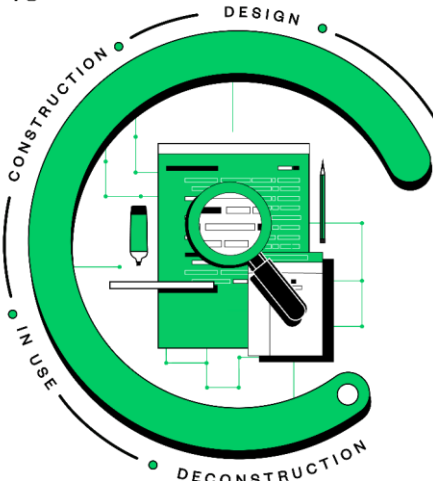


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KOMPETANSE?!

GrowingCircle project


Eilif Hjelseth,
professor @ NTNU


**Circular Economy in Construction
powered by Information Circularity**

<https://growingcircle.netlify.app/project/>

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2022-05-20

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Opplegg for workshopen



Presentasjoner:

- Introduksjon til GrowingCircle prosjektet (3-13)
- Rask intro om:
 - Datamaler (Data Templates) (14 - 22)
 - Digitalisering og digital kompetanse (23 - 34)
- GrowingCircle kurset: Awareness (35 - 71)
 - Rask presentasjon – dere får tilgang til kurset etterpå
- Diskusjon – Hvordan tar vi dette videre (72 - 754)
 - Kom med spørsmål i chatten underveis
 - Diskusjon med åpen mikrofon
- GrowingCircle: «Awareness exam»
 - Legger ut kurset i chatten før vi avslutter
 - Du tar kurset og eksamen i ledige stunder – meldt regnvær i helgen :-)

Forslag til spørsmål for diskusjon:

- Hva er behovet for denne type kompetanse?
 - Hva er det man egentlig trenger?
 - Nivå og omfang?
- Hvordan skal dette integreres opplæring av prosjektledere?
 - Egne kurs? (selvstudie, nettbasert o.l.)
 - Del av kurs/opplæring?
- Hva kan GrowingCircle gjenbruke eller bygge videre på av kurs og tester?
 - Andre som jobber med dette temaet?
- Hva synes dere er interessant å diskutere?
 - Kom med forslag!

SUSTAINABLE DEVELOPMENT GOALS



Håper det går greit med presentasjoner med norsk og engelsk tekst
Tar kun med hovedpunkter

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GrowingCircle Project – objectives



Awareness → Knowledge

Raise awareness among agents, through training/dissemination actions for the (fundamental ... core ... essential ...) role of **Data Templates** – and related concepts like: **Material Passport**, **Digital Building Logbook**, **Digital Twin** and likewise

Evidence → Research

Exploring concepts for reliable information exchange by use of concepts like; **Data Templates** – and related concepts like: **Material Passport**, **Digital Building Logbook**, **Digital Twin** and likewise ..

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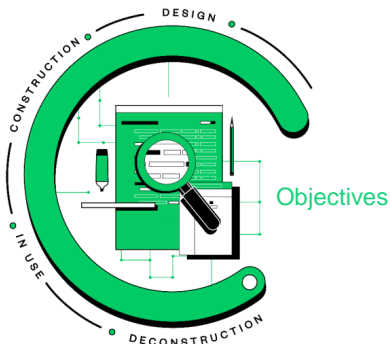
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GrowingCircle Project – objectives



Knowledge → Courses

Developing **courses** – with **certification** – to achieve competency to identify / use / adapt **Data Templates** concepts to **Integrate Data for an Efficient and Sustainable Construction**.

Research → Digital solutions / Templates

Evidence through practical implementation **Data Templates** in **specific case studies** by aligning with outcomes towards sustainability and circularity.

Explore solutions for increased use of information in **BIM**-based solutions

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GrowingCircle Project

<https://growingcircle.netlify.app/project/>

Timeline

November 2022
September 2020 to September 2022 – 24 months

Comming events:

- **ECPPM 2022, International Scientific Conference**
14th to 16th September – Trondheim – Norway
<https://www.ecppm2022.org/>
- **Concreta 2022, CI international exhibition**
13th to 16th October – Matosinhos – Portugal
<https://concreta.exponor.pt/announcements/concreta-2022/?lang=en>

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GrowingCircle Project – background

Circular Economy in Construction powered by Information Circularity

(based on Data Templates)

Focus on:

Regulatory framework
Internationalisation

Skills

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GrowingCircle Project – background

**Circular Economy in Construction
powered by Information Circularity**
(based on Data Templates)

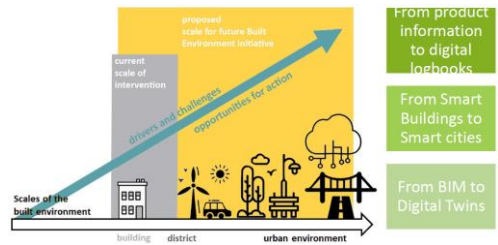
Focus on:



Resource
efficiency



Innovation



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GrowingCircle Project – combinations

Focus on
integration

DataTemplates
with
relevant and
trustworthy
information

Digital Building
Logbook
Material Passport
Product
documentation
Digital Twin



Regulatory framework
Internationalisation



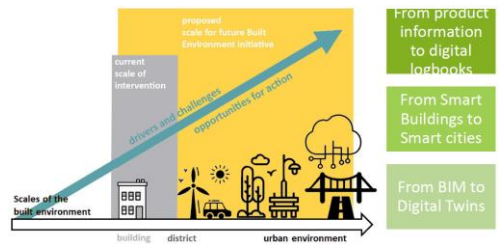
Skills



Resource
efficiency



Innovation



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Relevant Data Templates and Data Sheets (in Portuguese)

Product Catalog

#00 Cost and Characterization

#01 Data Templates evaluation

#02 Data Gaps and AM

#03 Waste Audits

#04 Design for Disassembly

#05 Data for Sustainability

DESIGN

CONSTRUCTION

IN USE

DECONSTRUCTION

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motosinhos / matosinhos habit

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Incremental Digital Twin

Boje et.al. (2020) 'Platforms Generation'***

Tchana et.al. (2019) 'DT evolution'***

Fjeld (2020) 'DT Maturity index'*

Calvetti et.al. (2020) 'Sensored Construction Sites'

Jia et.al. (2019) 'IoT for Smart Buildings'

Sacks et.al. (2020) 'DTC - Digital Twin Construction'****

#1 Monitoring***

#2 Intelligent semantic***

#3 Agent driven socio-technical***

Digital Model**

Digital Shadow**

Digital Twin**

Intelligent Twin

Static Twin

Detailed Twin

As-built Twin

Sensored Twin

Responsive Twin

Adaptive Twin

Fully autonomous decision-making

3D model for a virtual visualisation

Linked data for assets and processes

As-built

IoT

Responsive actions in the Physical Twin

Simulating scenarios semi-automatic actions

DOT

DBL

Sensored sites

Smart buildings

Digital-Data-Driven (D3c)

DTC****

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<https://www.mdpi.com/2075-5309/11/11/554>

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Most reads article in “Buildings” in Nov./dec. 2021



Open Access Review

Incremental Digital Twin Conceptualisations Targeting Data-Driven Circular Construction

by Pedro Mêda 1*, Diego Calvetti 1, Eilif Hjelseth 2 and Hipólito Sousa 1

¹ CONSTRUCT/GEQUALTEC, Construction Institute, Faculty of Engineering, Porto University, 4200-465 Porto, Portugal

² Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, 7491 Trondheim, Norway

* Author to whom correspondence should be addressed.

Academic Editors: David J. Edwards, Clinton Aigbavboa, Obuks Ejohwomu and Chris Roberts

Buildings **2021**, *11*(11), 554; <https://doi.org/10.3390/buildings11110554>

Received: 27 September 2021 / Revised: 11 November 2021 / Accepted: 14 November 2021 /

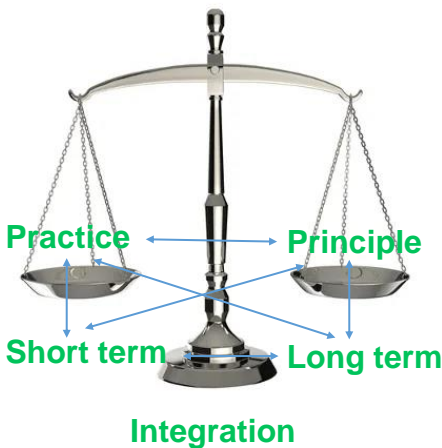
Published: 18 November 2021

(This article belongs to the Special Issue Digital Transformations within Circular Built Environment Research and Innovation)

<https://www.mdpi.com/2075-5309/11/11/554>

<https://www.aha.io>

GrowingCircle Project – a small project working on large questions ☺



The weasel
- unique combinations



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GrowingCircle Project – combinations

Regulatory framework Internationalisation
Skills
The European Green Deal
Circular Economy Action Plan
Level(s)
Product Policy

Focus on integration

DataTemplates with relevant and trustworthy information

Digital Building Logbook
Material Passport
Product documentation
Digital Twin

Resource efficiency
Innovation

From product information to digital logbooks
From Smart Buildings to Smart cities
From BIM to Digital Twins

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FM documentation

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Where has all the information gone?



What's the financial impact?

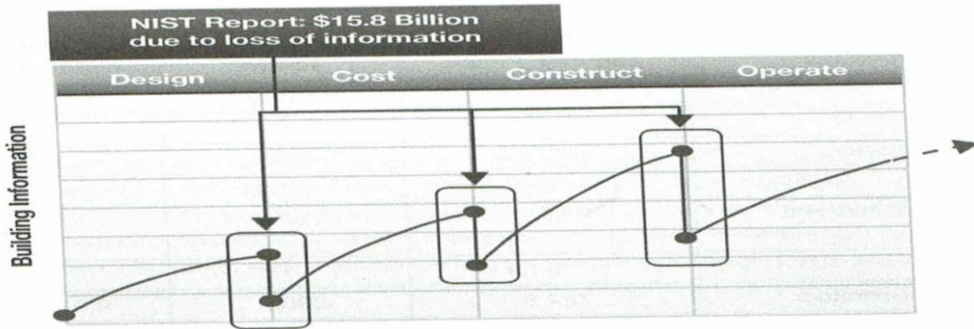


FIGURE 1.3 Loss of value as information is lost and reentered from phase to phase of the building life cycle (adopted from NIST report).
Courtesy FM:Systems

BIM data for FM



What do owners really need?

