

Eesti
Muusika- ja
Teatriakadeemia

Consultative stakeholder meeting

July 11, 2019
Tallinn, Estonia

see it. get it. do it.

Introducing a
Building Information Model
(BIM)-based process
for building permits in Estonia



Funded by the Structural Reform Support Programme of the European Union and implemented by Future Insight Group B.V. in cooperation with the European Commission's Structural Reform Support Service (SRSS).

This presentation has been produced under a contract with the Union and the opinions expressed are those of Future Insight Group B.V. and do not represent the official position of the European Commission.



Introductions

- What is the project / SRSS program?
- Who are we?
- Who are you?

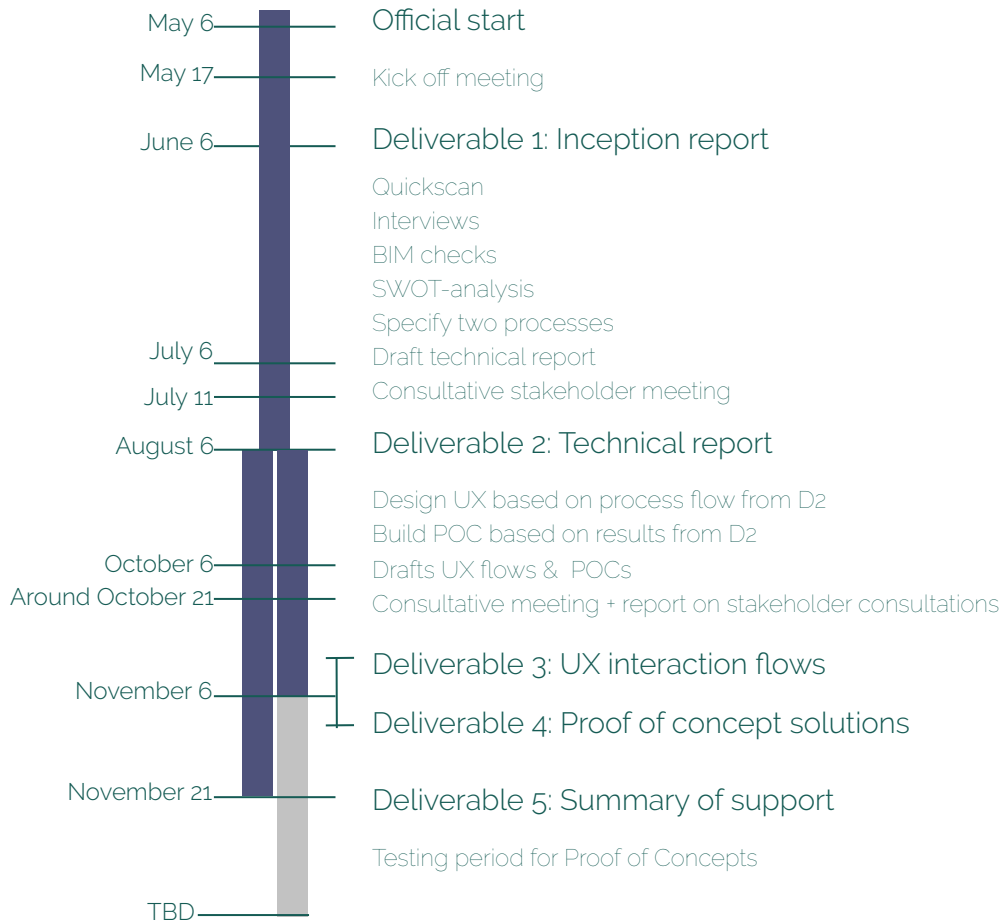


Technical report

- Inform about results so far
- Get your feedback
- Opportunities



Work-plan





Technical report

- A state of BIM in Estonia
- State of the art outside Estonia
- Conclusion and recommendations



