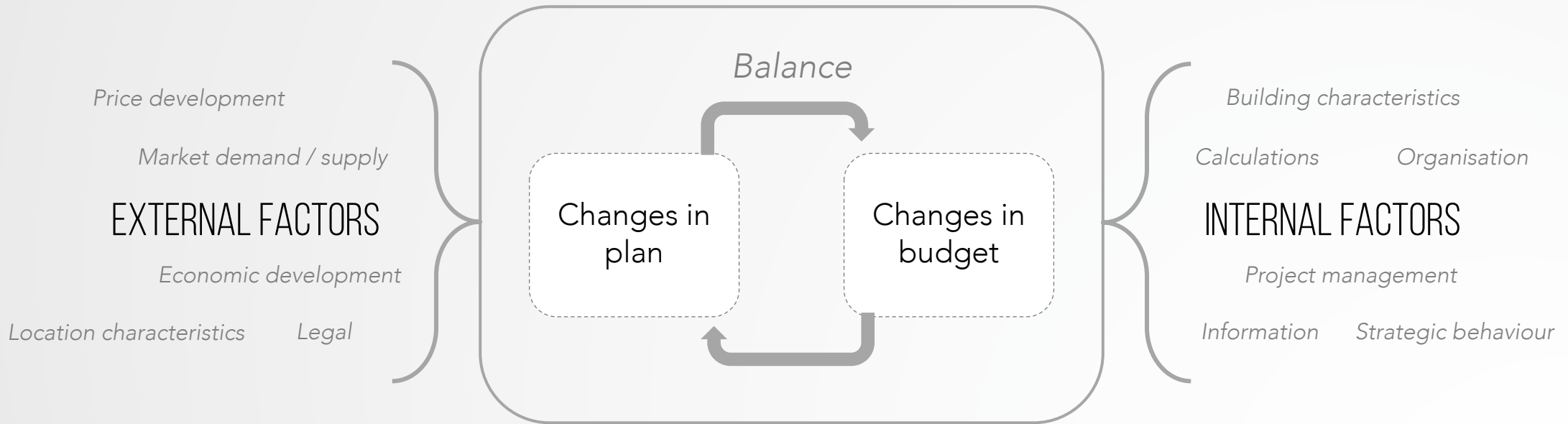
**SURVEY RESULTS**

37 RESPONDENTS



EXCEPT FROM 2 RESPONDENTS  
WORKING FOR HOUSING ASSOCIATION





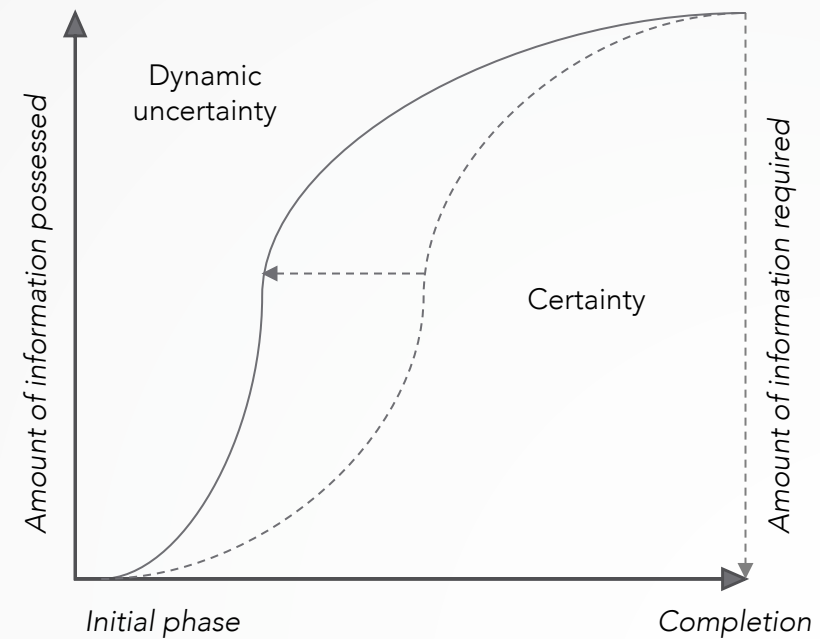


# IMPROVEMENTS

Building investigations in initial phase

Early (sub-)contractor involvement

Unforeseen: at least 5%, average of 12% during construction phase



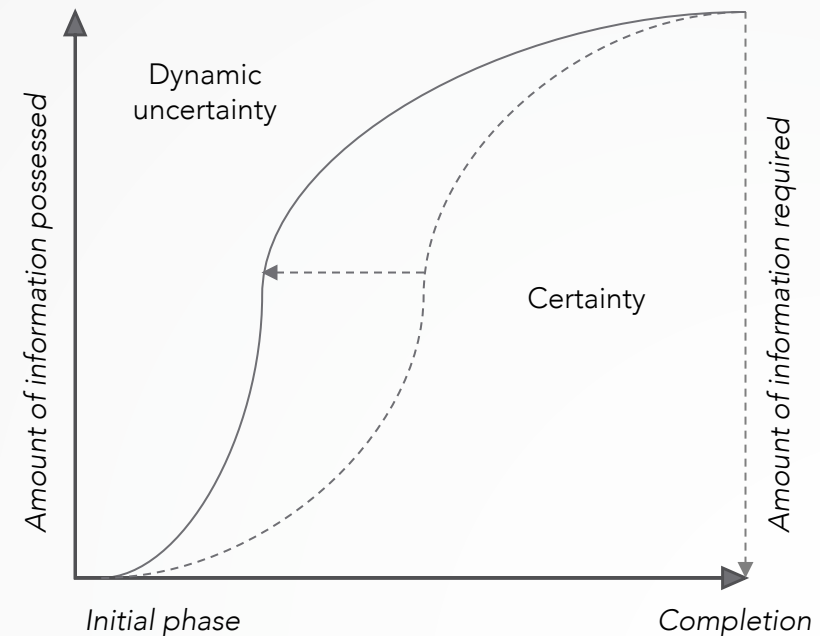
# IMPROVEMENTS

Building investigations in initial phase

Early (sub-)contractor involvement

Unforeseen: at least 5%, average of 12% during construction phase

**FLEXIBLE ATTITUDE  
DURING THE ENTIRE PROCESS!**



# ACCURACY OF THE INITIAL BUDGET OF REDEVELOPMENT PROJECTS

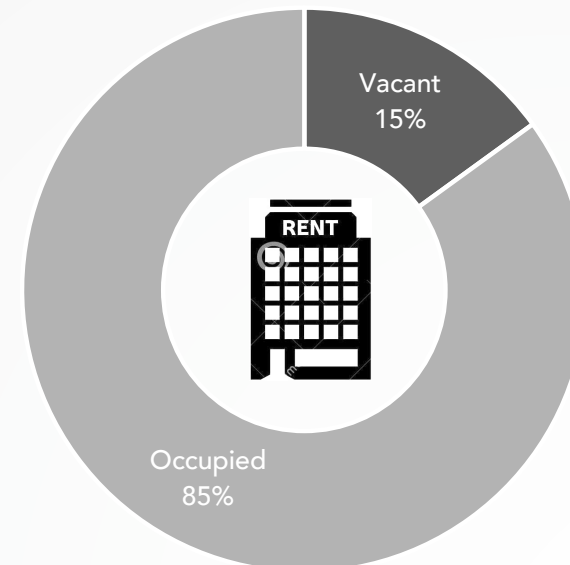
Thank you  
for your attention!



# UNBALANCED DUTCH REAL ESTATE MARKET

- High vacancy in the office (and retail) market
- Investors: consolidation