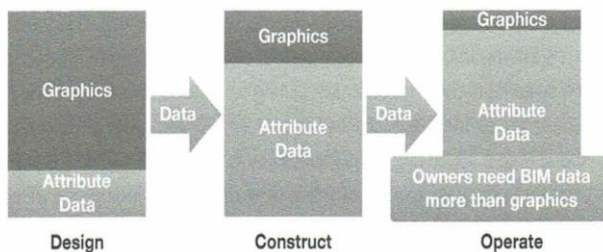


FIGURE 1.4 Mix of graphics and data changes over the facility life cycle.
Courtesy FM:Systems

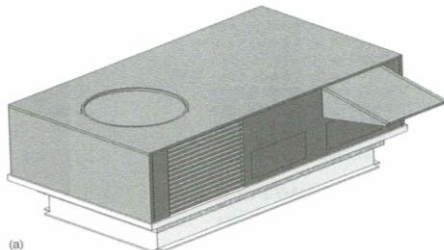
BIM => Professional information in system



Category	Parameter	Value
Construction	Wall Closure	
	Construction Type	
Material and Finishes	Frame Exterior Material	By Host
	Frame Interior Material	
	Glass Pane Material	
Dimensions	Height	Sash
	Default Sill Height	Sash
	Width	Glass
	Window Inset	1220.0
	Rough Height	915.0
Analytic Properties	Visual Light Transmittance	0.780000
	Thermal Resistance (R)	0.8327 (m ² K)/W
	Heat Transfer Coefficient	0.610000
Analytic Construction	Heat Transfer Coefficient (U)	1.5330 W/(m ² K)
	U-Value	Triple glazing - 1/4 in thick - clear/clear/clear glass
Identity Data	Type Image	
	Keynote	
	Model	
	Manufacturer	
Type Comments	Description	
	Assembly Code	
Type Mark	OmniClass Number	
	Code Name	
IFC Parameters	Operation	25.01.2017.11 Fixed Windows

What else do we know about the wall?
What should we know?
What others should know?

- The I in the BIM - what is the content of information in the BIM objects?



Category	Parameter	Value
Constraints	Clearance Bottom	1' 2"
	Level	Level: Level 1
	Offset	0' 0"
Construction	Right Economizer	<input checked="" type="checkbox"/>
	Left Economizer	<input checked="" type="checkbox"/>
	Curb Exits	<input checked="" type="checkbox"/>
	Clearance-Generic Models	Include Clearance
Electrical	Clearance Outlet Voltage	115.00 V
	Panel	
Plumbing	Actual Heater Gas Flow	0 GPM
	Actual Condensate Drain Flow	0 GPM
Mechanical	Mechanical - Airflow	
	Actual Supply Air Flow	0 CFM
	Actual Return Air Flow	0 CFM
	System Name	
Identity Data	Serial Number	
	Comments	
Phasing	Phase Created	New Construction
	Phase Demolished	None
Energy Analysis	Variable Air Volume Integrate...	0.000000
	Constant Volume Integrate...	0.000000
Analysis Results	Total Static Pressure	0.0000 in-wg
	Staged Furnace Steps	0
	Staged Furnace Output	300000.00 Btu/h
	Staged Furnace Input	375000.00 Btu/h
	Sensible Cooling Capacity	0.00 Btu/h
	Return Air Dry Bulb Temp.	0.00 °F
	Outdoor Air Wet Bulb Tempe...	0.00 °F
	Nominal Voltage	0.00 V
	Design Supply Air Flow	0.00 CFM
	Cooling Nominal Input Power	0.00 W
Other	CTRL Output Step 3	305000.00 Btu/h
	CTRL Output Step 2	600000.00 Btu/h
	CTRL Output Step 1	305000.00 Btu/h
	CTRL Input Step 2	112500.00 Btu/h
CTRL Input Step 1	375000.00 Btu/h	
CTRL Curb Height	1' 2"	

FIGURE 2.21 (a) BIM HVAC object; (b) Properties (data). Images by author.

• Identify facts in the BIM

TABLE 1.1 2002 Costs of Inadequate Interoperability by Stakeholder Group, by Life-Cycle Phase (totals in millions, unit costs in dollars) Based on Table ES-2 of NIST 04-867 Study

Stakeholder Group	Planning, Design, and Eng. Phase	Construction Phase	Operations and Maint. Phase	Total	Pct. of Total
Architects and Engineers	1,007.2	147.0	15.7	1,169.8	7.4%
Per square foot (SF)	0.89	0.13		1.02	
General Contractors	485.9	1,265.3	50.4	1,801.6	11.4%
Per SF	0.43	1.11			
Special Fabricators and Suppliers	442.4	1,762.2		2,204.6	13.9%
Per SF	0.39	1.55			
Owners and Operators	722.8	898.0	9,072.2	10,648.0	67.3%
Per SF	0.64	0.79	0.23	1.66	
Total	2,658.3	4,072.4	9,093.3	15,824.0	100.0%
Per SF	2.34	3.58	0.24	6.16	
Pct. of Total	16.8%	25.7%	57.5%	100.0%	

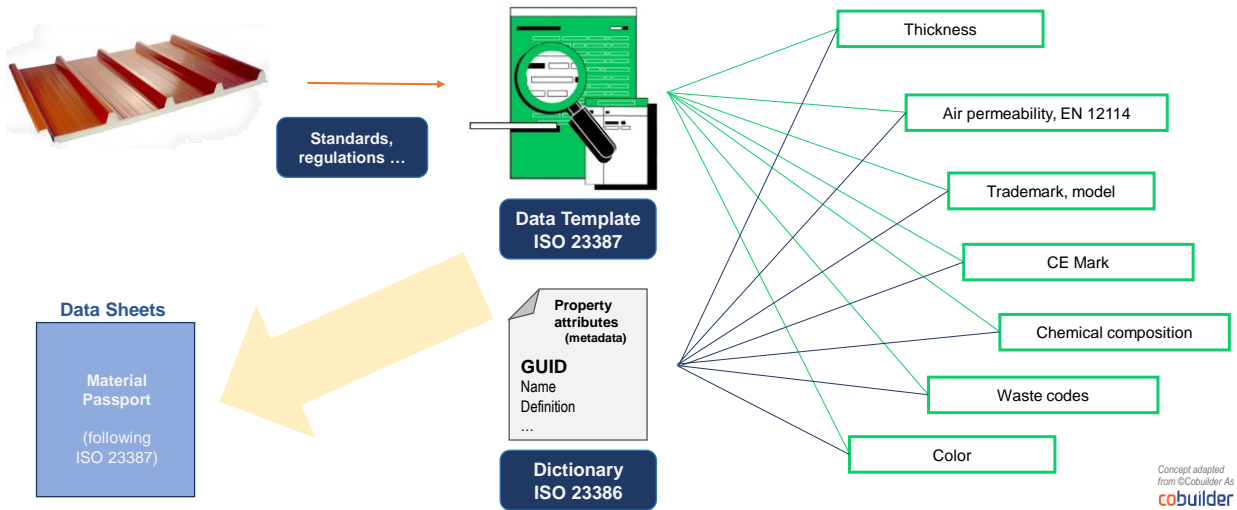
Note: Sums may not add to totals due to independent rounding.

TABLE 1.2 2002 Costs of Inadequate Interoperability by Cost Category by Stakeholder Phase (totals in millions) Based on Table ES-3 of NIST 04-867 Study

Cost Category	Avoidance Costs	Mitigation Costs	Delay Costs	Total	Pct. of Total
Architects and Engineers	485.3	684.5	—	1,169.8	7.4%
General Contractors	1,095.4	693.3	13.0	1,801.7	11.4%
Special Fabricators and Suppliers	1,908.4	296.1	—	2,204.5	13.9%
Owners and Operators	3,120.0	6,028.2	1,499.8	10,648.0	67.3%
Total	6,609.1	7,702.0	1,512.8	15,824.0	100.0%
Pct. of Total	41.8%	48.7%	9.6%	100.0%	

Note: Sums may not add to totals due to independent rounding.

Data Templates – implementation



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Relevant Standards

Concept adapted from iCobuilder AS cobuilder

- ISO 19650** Organization and digitization of information about buildings and civil engineering works, including BIM - information management using building information modelling
- ISO 12006-3 Organization of information about construction works (object-oriented)
- ISO 23386** Methodology to describe, author and maintain properties in interconnected data dictionaries
- ISO 23387** Data templates for construction objects used in the life cycle of any built asset
- ISO 17412** Building Information Modelling. Level of Information Need (LOIN). Concepts and principles
- ISO 17549-1/2** Information technology — User interface guidelines on menu navigation
- bSDD buildingSmart Data Dictionary** is an online service that hosts classifications and their properties, allowed values, units and translations
- ISO 22057** Sustainability in buildings and civil engineering works – Data templates for the use of EPDs for construction products in BIM

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For the sake of clarification

What is what? Uses? Purposes? Digital Twin enlightenment

The broader perspective early mentioned considers knowledge and data as a key enabler for sustainability. As so, there are additional concepts that must become part of this vision, as Digital Twin:

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Understanding of digitalisation

Process
People
Technology

DIGITALISATION
BIM

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BIM kompetanse består av:

Programmer BIM-basert
coBuilder
Byggtjeneste
Andre

Prinsipper og praksis for INFORMASJONSLEDELSE
Bruk av datamaler
Standarder

Din BIM-praksis

Profesjonskunnskap
Innsikt i faglige oppgaver

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Digital modenhet

- Hvis du er på dette nivået
- Hva betyr dette når du diskuterer med noen på lavere nivåer?

Ad Hoc
Digital Resister
 Business and IT digital initiatives are disconnected and poorly aligned with enterprise strategy, and not focused on customer experiences.
Business Outcome
 Business is a laggard, providing weak customer experiences and using digital technology only to counter threats.

Opportunistic
Digital Explorer
 Business has identified a need to develop a digitally enhanced, customer-driven business strategy, but execution is on a project basis. Progress is not predictable nor repeatable.
Business Outcome
 Digitally enabled customer experiences and products are inconsistent and poorly integrated.

Repeatable
Digital Player
 Business-IT goals are aligned at enterprise level around the creation of digital products and experiences, but not yet focused on the disruptive potential of digital initiatives.
Business Outcome
 Business provides consistent but not truly innovative products, services, and experiences.

Managed
Digital Transformer
 Integrated, synergistic business-IT management disciplines deliver digitally enabled product/service experiences on a continuous basis.
Business Outcome
 Business is a leader in its markets, providing world-class digital products, services, and experiences.

Optimized
Digital Disruptor
 Enterprise is aggressively disruptive in the use of new digital technologies and business models to affect markets. Ecosystem awareness and feedback is a constant input to business innovation.
Business Outcome
 Business remakes existing markets and creates new ones to its own advantage and is a fast-moving target for competition.

- Er vi tilstrekkelig klar over kommunikasjonsutfordringene?

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Digital modenhet

Digital transformasjon

Digitalisering

Digital

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Nye Veier

- Digitalisering har høy prioritet

The BIM Maturity Model by Mark Bew and Mervyn Richards adapted to reflect BLM's relationship to Level 3.