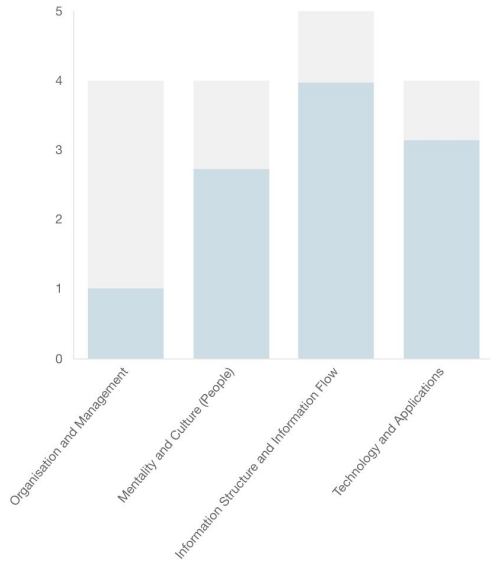
A state of BIM in Estonia

- BIM Quickscan
- BIM analytics
- Preparatory developments
- Interviews



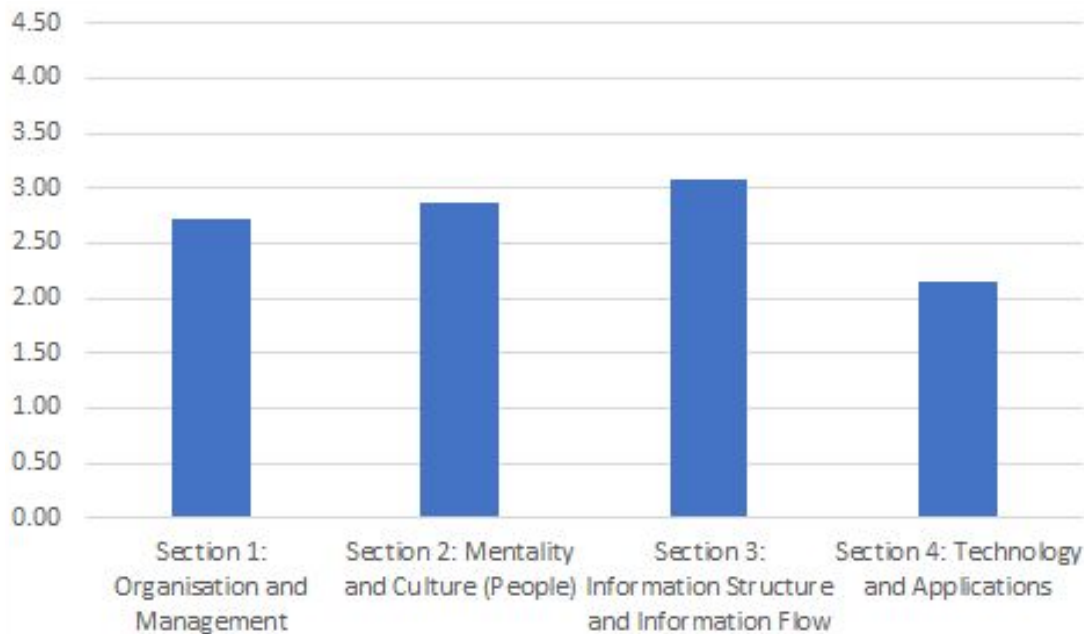


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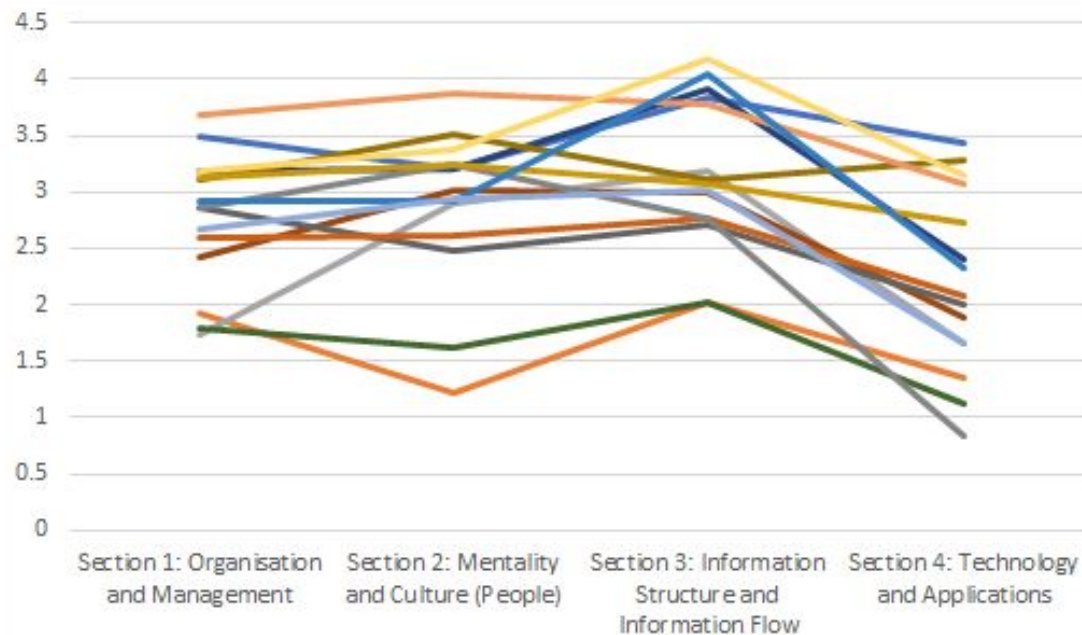


