Applicability of Maturity Assessment for Sustainable Construction
You can’t manage what you don’t measure

Peter Drucker
1909 - 2005
Austrian-born American management consultant, educator, and author
Contents

• Sustainability Assessment

• Process Model

• Application Example

• Summary
Assessment Concept

(Sustainability Assessment)

(Sustainability Assessment)

(Environment, Society, Economy)

(Draft design or existing building, Technical features and characteristics, Functional equivalent: technical and functional requirements)

(Environment, Society, Economy)

(Assessment results with indicators defined for)

(Environment, Society, Economy)

(Environmental/social/economic requirements from the customer’s specifications, Functional and technical quality of the building as specified, Functional equivalent)

(Technical requirements for the building, Functional requirements for the building)

(Legal requirements)

(Requirements from the customer’s specifications)

(Environmental)

(Social)

(Economic)

(Reference number: ISO 15392:2008(E))

(Sustainability in building construction — General principles)

(Développement durable dans la construction — Principes généraux)

(Quelle: AGNHB according to CEN/TC350)
Building Certification Systems

(Quelle/Visualisierung: IMBT, 2011)
Applied Certification System

Weighting:
- Environmental Quality 22,5%
- Economical Quality 22,5%
- Social & Functional Quality 22,5%
- Technical Quality 22,5%
- Process Quality 10,0%
Current Situation

- Project Development
- Design
- Preparation for Construction
- Construction
- Project Completion
- Use

Ideal timing

Good starting point

Hard to integrate Cost-intensive

Not any more reasonable

Certification of building stock

Status-Quo
Holistic Maturity Assessment and Monitoring Tools

- Stakeholder Goals
- Sustainability Criteria Interaction
- Identification of relevant Processes
- Quality of Process Implementation
Process Model

• A – Goal Definition
• B – System Analysis
• C1 – Assessment of Practices
• C2 – Maturity Level Evaluation
A – Goal Definition

- Stakeholder Requirements
- 4 Quality Levels
A – Goal Definition

Result: Stakeholder Requirements

Goal Definition

Visual Comfort

Acoustic Comfort

Fire Prevention

Thermal Comfort

...
B – System Analysis

- Systemic Approach
- Causal Loop Investigation
B – System Analysis

Result: Relevant Practices
C – Maturity Assessment

- Assessment of Practices
- Maturity Level Evaluation
C – Maturity Assessment

- SPiCE (ISO/IEC 15504-5) - Software Process Improvement and Capability Determination
- Development of Process Assessment Model
  - Definition of Processes
  - Process Attributes
    - Base Practices
    - Generic practices
  - N-P-L-P – scale
- Definition of Maturity Assessment Scale (Maturity Levels)
C – Maturity Assessment

Description of Process

Definition of Assessment Goals

Assessor (SWOT)

Capability Level

Assessment Area
C – Maturity Assessment

Process Attributes

Base Practices  Generic Practices

N – P – L – F Scale

N  Not achieved (0 - 15%)
P  Partially achieved (> 15 - 50%)
L  Largely achieved (> 50 - 85%)
F  Fully achieved (> 85 - 100%)
C – Maturity Assessment

Maturity Levels

Level 0 - not performed

Level 1 - performed informally
PA 1.1 process implementation

Level 2 - planned and tracked
PA 2.1 implementation management
PA 2.2 work product management

Level 3 - well-defined
PA 3.1 process definition and adaption
PA 3.2 process resources

Level 4 - quantitatively-controlled
PA 4.1 process measurement
PA 4.2 process controlling and monitoring

Level 5 - continuously-improving
PA 5.1 process modification
PA 5.2 process improvement
Application

Case Study

• Comparison of different Façade Types
Application

Stakeholder Requirements

- Visual Comfort
- Thermal Comfort
- Sound Insulation
- ....

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Weighting</th>
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<tbody>
<tr>
<td>LCA⁶</td>
<td>Life Cycle Assessment</td>
<td>13.5%</td>
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<td>C6</td>
<td>Risks to the local environment</td>
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<tr>
<td>C8</td>
<td>Sustainable use of resources / wood</td>
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<td>C14</td>
<td>Drinking water demand and volume of waste water</td>
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<td>C15</td>
<td>Space demand</td>
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<tr>
<td>LCRA</td>
<td>Building related life-cycle costs</td>
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<tr>
<td>C17</td>
<td>Suitability for third-party use</td>
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<td>C18</td>
<td>Thermal comfort in the winter</td>
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<tr>
<td>C19</td>
<td>Thermal comfort in the summer</td>
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<tr>
<td>C20</td>
<td>Interior air hygiene</td>
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<tr>
<td>C21</td>
<td>Acoustic comfort</td>
<td>0.8%</td>
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<tr>
<td>C22</td>
<td>Visual comfort</td>
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<td>C23</td>
<td>User control possibilities</td>
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<tr>
<td>C24</td>
<td>Quality of outdoor spaces</td>
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<tr>
<td>C25</td>
<td>Safety and risk of hazardous incidents</td>
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<tr>
<td>C26</td>
<td>Handicapped accessibility</td>
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<tr>
<td>C27</td>
<td>Space efficiency</td>
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<td>C28</td>
<td>Suitability for conversion</td>
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<td>C29</td>
<td>Public access</td>
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<tr>
<td>C30</td>
<td>Bicycling convenience</td>
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<td>C31</td>
<td>Assurance of design and urban development quality in a competition</td>
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<tr>
<td>C32</td>
<td>Percent for art</td>
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<td>C33</td>
<td>Fire prevention</td>
<td>4.5%</td>
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<tr>
<td>C34</td>
<td>Sound insulation</td>
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<tr>
<td>C35</td>
<td>Quality of building envelope with regard to heat and humidity</td>
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<td>C40</td>
<td>Ease of cleaning and maintenance</td>
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<td>C42</td>
<td>Ease of dismantling and recycling</td>
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<td>Quality of project preparation</td>
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<td>Integral planning</td>
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<td>C45</td>
<td>Optimization and complexity of planning method</td>
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<td>C46</td>
<td>Evidence of sustainable aspects in call for and awarding of tenders</td>
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<td>C47</td>
<td>Creation of conditions for optimal use and management</td>
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<td>C48</td>
<td>Construction site / construction process</td>
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<td>C49</td>
<td>Quality of contractors / prequalification</td>
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<td>C50</td>
<td>Quality assurance for construction</td>
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<td>C51</td>
<td>Commissioning</td>
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Optimization Potential
Application

System Analysis

- Slendering the Building Envelope
Application

Assessment of Practices

• N – P – L – F

• Compared to the Reference Scenario

Base Practices

Generic Practices
Application

Assessment of Practices

Fulfilment of Process Attributes

<table>
<thead>
<tr>
<th>Visual Comfort</th>
<th>PA 1.1</th>
<th>PA 2.1</th>
<th>PA 2.2</th>
<th>PA 3.1</th>
<th>PA 3.2</th>
<th>PA 4.1</th>
<th>PA 4.2</th>
<th>PA 5.1</th>
<th>PA 5.2</th>
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<td>0%</td>
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<tr>
<td>76%</td>
<td>83%</td>
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Capability Level

Σ Capability Levels = Maturity Level
Summary

• Identifying relevant Practices for the Fulfilment of Stakeholder Requirements

• Knowledge about Coherences between Practices and Functional Requirements

• Highlighting Synergies and Conflicts

• Detection of Optimization Potential of Scenarios

• Knowledge about a Maturity Level of a Sustainability Process
Thank you

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