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Hierarchy of information requirements, source: ISO 19650-1:2018

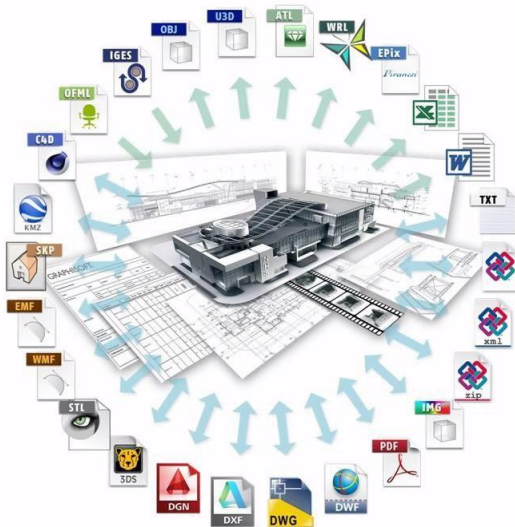
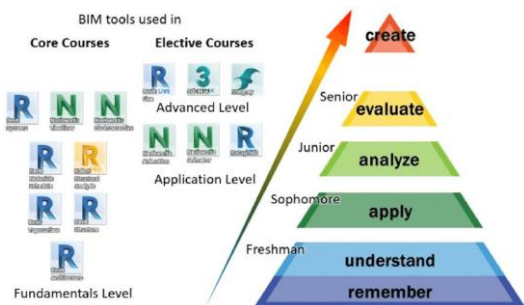
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BAE-næringen er ofte mest opptatt av: -Fag – bruk av løsninger -Ferdigheter i bruk av programvare



Hvorfor digitalisering?

- 1. Teknologiforståelse
- 2. Formidlingsevne
- 3. Sosial interaksjon og emosjonell intelligens
- 4. Kreativitet
- 5. Evne til å jobbe tverrfaglig
- 6. Sterk fagkompetanse og kritisk refleksjonsevne
-
- De seks nøkkelkvalifikasjonene er omtalt i Sintef rapport
- <https://akademikerne.no/2020/hoyt-utdannede-vil-ogsa-oppleve-at-arbeidsoppgavene-endrer-seg-radikalt>

Nye funn: Seks egenskaper som gjør deg ettertraktet i arbeidslivet

Adine Dørum titter én av boksene som blir avgjørende hvis du skal hevde deg i arbeidslivet fremover.



Forskingsrapport viser hvilke kompetanser som blir viktigere fremover. Olan Olsson

Elise Rennevig Andersen
Journalist

8. aug. 2020 09:00 | Sist oppdatert i dag 09:50

Arbeidslivet er i endring, og i fremtiden vil enkelte kvalifikasjoner bli viktigere enn andre.

I den nye rapporten *Hvordan påvirker digitalisering akademikerne?* viser forskningsinstituttet Sintef til at det ikke kun er de manuelle yrkene som er truet av et endret arbeidsliv.

Digital kompetanse



- **Digital kompetanse (literacy) er et etablert fagområde**
- **- søk ut dette**
- **Merk at ferdigheter (skills) i bruk av programvare kun er en av flere deler...**
- Digital kompetanse er ferdigheter, kunnskaper, kreativitet og holdninger som alle trenger for å kunne bruke digitale medier for læring og mestring i kunnskapssamfunnet.

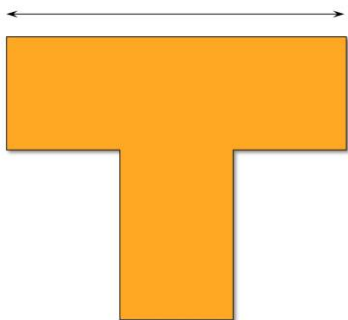


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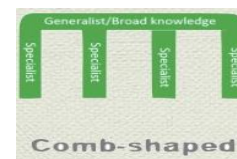
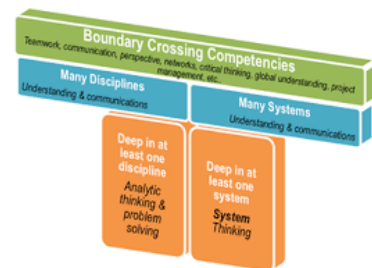
Kompetanseprofil



Breadth of understanding of connections across the business



Depth of understanding in a particular area



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Hva skal vi legge mest vekt på i undervisningen?

Brukes idag Antas brukt i fremtiden

- I BAE-næringen
- I andre sammenlignbare næringer
- I andre næringer

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Bygge rett type kompetanse på rett nivå

• **Level**
Advanced
Beginners

• **Type**
General
Specialised

• **Users**
Few
Many

Kan dette være en referanse for videre diskusjon?

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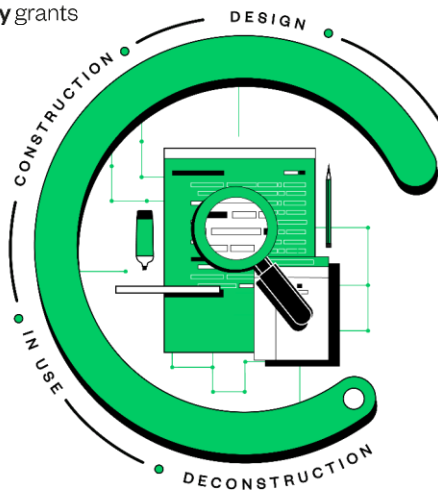
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Data Templates – Awareness

- Presenteres svært kjapt
 - – med fokus på tema – ikke innhold
- Du får tilgang til
 - Kurset i pdf og video versjon og lenke til eksamen
 - Legges i chaten før vi avslutter
- Du tar eksamen i ledige stunder ;-)



Course: Data Templates – Awareness

GrowingCircle

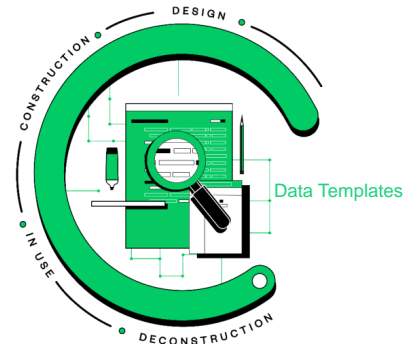
Integrated Data for an Efficient and Sustainable Construction

Learning Outcomes



To bring **awareness** of Construction Industry stakeholders (that already have a basic knowledge on BIM) for the **relevance and role** of **Data Templates** on the construction process and as tool to foster efficiency and circularity.

After this class you should have **gained competency** to identify the role of **Data Templates** plays to **Integrate Data for an Efficient and Sustainable Construction**.



Learning Outcomes

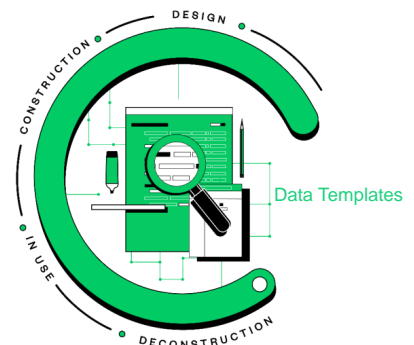


To bring **awareness** of **Construction Industry stakeholders** (that already have a basic knowledge on BIM) for the relevance and role of **Data Templates** on the construction process and as tool to foster efficiency and circularity.

After this class you should have **gained competency** to identify the role of **Data Templates** plays to **Integrate Data for an Efficient and Sustainable Construction**.

The learning objectives target:

- The Data Templates characteristics and functions
- Comprehension that Data Templates are data-driven and range Building's life cycle
- Identify the outcomes from Data Templates deployment for an efficient and more circular construction



To start – digital data is all around



cars.com Cars for Sale Research & Reviews News & Videos Sell Your Car Service & Repair

Make Body style **Advanced search** **Shop by what matters**

New/used: New cars Make: Nissan Model: Pathfinder

Price: No max price Distance: 30 miles ZIP: 60606 **Search**

From cargo space to test drive, find you cars to love.

Body style: Car

Make: Any Model: Any

Model variant: Any

Mileage: Any

Gearbox: Any

Min price: Any Max price: Any

Body type

- Hatchback (165,972)
- Estate (19,349)
- SUV (112,816)
- Saloon (29,494)
- MPV (11,402)
- Pickup (5,572)
- Coupe (21,942)
- Convertible (19,730)

Fuel type

- Bi Fuel (324)
- Diesel Hybrid (2,019)
- Electric (6,565)
- Natural Gas (1)
- Petrol Hybrid (14,204)
- Diesel (144,527)
- Diesel Plug-in Hybrid (102)
- Hydrogen (3)
- Petrol (215,622)
- Petrol Plug-in Hybrid (5,984)



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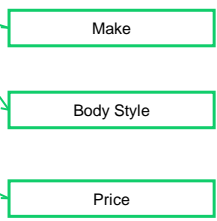
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To start – digital data is all around



Basics

Exterior color	White
Interior color	Charcoal
Drivetrain	Four-wheel Drive
MPG	21-27
Fuel type	Gasoline
Transmission	9-Speed Automatic
Engine	3.5L V6 24V GDI DOHC
VIN	5N1DR3BD0NC123895
Stock #	220007
Mileage	10 mi.
Vehicle history	-

Features

- These features are associated with this vehicle type. Contact the seller to confirm this specific vehicle has them.
- 000 Lbs)
 - 18 Painted Alloy Wheels
 - 1st, 2nd and 3rd row head airbags
 - 3rd Row Head Room: 37.8"
 - 3rd Row Hip Room : 48.7 "
 - 3rd Row Leg Room : 28.0 "
 - 3rd Row Seats: Bench
 - 3rd Row Shoulder Room: 58.4"
 - 4 Door
 - 4-Wheel Disc Brakes
 - 4-wheel ABS Brakes
 - 6 Speakers
 - 60-40 Third Row Seat
 - ABS Brakes
 - ABS and Driveline Traction Control
 - AM/FM Radio: Siriusxm
 - Adaptive cruise control
 - Manufacturer's 0-60mph acceler...
 - Max cargo capacity: 80 cu.ft.
 - Metal-look/piano black center co...
 - Multi-link rear suspension
 - NissanConnect
 - NissanConnect Services
 - Nissanconnect Featuring Apple C...
 - Occupant Sensing Airbag
 - Outside Temperature Display
 - Overall Length: 197.0"
 - Overall Width: 77.9"
 - Overall height: 70.9"
 - Overhead Airbag
 - Overhead Console
 - Overhead console: Mini with stor...
 - Painted aluminum rims
 - Panic Alarm

- Driver airbag
- Driver and passenger heated-cu...
- Driver and passenger knee airbags
- Dual Front Impact Airbags
- Dual Front Side Impact Airbags
- Dual front air conditioning zones
- Dual illuminated vanity mirrors
- Dusk sensing headlights
- Electronic Stability Control
- Emergency Communication Syst...
- Engine immobilizer
- External temperature display
- Fold forward seatback rear seats
- Four Wheel Independent Suspen...
- Four-wheel Independent Suspen...
- Front Anti-Roll Bar
- Front Beverage Holders
- Front Bucket Seats
- Front Center Armrest
- Front Dual Zone A/C
- Right rear passenger door type: ...
- Roof Rack: Rails Only
- Roof rails
- Seatback storage: 2
- Seatbelt pretensioners: Front
- Security System
- Selective service internet access
- Side airbag
- SiriusXM AM/FM/HD/Satellite Ra...
- SiriusXM Satellite Radio(TM)
- Spare Tire Mount Location: Unde...
- Speed Control
- Speed Sensitive Audio Volume C...
- Speed-Sensing Steering
- Speed-Sensitive Wipers
- Speed-proportional power steeri...
- Split Folding Rear Seat
- Split rear bench
- Spoiler
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Moving to Construction Industry...