A state of BIM in Estonia





A state of BIM in Estonia





A state of BIM in Estonia



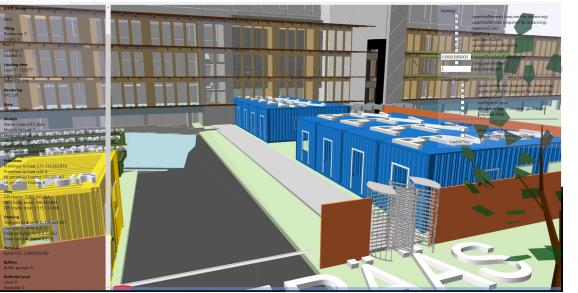
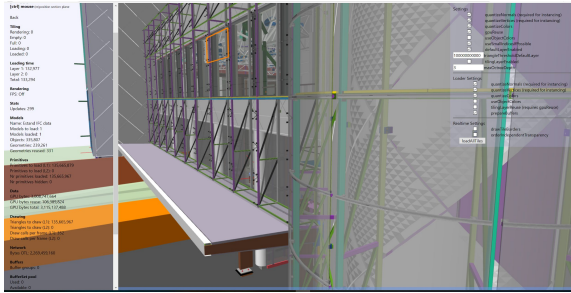
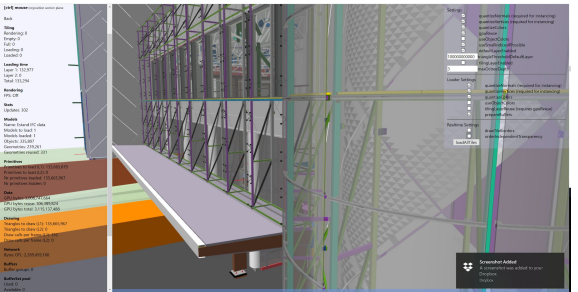
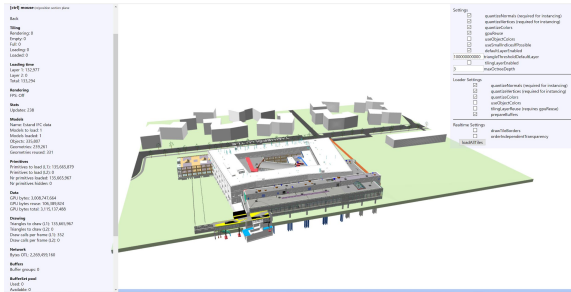
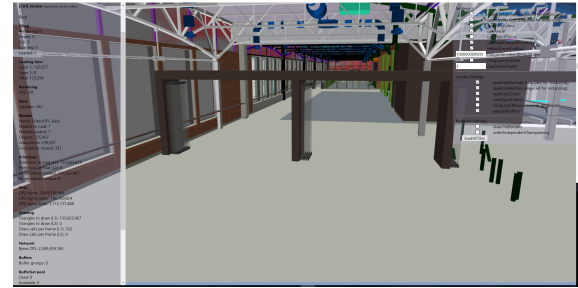
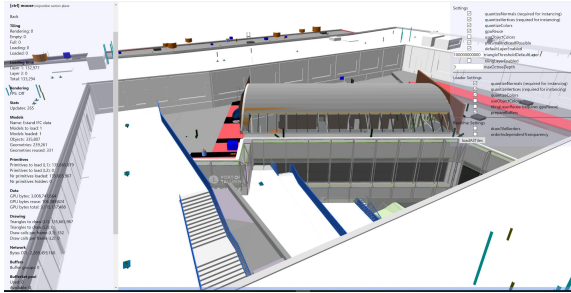