- Transformation
  - Sustainability targets
  - Shortage in housing market
  - Preservation of existing stock
  - Risks and uncertainty

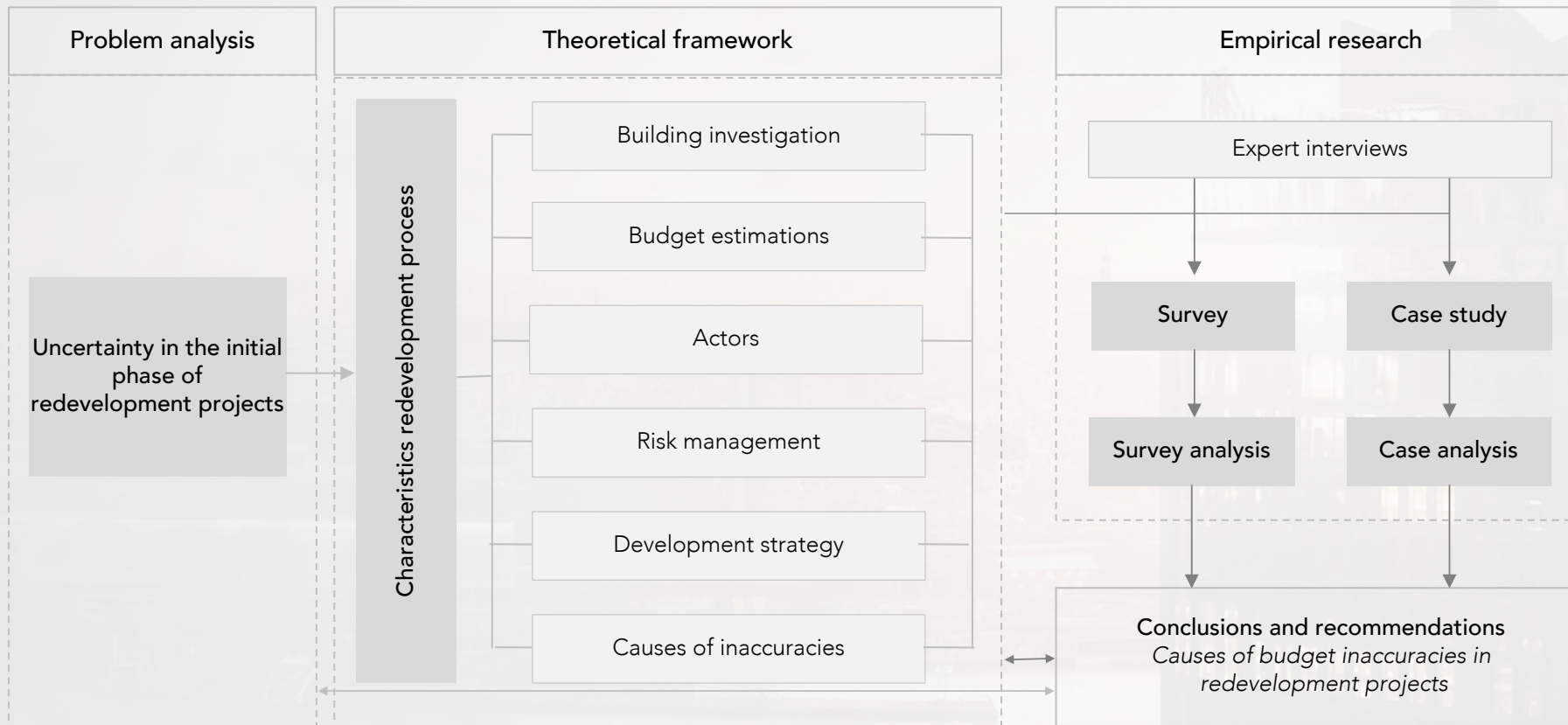
Dutch office stock in 2016: vacant vs. in-use



## SUB QUESTIONS

1. What is the (average) **accuracy** of the initial budget and percentage **unforeseen** in redevelopment projects?
2. Which factors within the redevelopment process are the main **causes** for cost inaccuracies and what are the perceived probability and effect of these factors on the development of the costs?
3. How does the **development strategy** in the redevelopment process, and in particular in the initial phase, affect the development of the budget?
4. Which **improvements** can be made in the redevelopment process to increase the accuracy of the initial budget and decrease the risks?