The Construction Industry uses also similar tools:

Digital product passports (DPP)

Circular Materials Passports

Material Passports

Product Circularity Data Sheets

others....



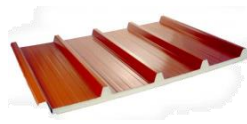
Why this is so important?



Write down your arguments:

Iceland
Liechtenstein
Norway grants

Why this is so important?



Program Operator  REPÚBLICA PORTUGUESA | AMBIENTE E AÇÃO CLIMÁTICA

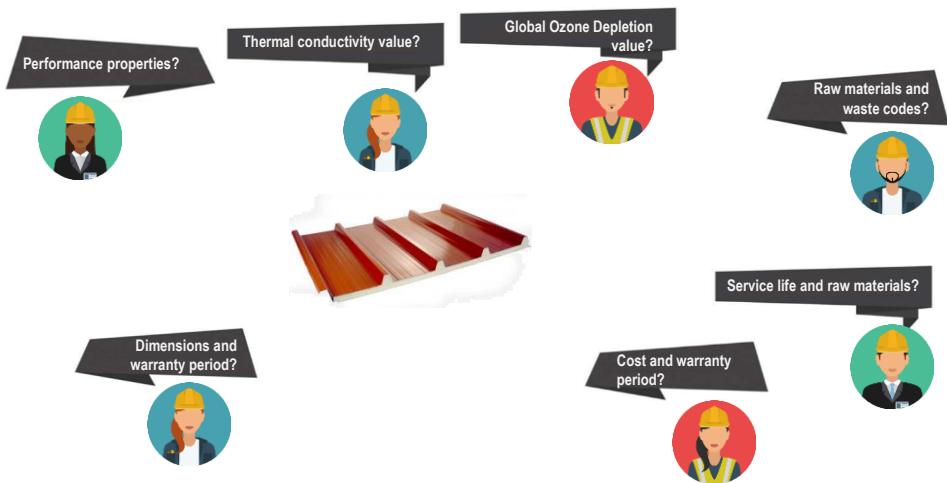
Project **GrowingCircle**

Promotor  INSTITUTO DA CONSTRUÇÃO

Partner  NTNU
Norwegian University of Science and Technology

Iceland
Liechtenstein
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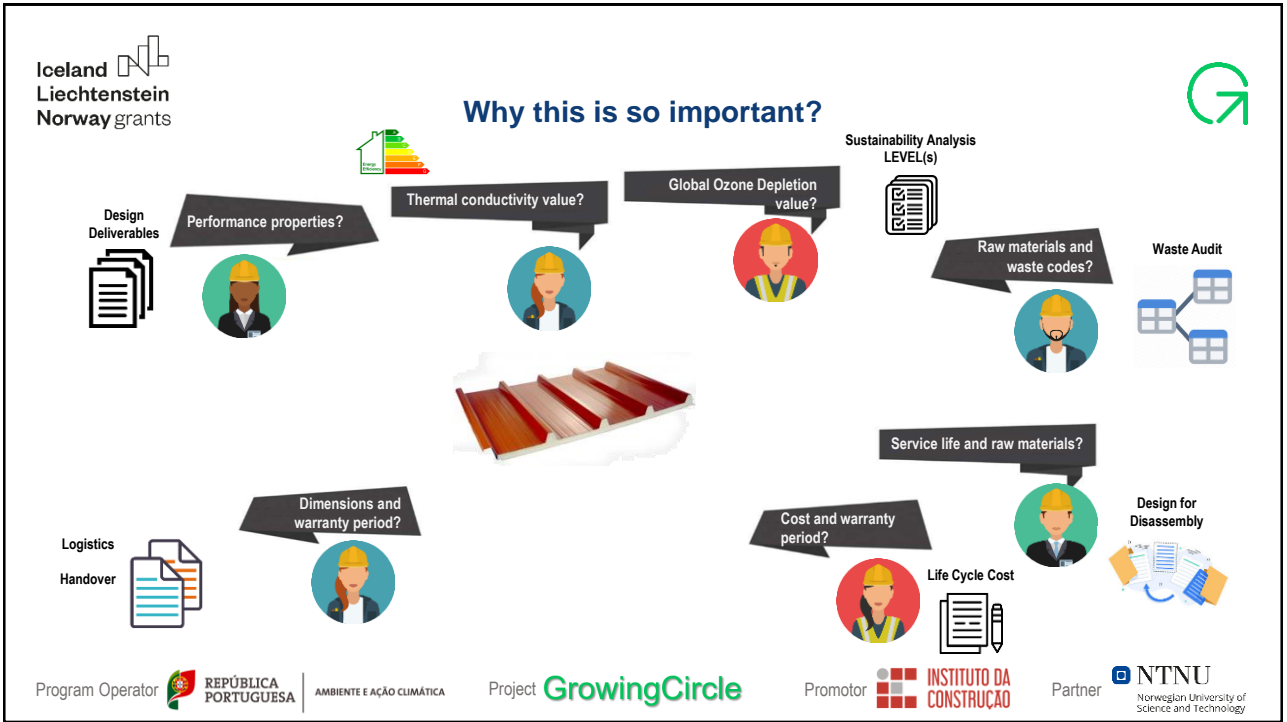


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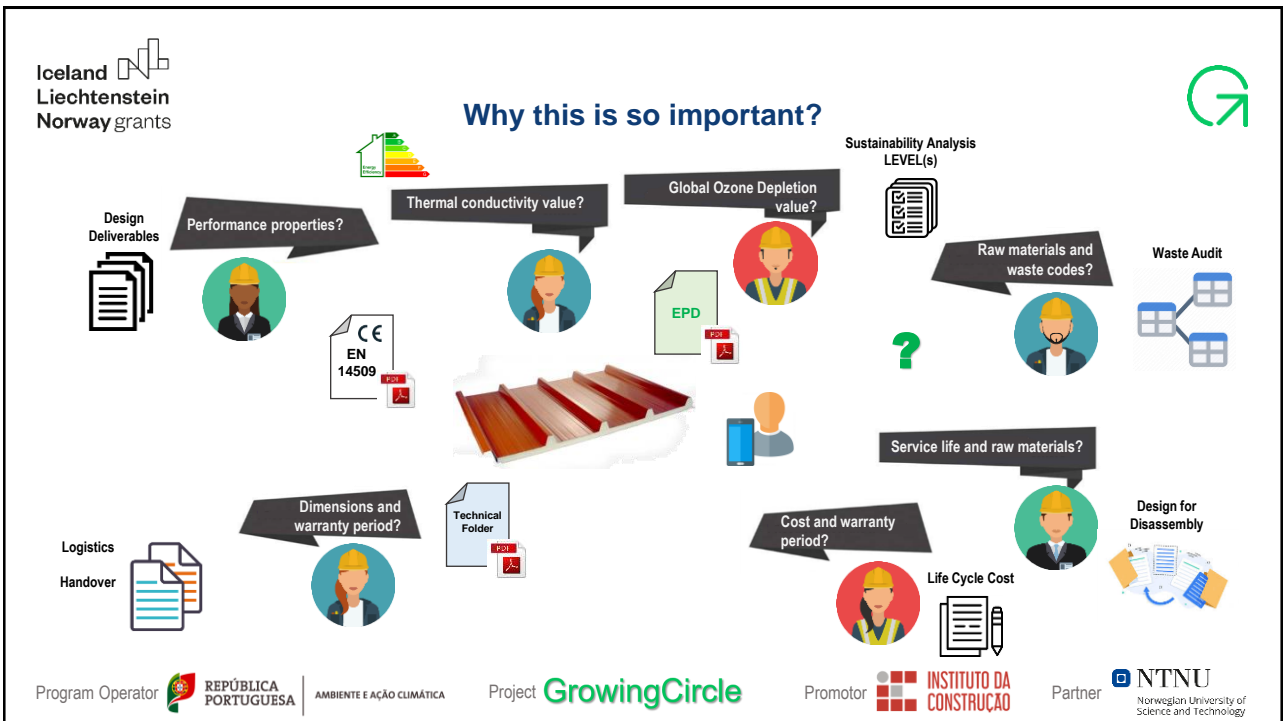
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The 'Data-Elephant' in the Construction Industry



Challenges for building materials 'supply chain' (by Paul Surin)

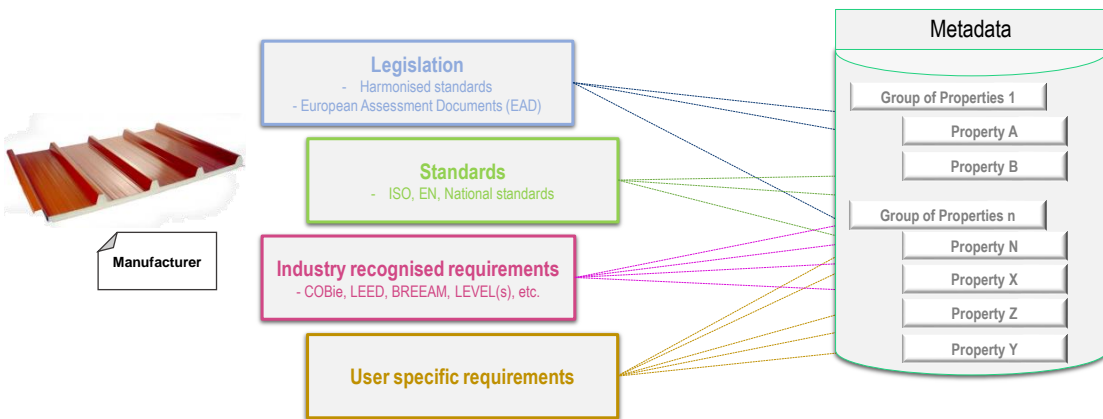
- Siloed data in inconsistent formats
- Low data quality and lack of data governance
- Over 30 classification systems – BauClass, Uniclass, NRM
- Fragmented BIM landscape with different standards (To BIM or not to BIM)
- Fragmented vendor landscape with limited interoperability Lack of standards for parts/equipment catalogues
- Lack of IT & OT security of Digital Twins and Models
- Sites lack infrastructure to leverage data
- Install base lacks sensors and embedded monitoring to benefit from IoT
- Insufficiently skilled labour to implement complex data projects