A state of BIM in Estonia



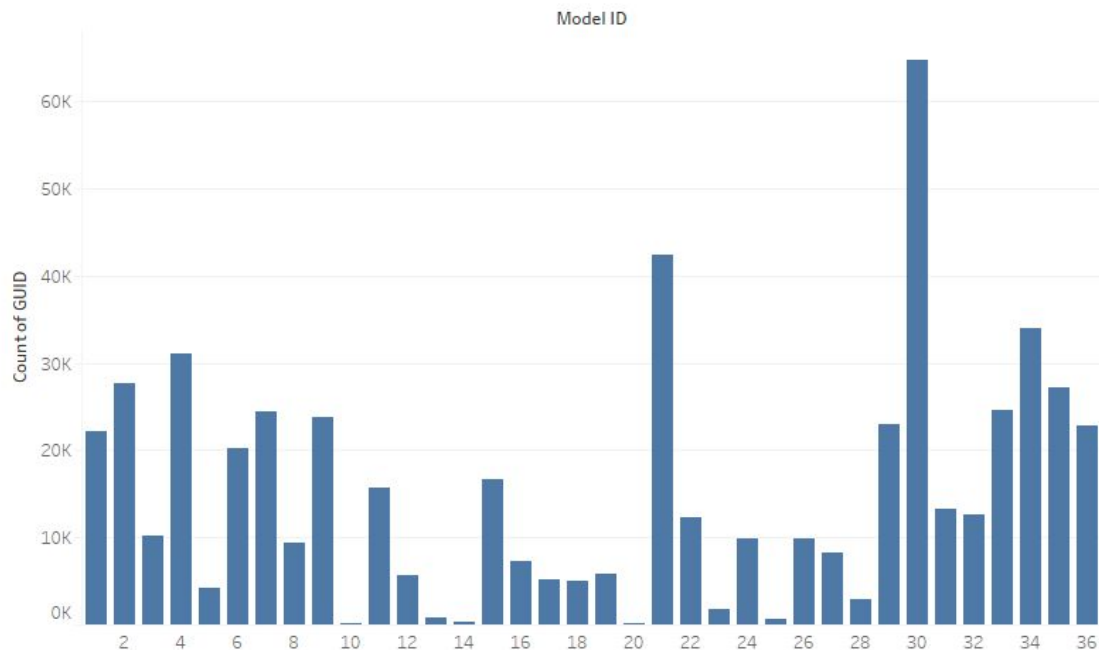


A state of BIM in Estonia



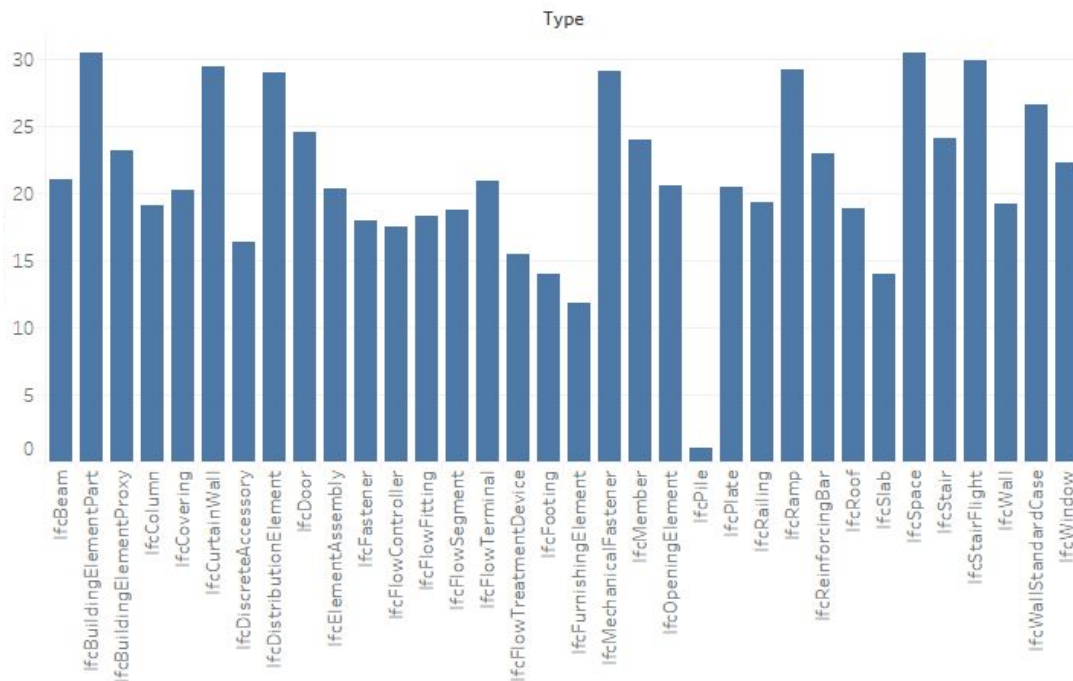