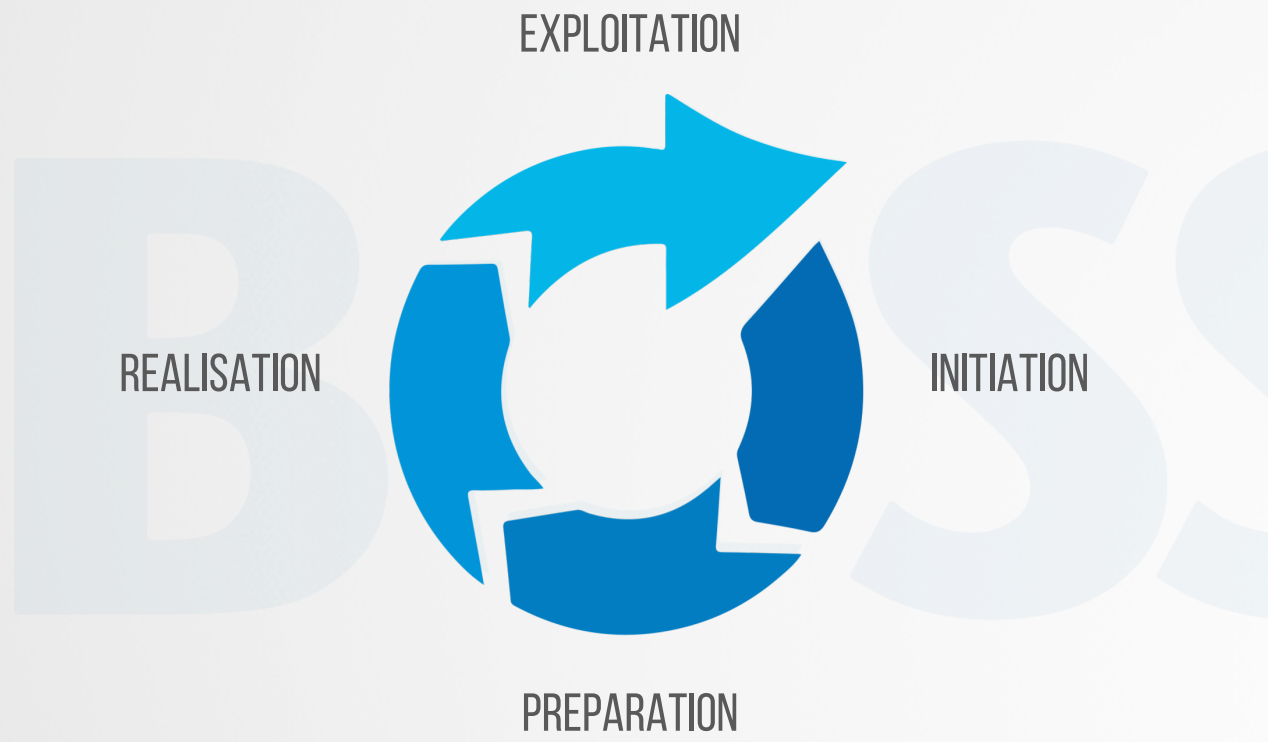
# RESEARCH DESIGN AND METHODOLOGY



# RELEVANCE