Simply investing in BIM is insufficient to address the **data challenges** faced by materials' 'supply chain'

Adapted from Paul Surin (IBM)

The solution



Concept adapted from @Cobuilder As cobuilder

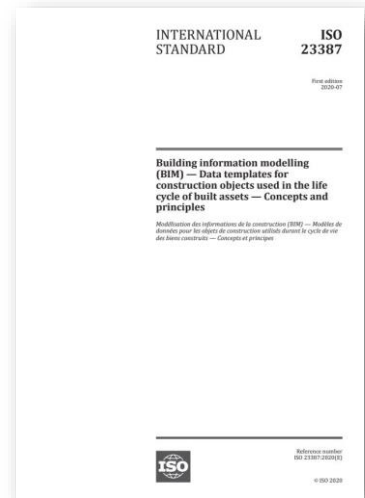
Data Templates (*are - will - have*)



Write down your answers:

Data Templates

- are:
- will:
- have:



Data Templates (*are - will - have*)



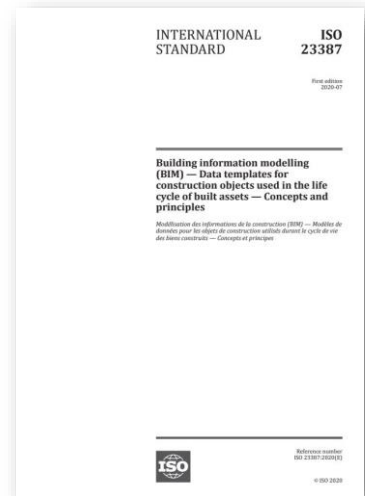
Data Templates are standardised, interoperable metadata structures used to describe the characteristics of construction objects. [ISO 23387](#)

“Data templates will enable construction project stakeholders to exchange information about construction objects through an asset life cycle, using the same data structure, terminology and globally unique identifiers to enable machine-readability.” [ISO 23387](#)

“Data templates have a common data structure describing the characteristics (called ‘properties’) of a construction object, and its physical qualities, according to a credible source of information – be it a standard or regulation.

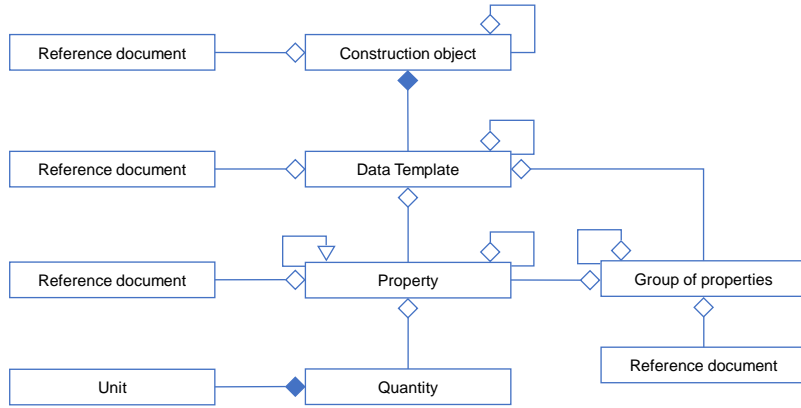
On the other hand, for any software, the data template structure is a set of concepts that are connected to each other with different relationships.”

[Cobuilder](#)

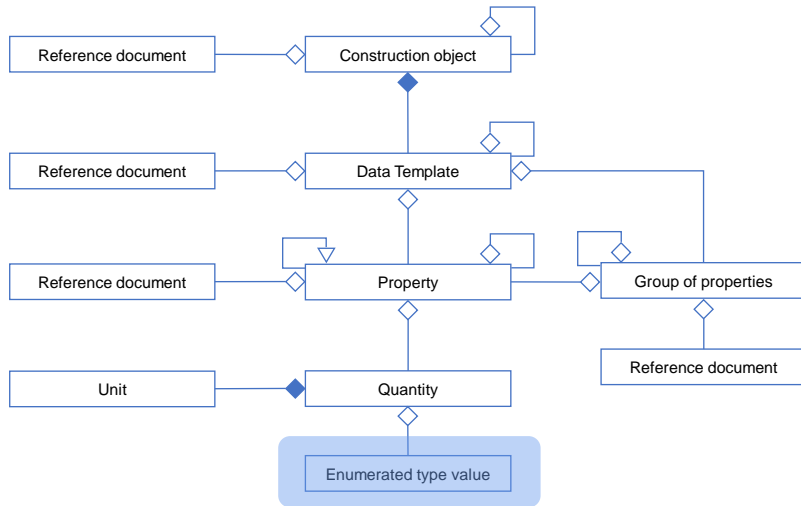




Data Templates in detail (ISO 23387)



Data Templates in detail (ISO 23387)



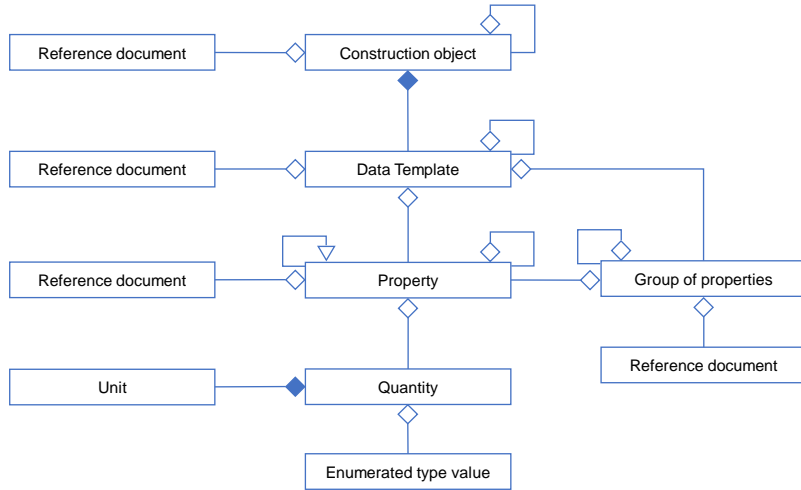
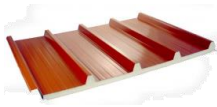
Data Sheets
(following
ISO 23387)

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Liechtenstein
Norway grants



Data Templates in detail (ISO 23387)

Example:

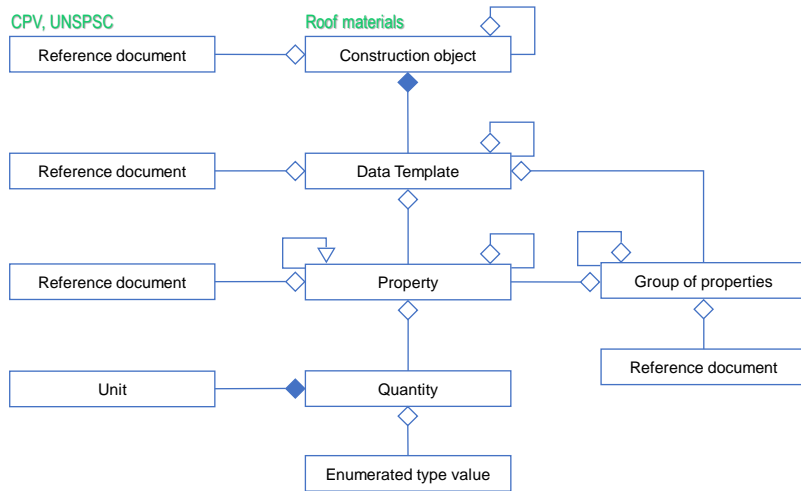
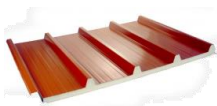