A state of BIM in Estonia



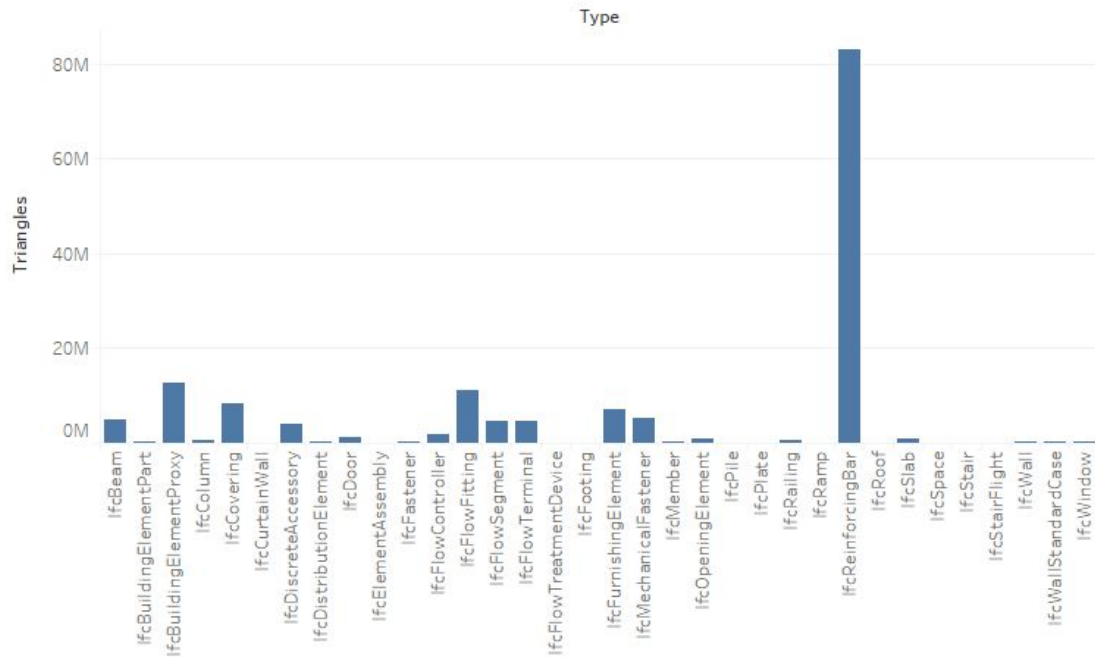


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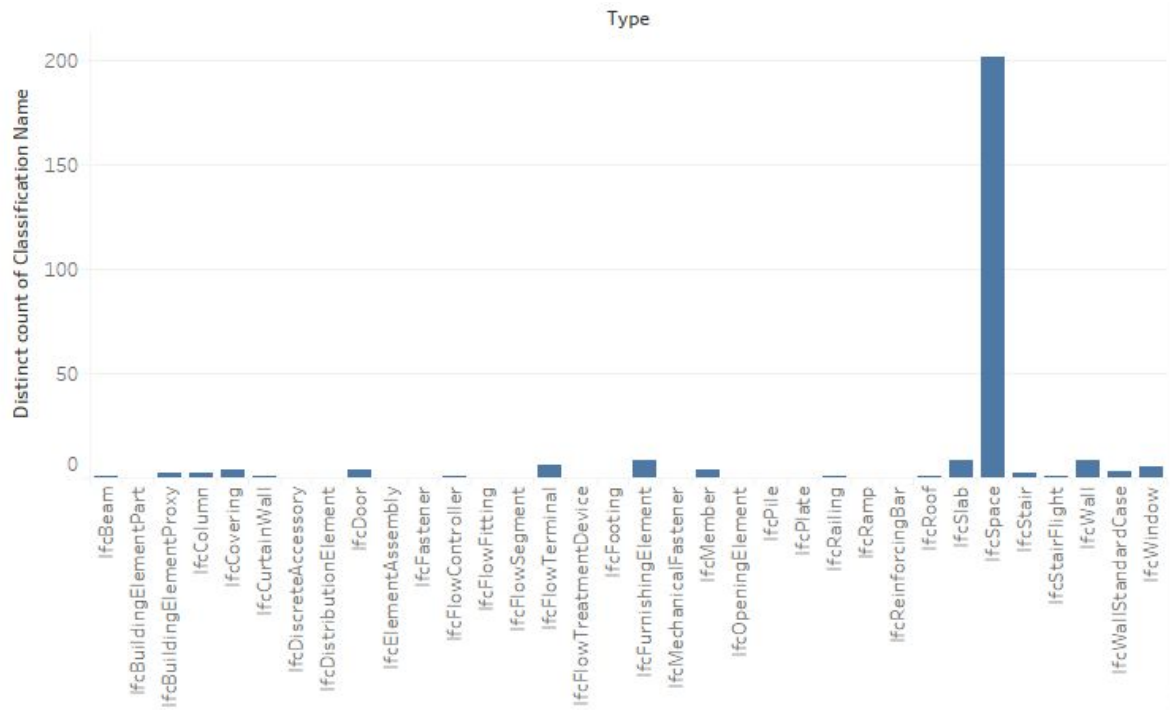


