Scenario Developing for life cycle design and analyses

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www.vub.ac.be/arch/transform
www.ovam.be/veranderingsgerichtbouwen
In February 1951 the Popular Mechanics Magazine presents the “Hiller Hornet”, a personal helicopter “ready for the civilian market”.

Luckily, as this prediction turned out to be a mistake, new houses were not equipped with helicopter garages. After all, the future cannot be predicted.
Because the future cannot be predicted we build in a transformable way: multi-purpose assets, movable structures and demountable building elements.

These strategies demonstrate the understanding that our requirements will always change. Their aim is to create buildings that support that change efficiently.

The only certainty is that the future is uncertain. Therefore, we design in a transformable way.

**Multipurpose assets**

**Movable structures**

**Reversible design**

SOURCE
www.kpw-architecten.be/hoogbouwplein

OVAM (2015).
www.ovam.be/veranderingsgerichtbouwen

SOURCE

SOURCE
Although transformable buildings allow us to anticipate change without predicting the future one should look forward in time when evaluating their long-term advantage.

Therefore Scenario Developing arouses our interest. Although scenarios are commonly used in other sectors, they have been rarely adopted during the design or assessment of buildings.

Scenario Developing for life cycle design and analyses

What are scenarios?

How to build them?
Scenarios express how a building might change. They take into account the owners’ knowledge about future requirements and the designers’ insight in the building’s adaptability.

Subjecting subsequently each design alternative to those imaginable futures allows appraising their robustness and saying “I am prepared for whatever happens”.

What are scenarios?
**Scenario are stories, exploring imaginable but divergent futures.**

Plausible versus possible scenarios
Probable or preferable scenarios

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SOURCE www.extrapolationfactory.com/futurematic
Scenarios, being narrative by nature, relate easily to architecture and its users. For example Friedman (2002) developed scenarios resembling the growth of a household. To each of the subsequent expansions relate changing requirements. Thinking in terms of scenarios allows evaluating the house's potential to change and fulfill those requirements.

Adaptable homes need to be able to respond to a situation commonly occurring nowadays where a child grows up and leaves the original household to form his or her own household, but then, after divorce, may return later to the original household, only to remarry and leave again.

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To each of the subsequent expansions relate changing requirements. Thinking in terms of scenarios allows evaluating the house’s potential to change and fulfil those requirements.
Divergent scenarios support qualitatively the design process. They raise awareness about the uncertainty the future holds and facilitate the co-creation of alternative design solutions.

Thereafter, scenarios allow evaluating quantitatively the variability of the long-term impact of those solutions. The resulting insights support the final choice that has to be made.

What are scenarios?

**Scenarios support the design process and evaluation.**

Raise awareness about an uncertain future
Allows co-creating design solutions
Support decision making

In reaction to the various household types KPW Architecten encountered during the development of scenarios, they shifted their design process from just ‘programming’ to the implementation of a ‘building strategy’, i.e. a family tree of apartment types expressing how dwellings can transform during future refurbishments.

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What are scenarios?

**Scenarios support the design process and evaluation.**

- Raise awareness about an uncertain future
- Allows co-creating design solutions
- Support decision making

**Conventional external wall**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Initial</th>
<th>Scn. 1</th>
<th>Scn. 2</th>
<th>Scn. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€ 208/m²</td>
<td>€ 426/m²</td>
<td>€ 516/m²</td>
<td>€ 590/m²</td>
</tr>
</tbody>
</table>

**Transformable external wall**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Initial</th>
<th>Scn. 1</th>
<th>Scn. 2</th>
<th>Scn. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€ 301/m²</td>
<td>€ 453/m²</td>
<td>€ 501/m²</td>
<td>€ 620/m²</td>
</tr>
</tbody>
</table>

Before scenarios can support the design process of transformable buildings in a qualitative and quantitative way they should be developed deliberately.

According to the method Schwartz describes in his book *The art of the long view* three major steps can be distinguished.

**Scenario Developing for life cycle design and analyses**

What are scenarios?

How to build them?
First, the scenarios’ building blocks have to be identified. Known unknowns such as demographic evolutions are well-studied and can be predicted with historic data.

Unknown unknowns are in contrast unpredictable. Different trend reports might however inspire their identification. These critical uncertainties determine the differences between the developed scenarios.

How to build scenarios?
**Identify the scenarios’ building blocks.**

Known unknowns
Unknown unknowns

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The ageing of our population, constantly declining family and household sizes and raising housing demand are known unknowns. During long-term surveys these evolutions could be observed and translated into diverse models. Such models allow to project future changes with a defined level of certainty.

**SOURCE** Author unknown (2014). *Population structure and the demographic transition model. Via slideshare.net*
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How to build scenarios?

**Identify the scenarios’ building blocks.**

Known unknowns
Unknown unknowns

The development and acceptance of new housing types, mobility of families (as a result of short term renting) and the spatial requirements per dwelling size and type are new, emerging and unpredictable trends. These critical uncertainties are often identified in futurist and prospective reports.

**SOURCE**
Second, stories have to be developed from the identified uncertainties. Therefore scenario plots and inspiring names have to be selected. Moreover, architects are well-placed to imagine and detail these future refurbishments.

Thereafter is studied how each design alternative will respond in each scenario. Architects are well-placed to imagine and detail these future refurbishments.

How to build scenarios?

**Develop the scenario stories.**

Select a scenario plot and choose a good name.

**Identify life cycle options.**

![Scenario Developing for life cycle design and analyses](image)

Waldo Galle

Transform research team

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How to build scenarios?

**Develop the scenario stories.**

Select a scenario plot and choose a good name

Identify life cycle options

Third, scenarios can be quantified and the proposed design alternatives can be evaluated. Therefore, a digital BIM model can be created per scenario.

Assigning to the modelled scenarios environmental burdens, construction costs or other impacts in a parametric way allows assessing the alternatives’ robustness for various assumptions.

How to build scenarios?

**Quantify and evaluate design alternatives and scenarios.**

Create a BIM model
Assess and evaluate the robustness

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How to build scenarios?

**Quantify and evaluate design alternatives and scenarios.**

Create a BIM model
Assess and evaluate the robustness

In conclusion, scenarios or imaginable futures relate easily to architecture and its users. For that reason, they own the potential to support the design and life cycle assessment of transformable buildings.

Building effective scenarios starts with identifying critical uncertainties. From these building blocks divergent stories can be developed. Quantifying them returns the insights designers need to make a deliberate choice.

Scenario Developing for life cycle design and analyses

What are scenarios?
explore imaginable but divergent futures
relate to architecture and its users
support design and evaluation

How to build them?
identify the scenario building blocks
develop the scenario stories
quantify and evaluate