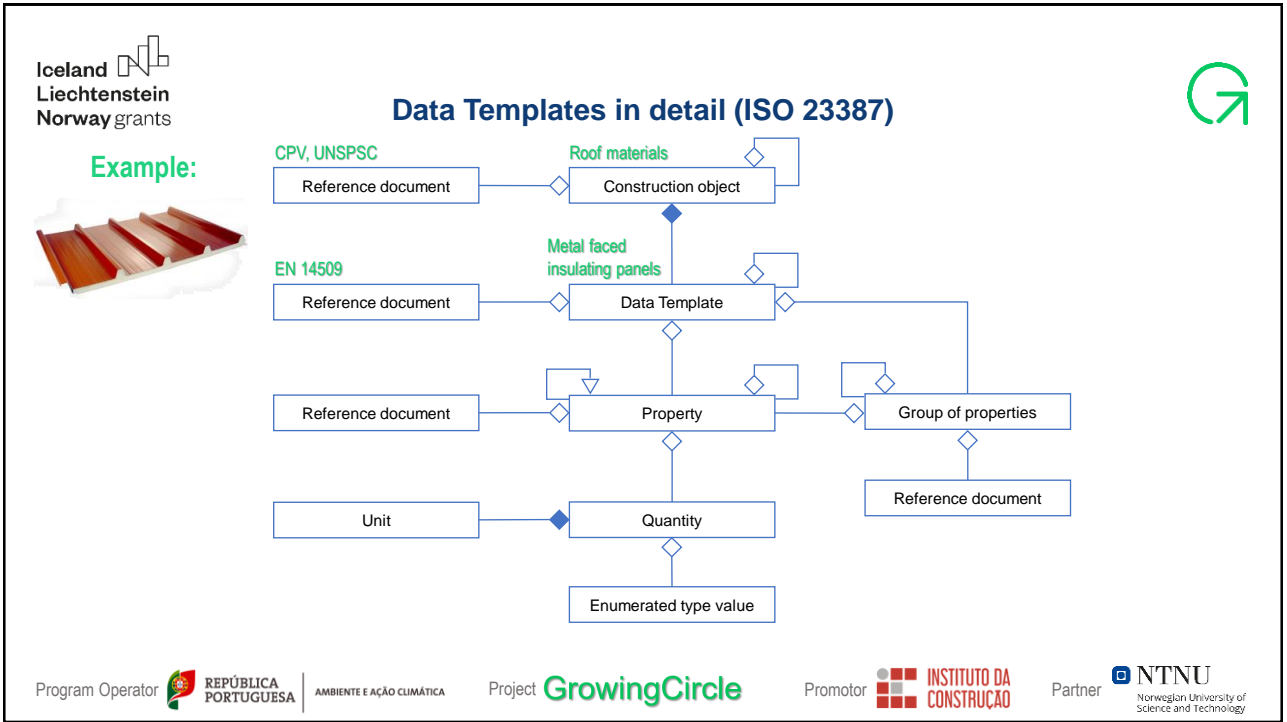
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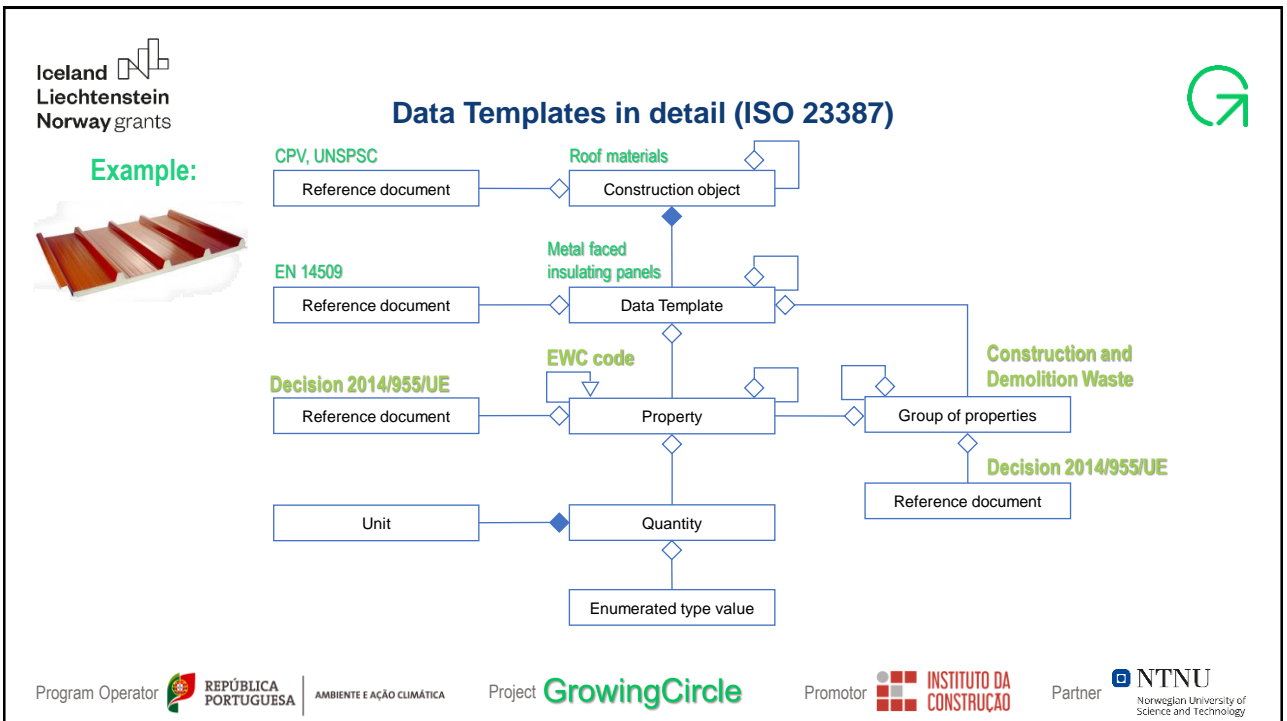
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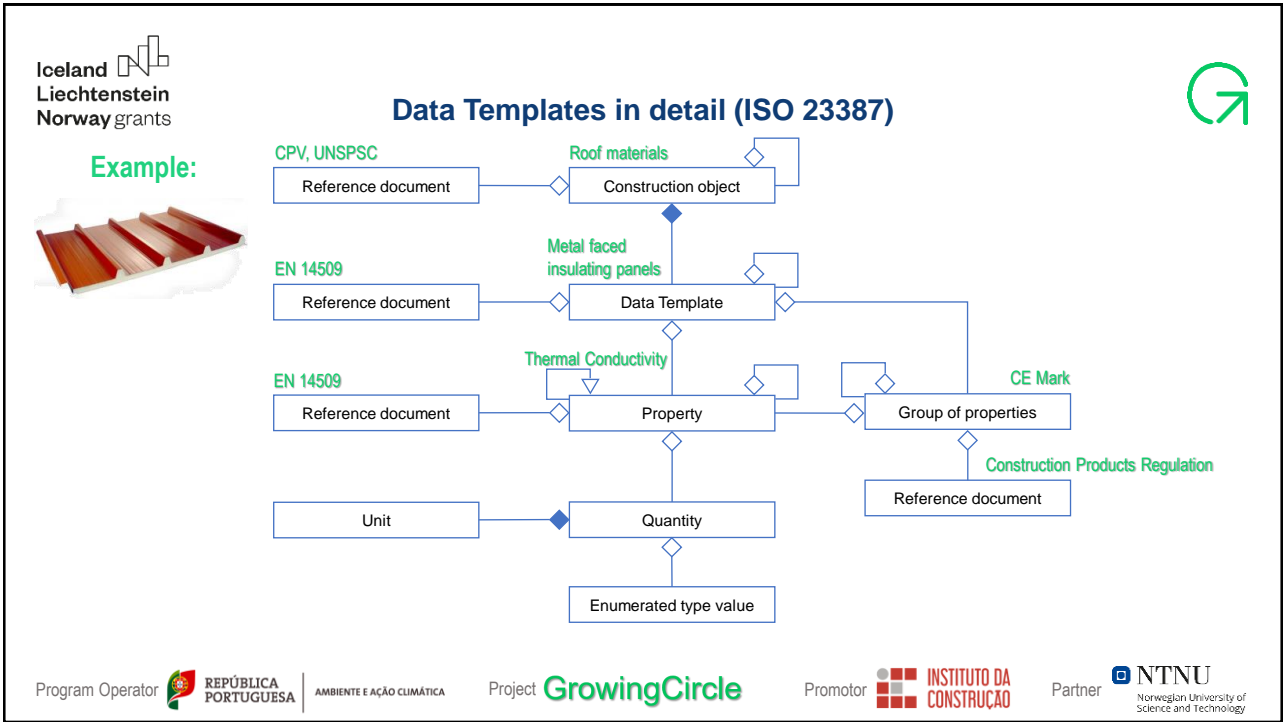