A state of BIM in Estonia





A state of BIM in Estonia





A state of BIM in Estonia





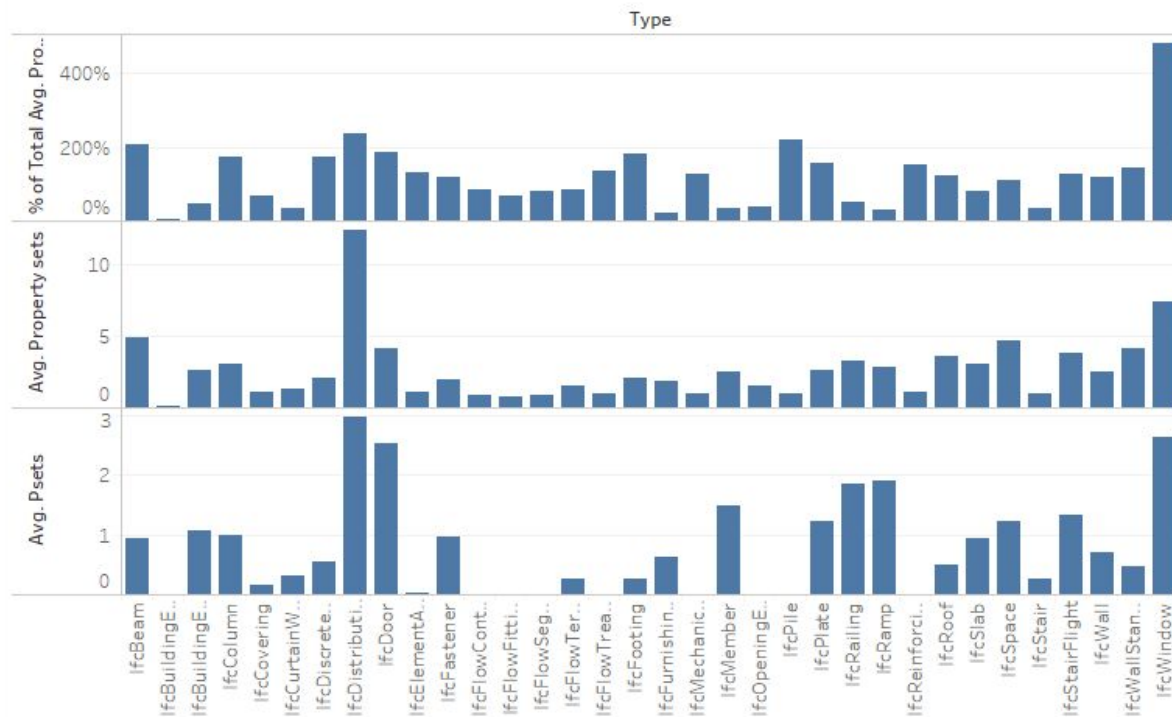
A state of BIM in Estonia

Identification	Location	Quantities	Material	Profile	Relations	Classification
Hyperlinks	Arhitektuur	BaseQuantities			Ehituskonstruksioonid	
Property				Value		
01 Nimetus				VS-01		
02 Materjal				Betoon monoliit (kandev kiht); Soojustus E...		
03 Tähistus või ristlõige				VS-01		
06 Maht (kubatuur)				10,2		

SPETSIFIKATSIOONIDE PARAMEETRID				ZONES	0,0; 3D pikkus: 13 977,0
Pset_ManufacturerTypeInformation		Pset_WindowCommon			
Pset_FireRatingProperties		Pset_ManufacturerOccurrence			
MANUFACTURING	OPENINGS	PRODUCT INFO	Pset_DoorWindowGlazingType		
KLAASFASSAADIDE SPETSIFIKATSIOONIDE PARAMEETRID		MAIN CONSTRUCTION			
IfcWindowPanelProperties		IfcWindowPanelProperties			
GENERAL RATINGS	GLAZING	Ifc Dimensions	IfcWindowLiningProperties		
AC Pset_RenovationAndPhasing		AVATÄITED	ENVIRONMENTAL	FLOORINGS	
Identification	Location	Quantities	Relations	Classification	Hyperlinks
Property			Value		
Model			(AR) 1807_TP_AR		
Discipline			Architectural		
Name			A		
Type			Variable Window 21		
Type Name			Variable Window 21		
Description					
Layer			(AR)1241-Valisseinad		