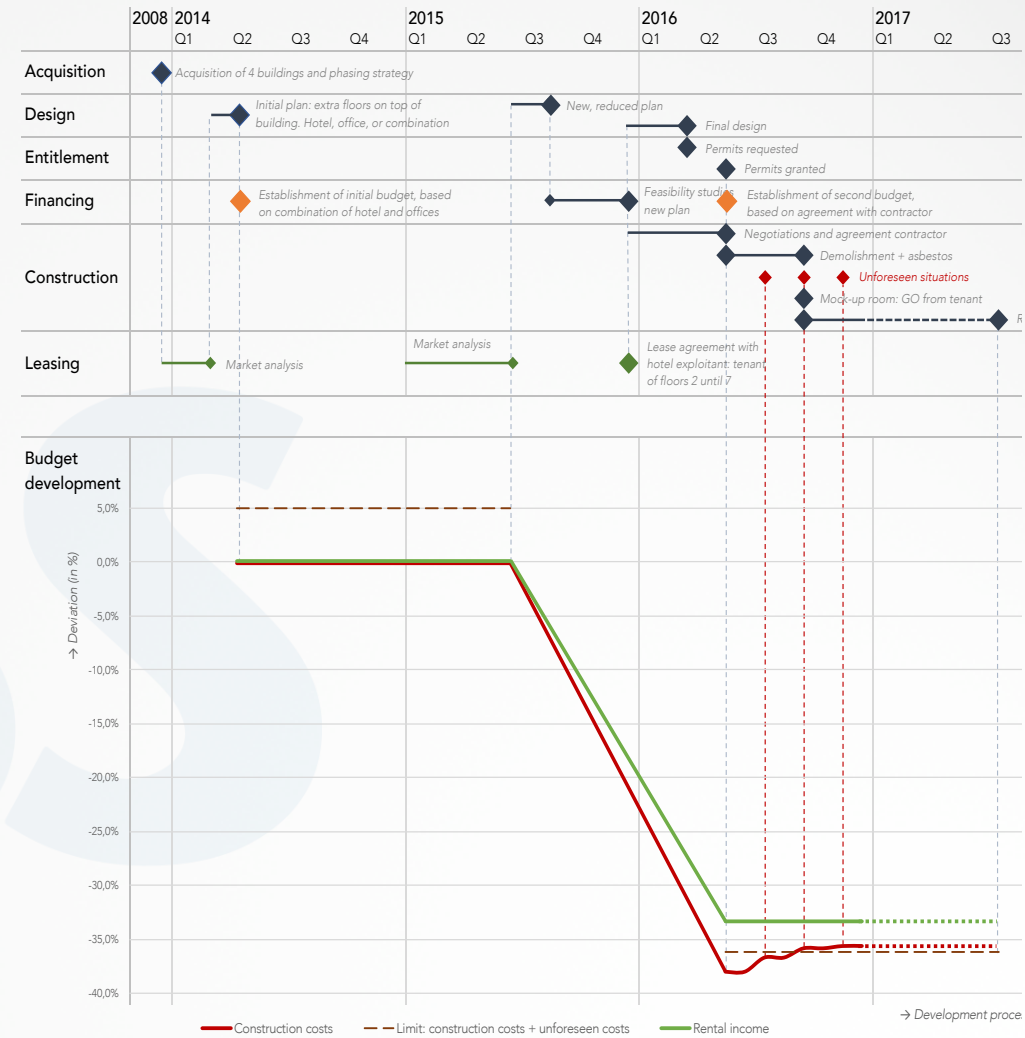
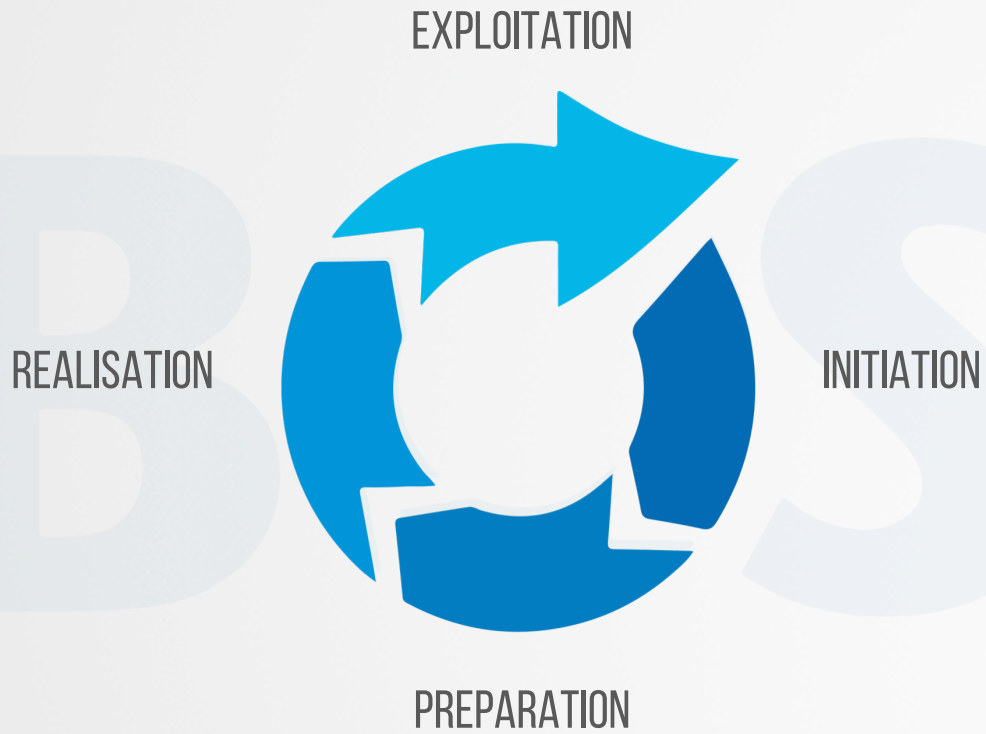
# (RE)DEVELOPMENT PROCESS