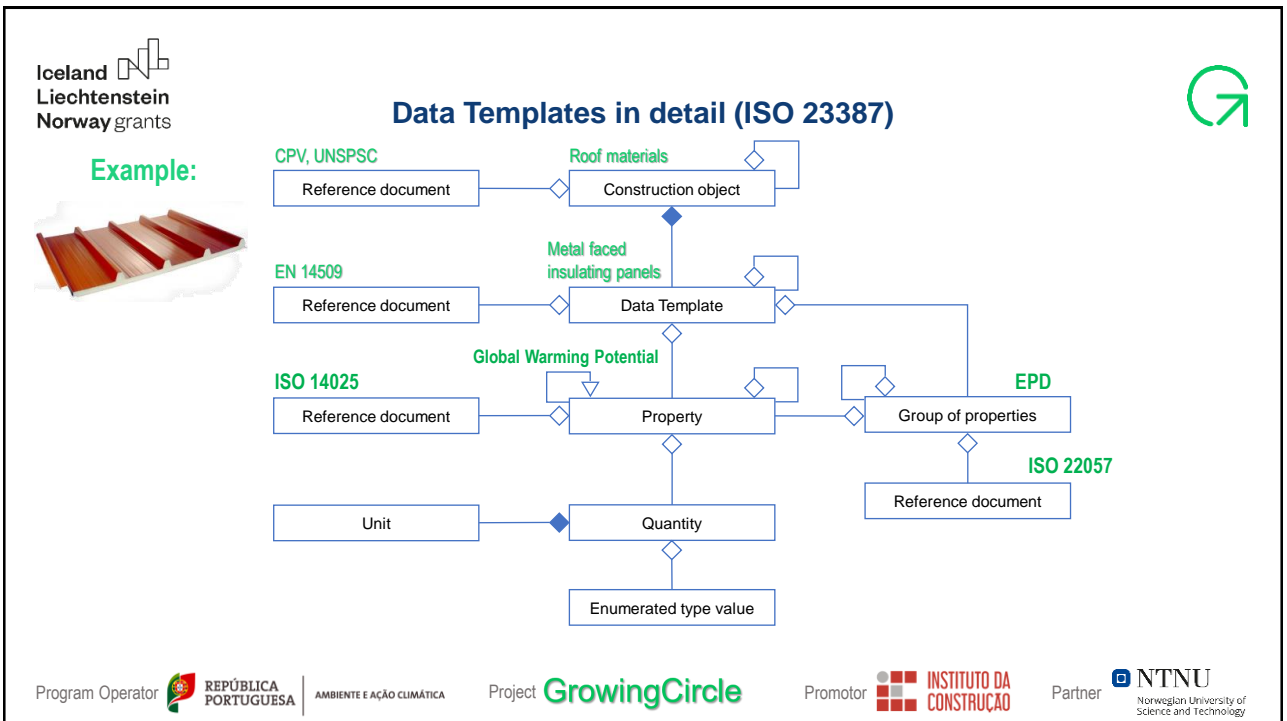
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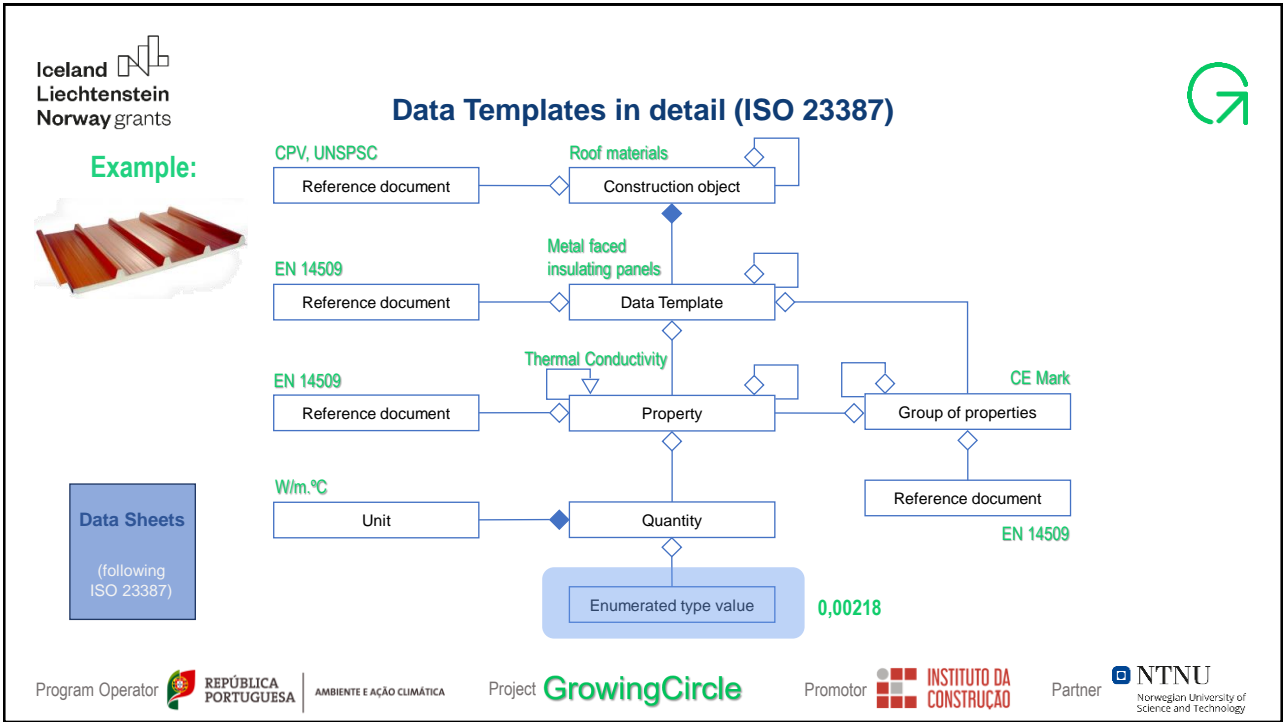
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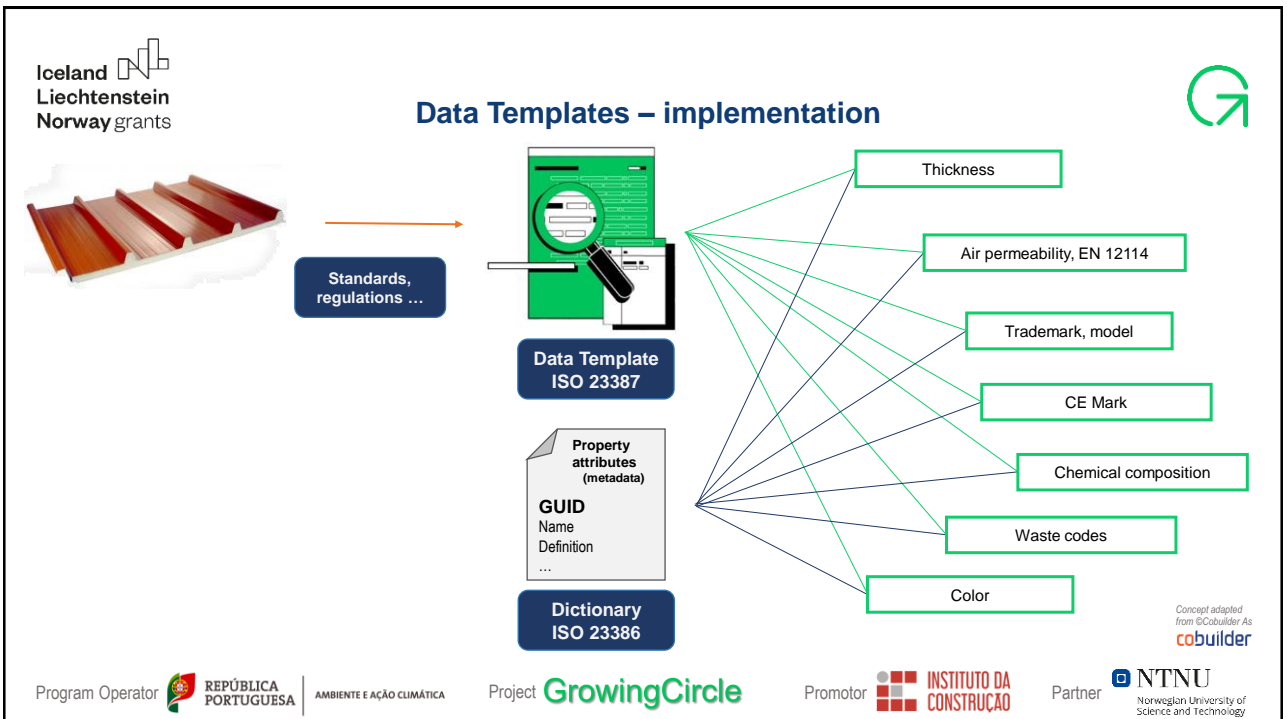
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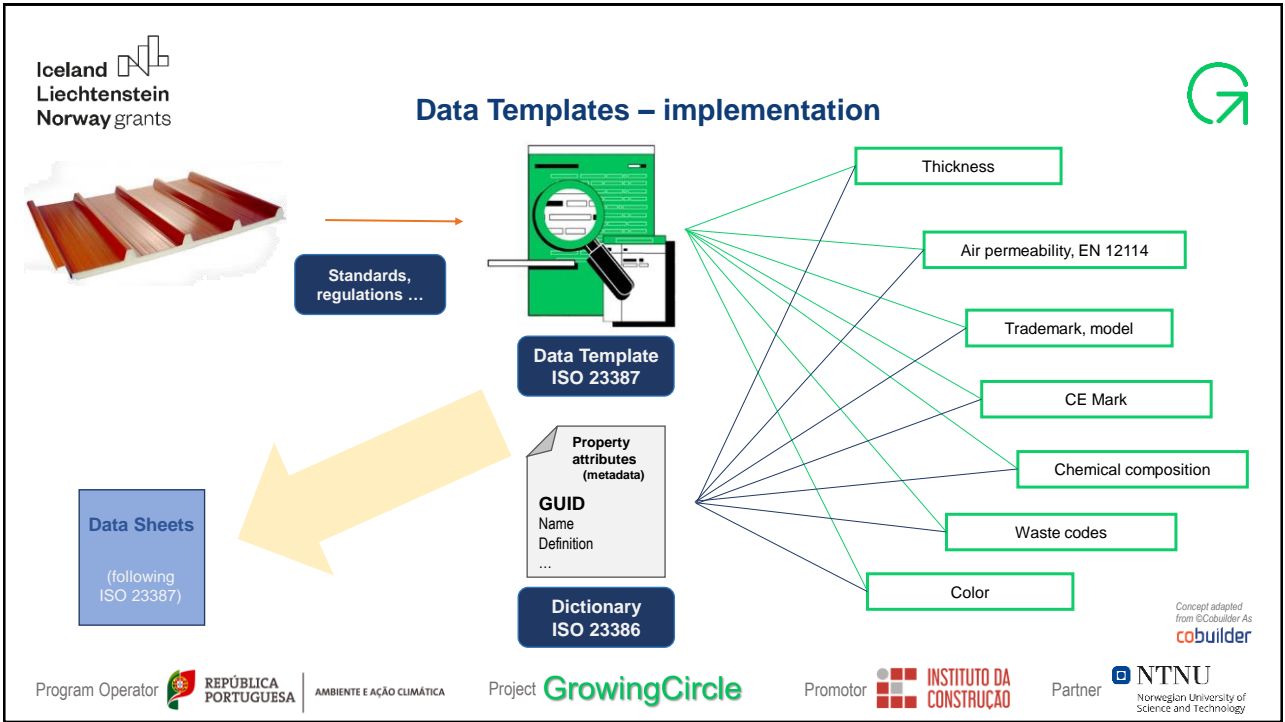
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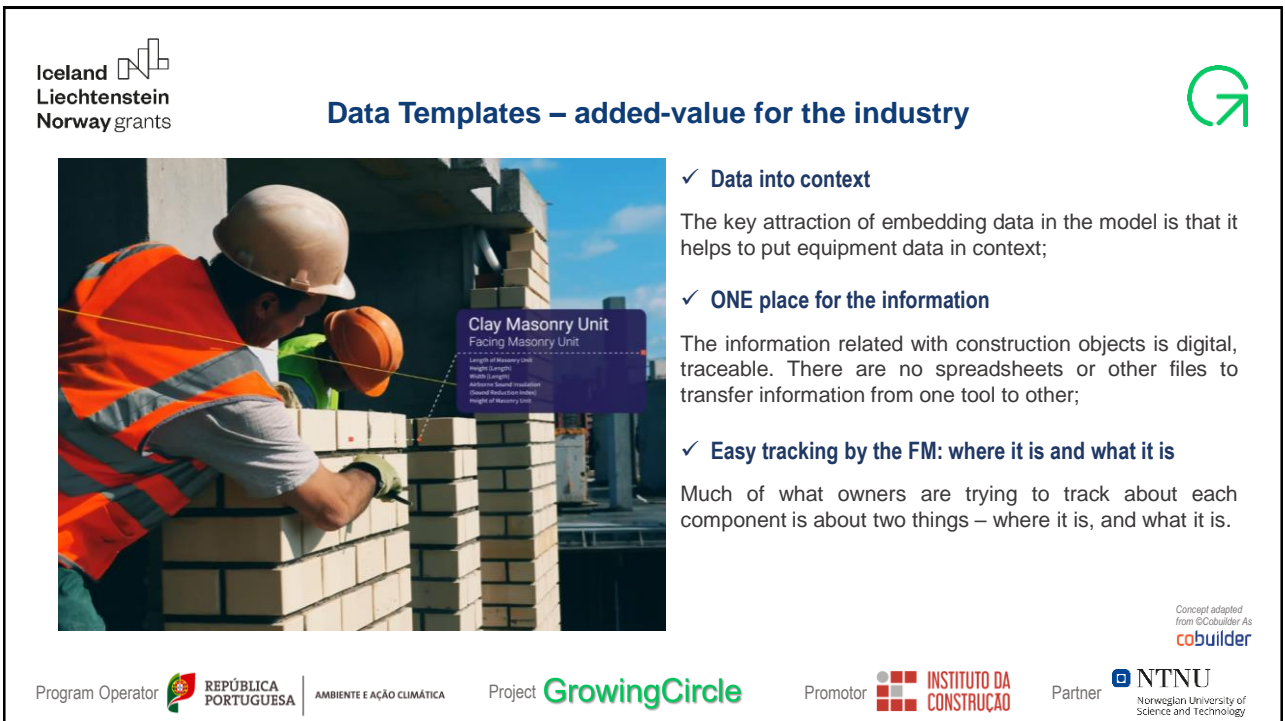
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Relevant Standards

Concept adapted from iCobuilder AS
cobuilder

- ISO 19650** Organization and digitization of information about buildings and civil engineering works, including BIM - information management using building information modelling
- ISO 12006-3 Organization of information about construction works (object-oriented)
- ISO 23386** Methodology to describe, author and maintain properties in interconnected data dictionaries
- ISO 23387** Data templates for construction objects used in the life cycle of any built asset
- ISO 17412** Building Information Modelling. Level of Information Need (LOIN). Concepts and principles
- ISO 17549-1/2** Information technology — User interface guidelines on menu navigation
- bSDD buildingSmart Data Dictionary** is an online service that hosts classifications and their properties, allowed values, units and translations
- ISO 22057** Sustainability in buildings and civil engineering works – Data templates for the use of EPDs for construction products in BIM