A state of BIM in Estonia





Conclusions

“A state of BIM in Estonia”

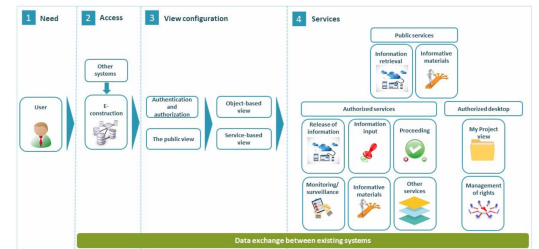
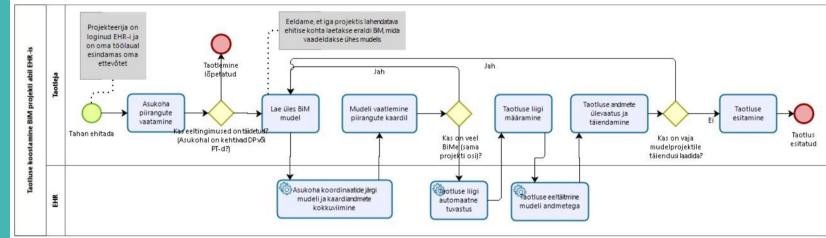
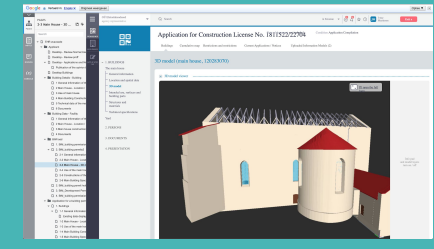
- High level leading group
 - Large peloton
 - Little laggards
- High level of IFC expertise
- All the necessary ingredients to unlock full potential of BIM-based checking



Preparatory developments

- e-Construction platform vision
- PWC report (Mapping, optimizing, and adjusting for the introduction of e-construction of the procedures of the Register of Buildings)
- EHR prototype
- Permit checklists Tallinn & Tartu

A state of BIM in Estonia





A state of BIM in Estonia

Interviews

- Open, enthusiastic attitude
- BIM collaboration on high level
- IFC is widely adopted
- BIM based model check initiative 👍
- Could save a lot of time and add transparency
- Beware of adding too much extra requirements

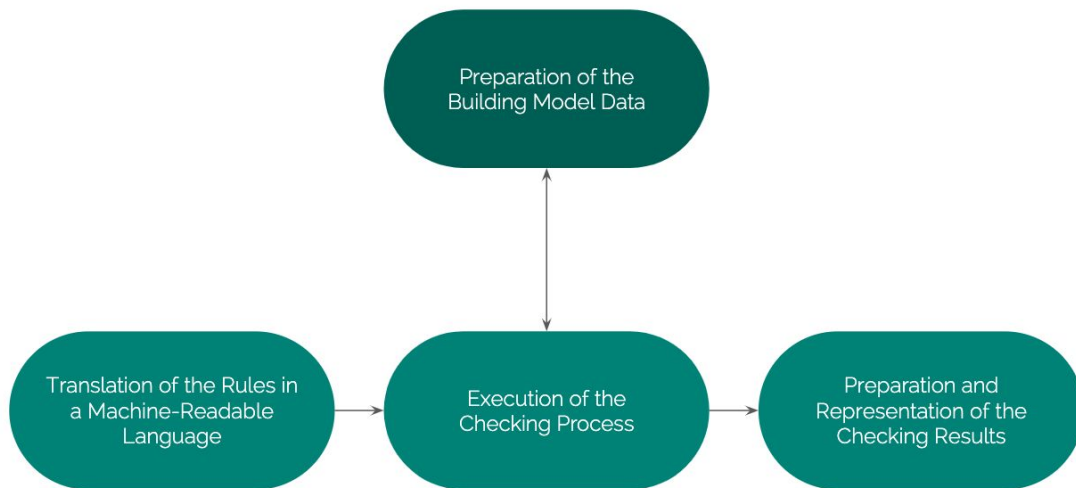


State of the art outside Estonia



Rule checking vs compliance checking

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State of the art outside Estonia