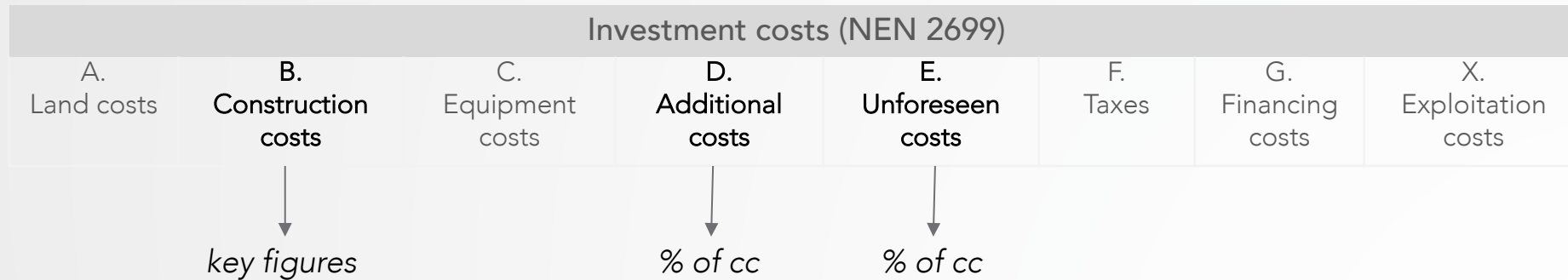
| Initiation   | Feasibility   | Commitment   | Construction  | Management   |
|--|---|--|---|--|
| <b>LAND DEVELOPMENT</b>                            |   |  |   |  |
| Site selection, investigation of land ownership    | Soil investigation  | Land purchase  | Site preparation  |  |
| <b>DESIGN</b>                                      |   |  |   |  |
| Development of idea, spatial concept               | Development of PoR and preliminary design, selection of architect | Development of final design and engineering                        |   |  |
| <b>ENTITLEMENT</b>                                 |   |  |   |  |
| Investigation of zoning plan and necessary permits | Investigation of environmental effects                            | Application of building permit, communication with interest groups | Secure necessary (building) permits, application usage permit |  |
| <b>FINANCING</b>                                   |   |  |   |  |
| Analysis by 'back of envelope pro forma'           | Analysis of economic feasibility                                  | Analysis of economic feasibility, arranging project financing      | Controlling budget  | Closing loan, generating profits                       |
| <b>CONSTRUCTION</b>                                |   |  |   |  |
|  | Cost engineering  | Selection contractor   | Execute building contracts, supervision of construction       | After-care, facility/technical management              |
| <b>LEASING</b>                                     |   |  |   |  |
| Watching market trends; determining target market  | Market analysis, market feasibility study                         | Marketing plan, closing pre-rental agreements                      | Marketing and promotion, closing pre-rental agreements,       | Closing rental agreements                              |
| <b>SALE</b>  |   |  |   |  |
| Watching economic trends                           | Market analysis, market feasibility study                         | Marketing plan   |   | Property management, sale contract sale of the project |



# (RE)DEVELOPMENT PROCESS



# INITIAL BUDGET: CLASSIFICATION

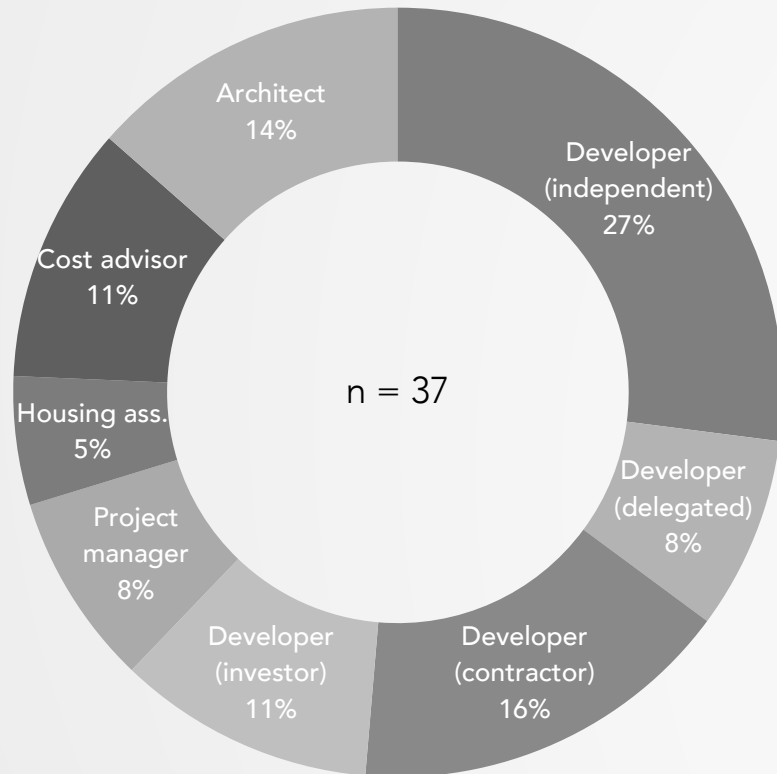


# RISK ANALYSIS

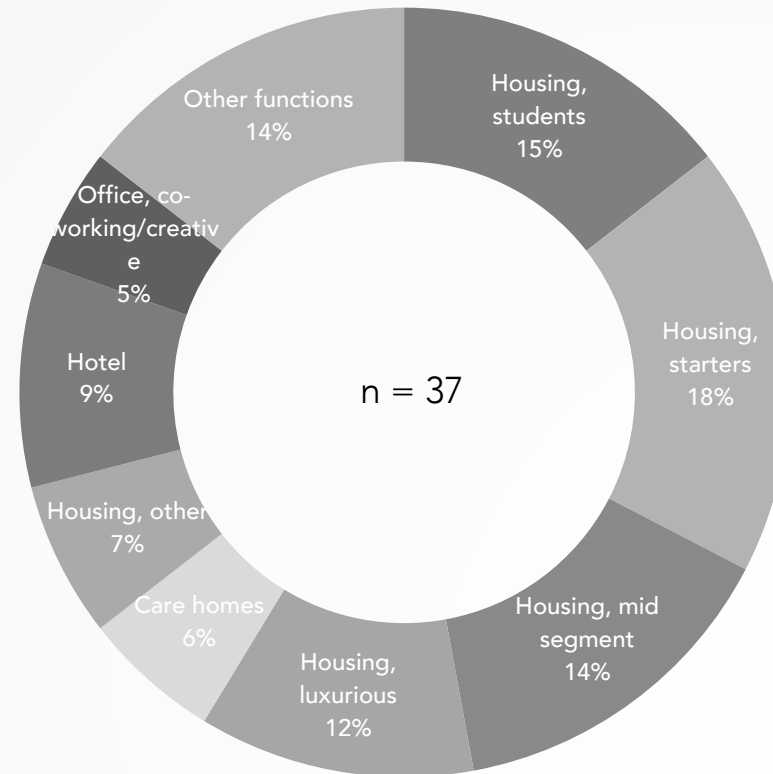
- Identification
  - Based on experience (subjective)
- Quantification
  - Risk premium / scenario analyses (subjective)
- Risk behaviour
  - Different perceptions of risk