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Recap

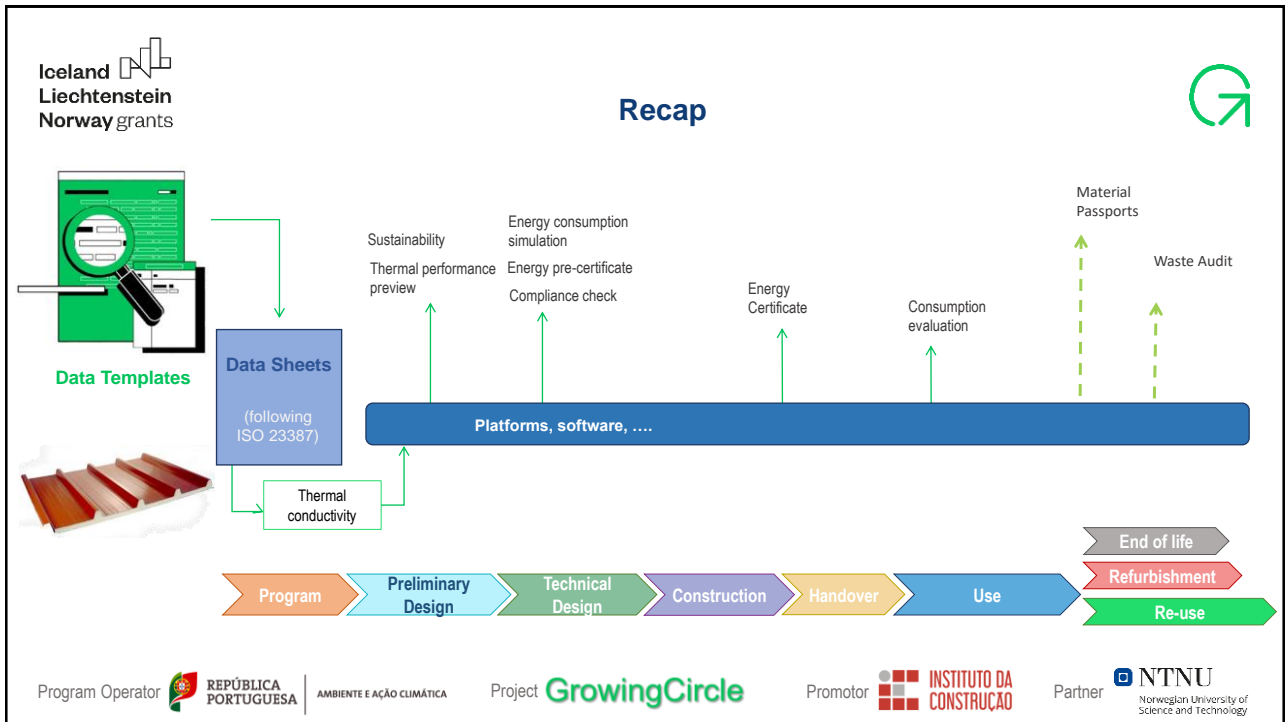
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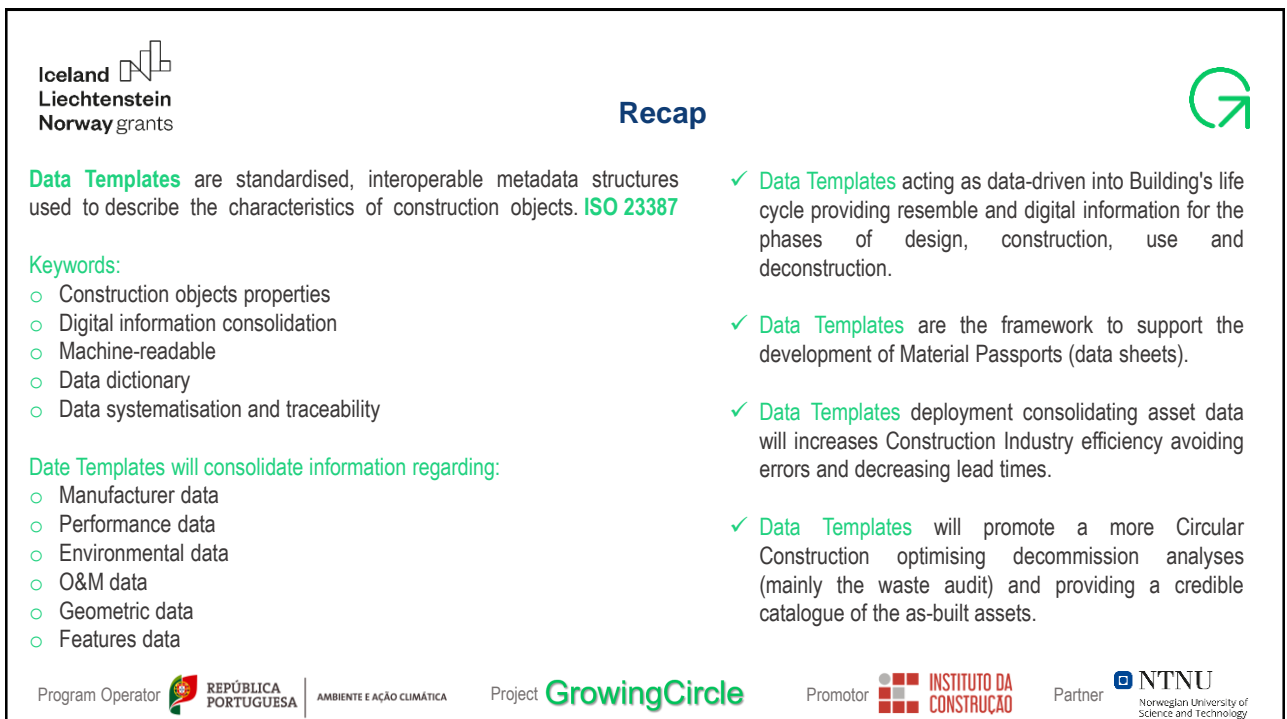
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GrowingCircle



GrowingCircle project joins Instituto da Construção and Trondheim University

GrowingCircle - "Integrated Data for Efficient and Sustainable Construction" project was approved under the EEA Grants 2014-2021 "Environment, Climate Change and Low Carbon Economy Programme".

To enhance the construction sector digitalization trends it is necessary to develop mechanisms to foster information systematization, integration, management, maintenance and tracking about the built objects and the construction products that compose them.

Data Templates are the standard and interoperable metadata structures capable of responding to these challenges, contributing to the effective implementation of more circular, more efficient and environmentally friendly practices.

The project is promoted by IC – Instituto da Construção, Portugal with NTNU – Trondheim University, Norway as partner.

Partnership **cobuilder**

GrowingCircle and Cobuilder are developing case studies whose result will be, among others, a GrowingCircle catalog of construction products, according to the Data Templates (ISO 23387)

Video and exam

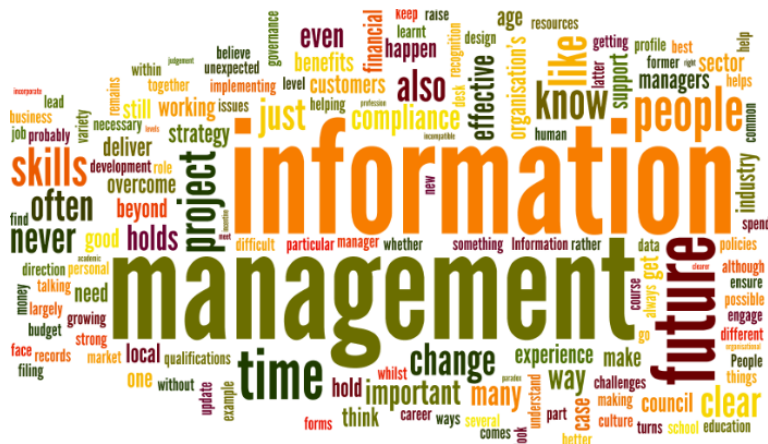


- **GrowingCircle project continues the awareness actions on Data Templates.**
- **This video aims to explain how Data Templates are relevant structures for the information traceability through the construction processes.**
- <https://www.youtube.com/watch?v=RnMsT4fOMk> (20:48)
- **Gain knowledge on the theoretical framework and standards behind Data Templates.**
- **Assist to the video and obtain the GrowingCircle awareness certification answering correctly to 6 of 10 questions in the form:**
- <https://forms.gle/bAWaTGWdEPVhrRLXA>

What was your result form the exam?



Fremtidens Dagens prosjektledelse Prosjektledelse ↔ Informasjonsledelse

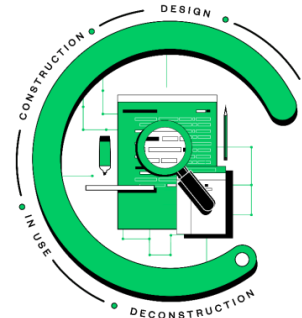




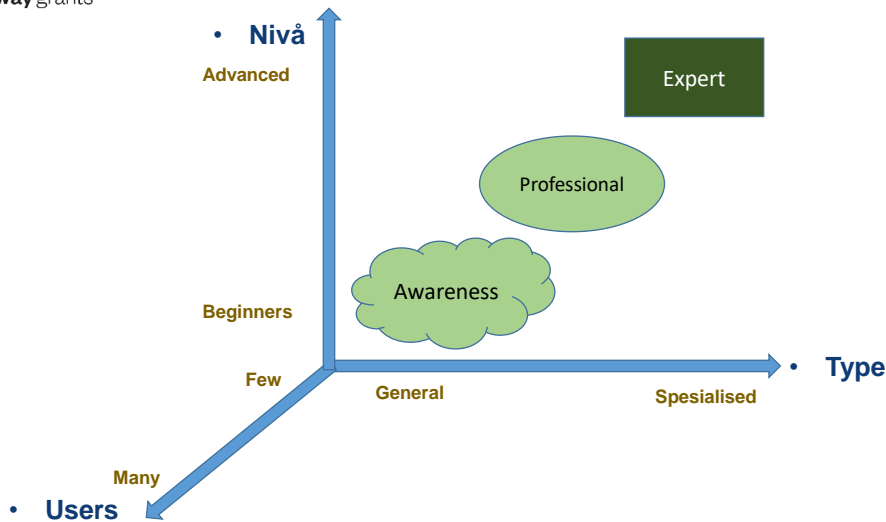
Takk for oppmerksomheten!

Eilif Hjelseth

Nå er det tid for dikusjon:



Bygge rett type kompetanse på rett nivå





Forslag til spørsmål for diskusjon:

- Hva er behovet for denne type kompetanse?
 - Hva er det man egentlig trenger?
 - Nivå og omfang?
- Hvordan skal dette integreres opplæring av prosjektledere?
 - Egne kurs? (selvstudie, nettbasert o.l.)
 - Del av andre kurs/opplæring?
- Hva kan GrowingCircle gjenbruke eller bygge videre på av kurs og tester?
 - Andre som jobber med dette temaet?
- Hva synes dere er interessant å diskutere?
 - Kom med forslag!