GRACE

Golden nugget #9

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Information structures for requirements management of environmental performance in industrialised house building

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Aim

The aim of this study is to describe the challenges and current potentials between environmental requirements and supporting information structures for ETO production strategies, with the underlying research questions:

- *What are the challenges for managing environmental requirements in ETO product realisation processes?*
- *How could information be structured to support requirement management in industrialised house building product realisation work?*

Current State

- **Industrialised house building** context is in the **engineer-to-order production strategies** meeting site and client requirements through the product realisation process.
- **Miljöbyggnad** is a certification that the client certify after erected and finished project**.**
- The three studied cases of **Miljöbyggnad 3.2** have a distribution of **15 indicators** in the field of **Materials, Inner environments, and Energy.**
- **No mature supporting process** are identified for managing Miljöbyggnad indicators along the design process.

Results

- Structuring requirement for the product realization process in the house building context has become central in meeting client and project obligations by certifications.
- Based on indicators the certification has the purpose for house-building companies to reach the goals for a green transition with climate neutral construction processes before 2050.
- Requirement management becomes a crucial part of the multi-storey house building design phase, where unique layout and other client choices are present in each project.
- A prerequisite for the systematic requirement management is the definition of underlying information structures to the four domains.
- Six characteristics of requirement: 1. Predefine requirements in ETO; 2. Component integrity; 3. Project vs. Product requirement; 4. Project progress; 5. Requirement ownership; 6. Looping requirements.

Discussion of the results

By combining platform-based development and manufacturing with requirements management, the work contributes to the identification and definition of six characteristics and their relationships to support in an ETO product realisation process. This provides a more structured foundation for integrating environmental considerations early in and throughout the product realisation process, thereby enhancing the predictability and measurability of sustainability outcomes. In a critical discussion of the output and for generalisation of the result, it could be limited to the ETO production situation and limited to the contextual situation in Sweden.

Miljöbyggnad case application

Indicators	*Project performance*	*Req. Target value A, B, C.*	*Units*	*Receiver domain*	*Integrity Requirement System*
1.Heating power	A: Silver B: Silver C: Silver	<20,00 -II- -II-	W/m^2, Aom	Product	High
2.Solar thermal load	A: Silver B: Silver C: Silver	<29,00 -II- -II-	W/m^2	Product	Low
3.Energy use	A: Gold B: Silver C: Gold	<49,00 (70%) <55,00 (80%) <49,00 (70%)	kWh/m^2 (70%/80% BBR)	Product	Medium
4.Renewable energy	A: Silver B: Bronze C: Gold	>75% +10% >50% >80%+>5%	% renewable +% local gen.	Product Resource (Energy)	Low
5.Sound	A: Silver B: Silver C: Silver	2+2 classes + MR* -II- -II-	SS25267+BBR	Product Process (MR*)	High
6.Radon (Gas+ Gamma)	A: Silver B: Bronze C: Guld	≤100 + <0,3 + MR* ≤200 + <0,3 + MR* ≤60 + <0,3 + MR*	Bq/m3 + µSv/h	Product Process (MR*)	Low
7.Ventilation	A: Bronze B: Bronze C: Guld	≥0,35 + MR* -II- ≥10.00+≥10.00+MR*	l/s,m^2 l/s+l/s	Product Process (MR*)	Medium
8.Moisture	A: Silver B: Bronze C: Gold	Moist. expert + DR** Moist. comp. + DR** Moist. diploma. + DR**		Process (DR**) Resource	
9.Termal climate Winter	A: Bronze B: Silver C: Silver	≤15% + MR* ≤10% + MR* ≤10% + MR*	PPD	Product Process (MR)*	Medium
10.Thermal climate summer	A: Bronze B: Silver C: Silver	≤20% + MR* ≤15% + MR* ≤15% + MR*	PPD	Product Process (MR)*	Medium
11.Daylight	A: Bronze B: Bronze C: Silver	≥ 0,8 % -II- ≥ 1,0 %	Daylight factor (DF) window area/floor area	Product Resource (Sun)	High
12.Legionella	A: Silver B: Silver C: Gold	≥ 50+≥ 50+≤ 24° -II-		Resource (Water) Process	
13. Logbook building materials	A: Silver B: Silver C: Gold	Routines	Antal	Process	High
14.Phasing out hazardous substances	A: Silver B: Silver C: Silver	Material	%	Product	High
15.Climate impact building site	A: Bronze B: Bronze C: Silver	Routines	Routines	Process	Medium

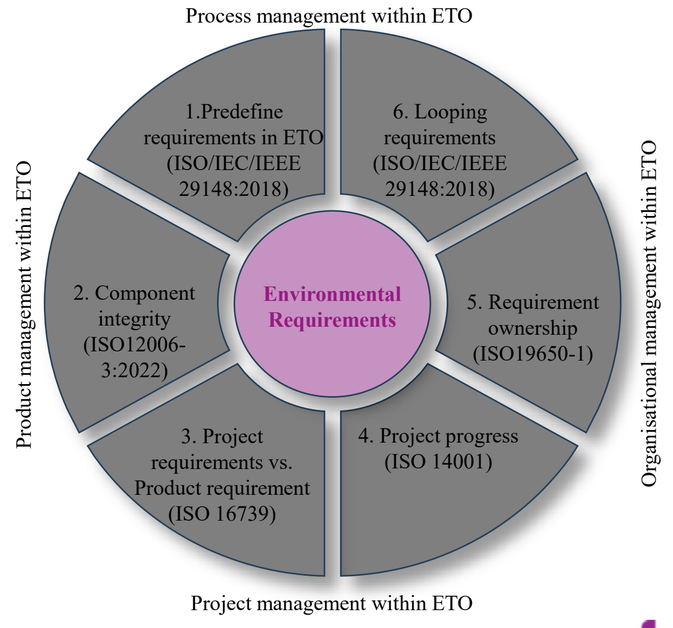
*Maintenance routines (no unit), ** Design routines (no unit)

Domains of interest for requirements in Miljöbyggnad

Domains

- **Product performance challenges:**
- Process performance challenges:
- **Organisational performance challenges:**
- Project performance challenges:

Challenges and potentials with information structures



This result has been developed as part of the research projects ReShare – shared understanding and requirement management for green transition (WP1) -Information structures for requirements management of environmental performance in industrialised house building. It is based on a paper presented at the 12th Swedish Production Symposium in 2026.



If you have questions about the content in this Golden Nugget, please contact
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