# SURVEY RESPONDENTS

Type of actor

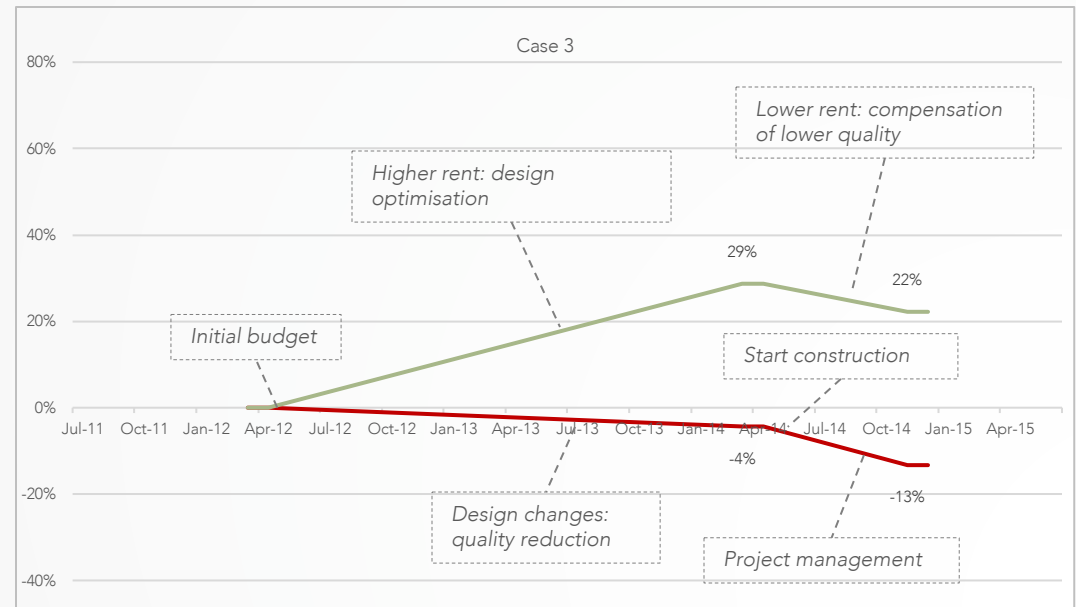
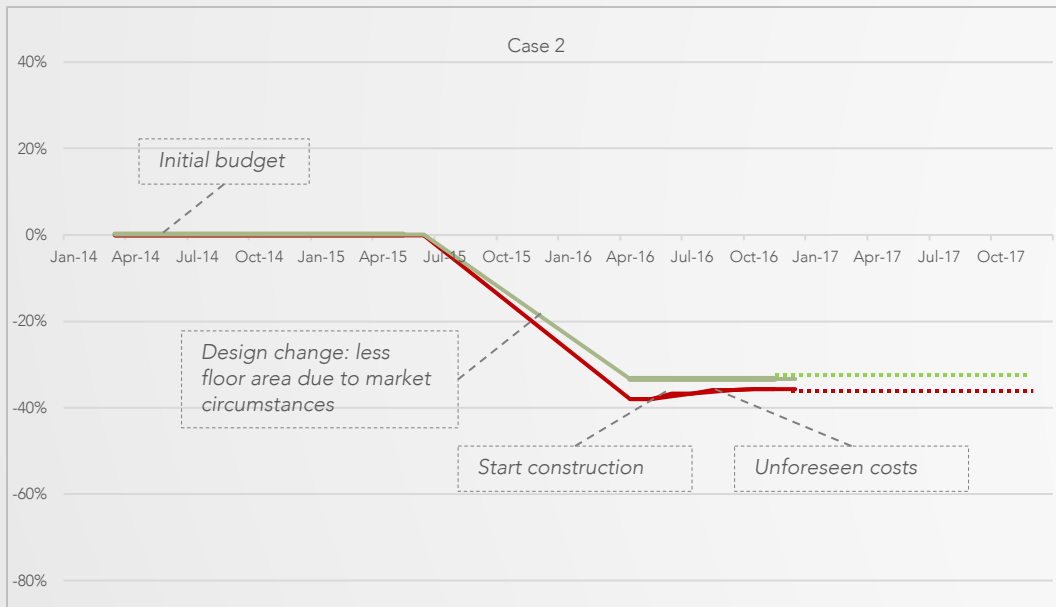
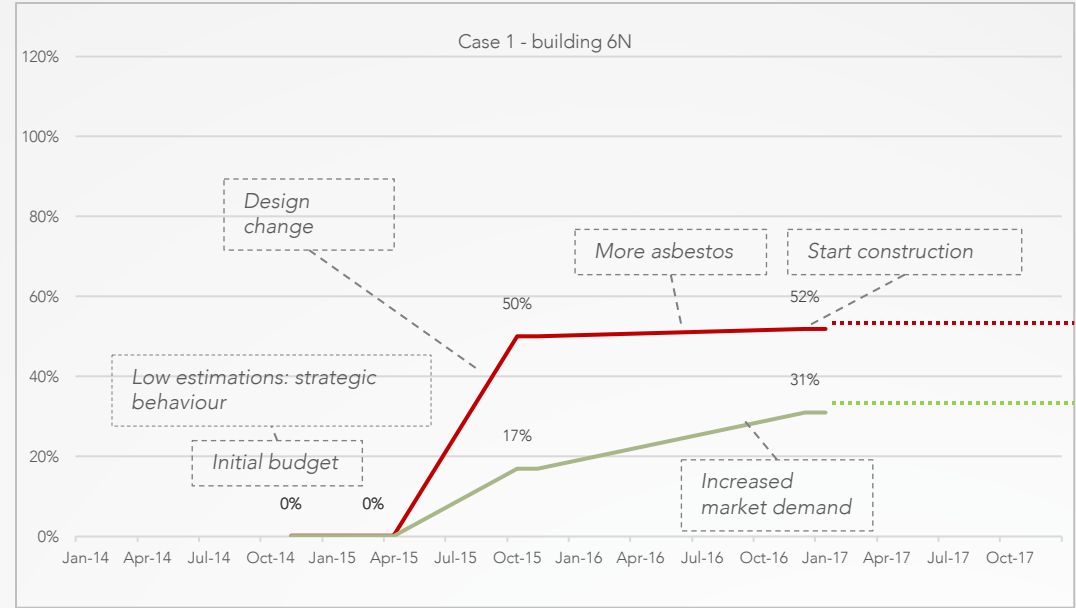
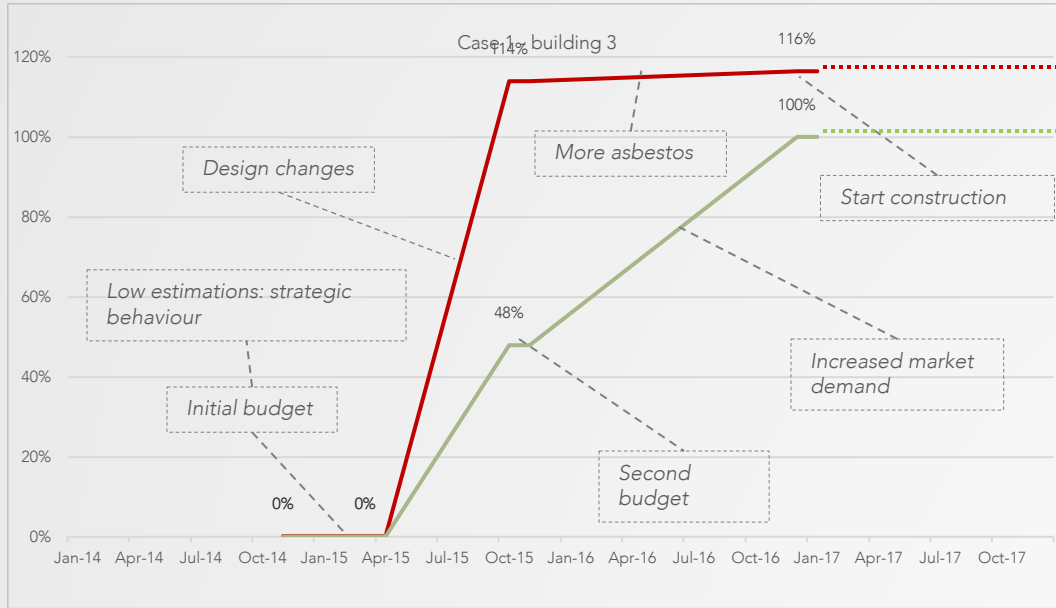


Type of projects

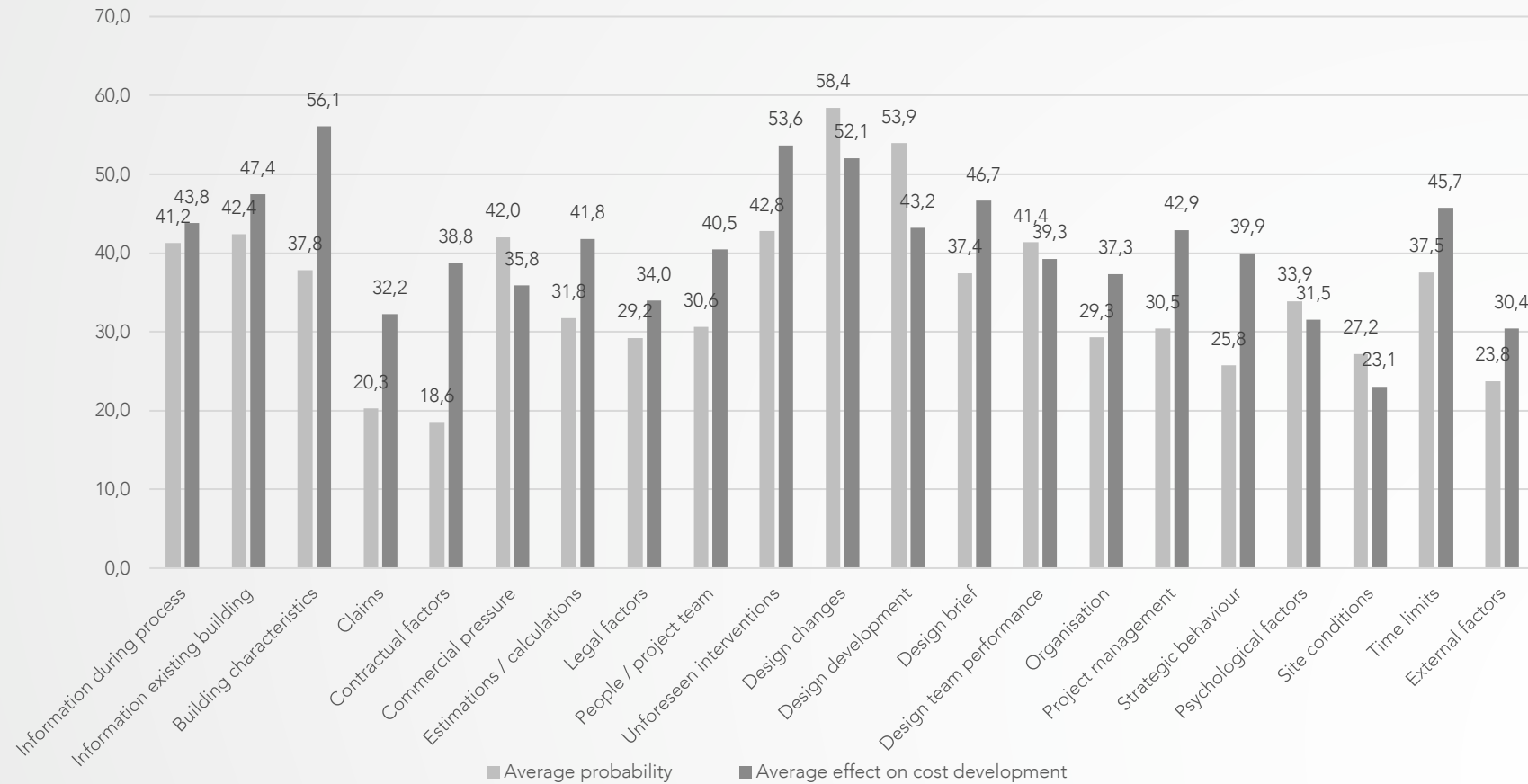


# SURVEY FINDINGS, BUDGET ACCURACY

|   | <i>Minimum</i> | <i>Maximum</i> | <i>Average</i> | <i>Std. dev.</i> | <i>n</i> |
|---|----------------|----------------|----------------|------------------|----------|
| <i>Construction costs</i>                   | -10 %          | 39 %           | <b>14,04 %</b> | 9,24             | 26       |
| <i>Revenues</i>                             | -16 %          | 31 %           | <b>9,00 %</b>  | 12,25            | 26       |
| <i>LFA</i>                                  | -10 %          | 10 %           | <b>1,42 %</b>  | 6,42             | 26       |
| <i>GFA</i>                                  | -4 %           | 10 %           | <b>3,27 %</b>  | 3,91             | 26       |
| <i>Unforeseen (% of construction costs)</i> | 0 %            | 25 %           | <b>11,77 %</b> | 6,69             | 26       |



# SURVEY FINDINGS



# SURVEY FINDINGS, PER ACTOR

| Rank                            | n  | 1                                     | 2                        | 3                                     | 4                                  | 5                                     |
|---------------------------------|----|---------------------------------------|--------------------------|---------------------------------------|------------------------------------|---------------------------------------|
| <b>Total</b>                    | 37 | Design changes                        | Design development       | Unforeseen interventions              | Building characteristics           | Missing information existing building |
| <b>Developer independent</b>    | 10 | Design changes                        | Building characteristics | Missing information existing building | Design development                 | Unforeseen interventions              |
| <b>Developer delegated</b>      | 3  | Missing information during process    | External factors         | Design changes                        | Estimations / calculations         | Unforeseen interventions              |
| <b>Developer contractor</b>     | 6  | Design changes                        | Building characteristics | Design brief                          | Unforeseen interventions           | Design team performance               |
| <b>Developer investor</b>       | 4  | Unforeseen interventions              | Building characteristics | Legal factors                         | Missing information during process | Design changes                        |
| <b>Project manager</b>          | 3  | Missing information during process    | Design development       | Unforeseen interventions              | Time limits                        | Design brief                          |
| <b>PM – housing association</b> | 2  | Strategic behaviour                   | Building characteristics | Time limits                           | Organisation                       | Estimations / calculations            |
| <b>Cost advisor</b>             | 4  | Design changes                        | Design development       | Commercial pressure                   | Design brief                       | Design team performance               |
| <b>Architect</b>                | 5  | Missing information existing building | Building characteristics | Project management                    | People / project team              | Design changes                        |



## SUB QUESTION 2: CAUSES FOR INACCURACIES

| Variables                             | Literature               | Survey (n=37) | Case 1   | Case 2   | Case 3  |
|---------------------------------------|--------------------------|---------------|--|--|---|
| <b>Main reason for design changes</b> | <i>Various, unranked</i> | -             | <i>Market demand</i> <ul style="list-style-type: none"> <li>• <i>Higher rent</i></li> <li>• <i>More floor area</i></li> <li>• <i>Higher quality</i></li> </ul> | <i>Mismatch market vs. initial plan</i> <ul style="list-style-type: none"> <li>• <i>Less floor area</i></li> <li>• <i>Lower costs</i></li> </ul> | <i>Risk behaviour of investor and delay in change of legislation</i> <ul style="list-style-type: none"> <li>• <i>More reused materials</i></li> <li>• <i>Lower investment</i></li> <li>• <i>Own coordination</i></li> </ul> |

## SUB QUESTION 3: PROCESS VS. BUDGET

| Variables                       | Case 1 | Case 2                      | Case 3  |
|---------------------------------|--------|-----------------------------|---|
| Establishment of initial budget | ✓      | ✓                           | <i>Contractor involvement<br/>Based on quantities</i> |
| Risk analysis                   | ✓      | ✓                           | <i>+ contractor</i>                                   |
| Risk distribution               | ✓      | <i>Contractor: asbestos</i> | ✓   |
| Building investigation          | ✓      | <i>Contractor (late)</i>    | ✓   |