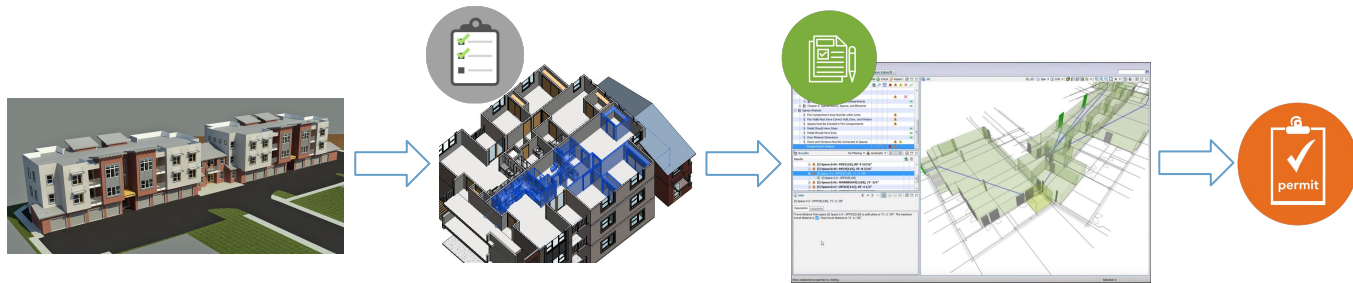


State of the art outside Estonia



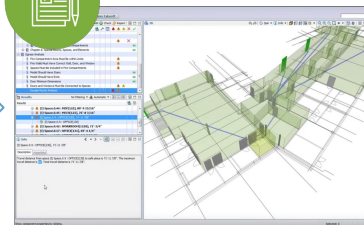
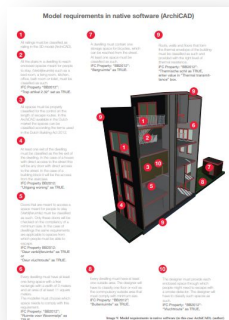


State of the art outside Estonia





State of the art outside Estonia





State of the art outside Estonia

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All railings must be classified as railing in the 3D model (ArchiCAD).

2

All the stairs in a dwelling to reach enclosed spaces meant for people to stay, (Verblijfsruimte) such as a bed room, a living room, kitchen, office, bath room or toilet, must be classified as such.

IFC Property "BB2012":
"Trap artikel 2.32" set as TRUE.

3

All spaces must be properly classified for the control on the length of escape routes. In the ArchiCAD available in the Dutch market the spaces can be classified according to the terms used in the Dutch Building Act 2012.

4

At least one exit of the dwelling must be classified as the fire exit of the dwelling. In the case of a house with direct access to the street this will be any door with direct access to the street. In the case of a building block it will be the access from the staircase.

IFC Property BB2012:
"Uitgang woning" as TRUE.

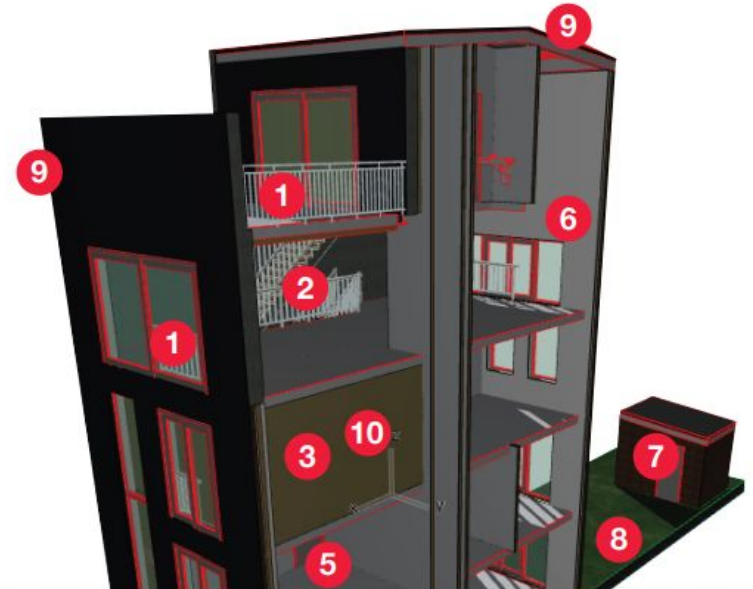
7

A dwelling must contain one storage space for bicycles, which can be reached from the street. At least one space must be classified as such.

IFC Property: "BB2012":
"Bergruimte" as TRUE.

9

Roofs, walls and floors that form the thermal envelope of the building must be classified as such and provided with the right level of (thermal resistance).
IFC Property: "BB2012":
"Thermische schil as TRUE, enter value in "Thermal transmittance" box.





State of the art outside Estonia

1

The assessor must check whether all railings are classified as such. Otherwise they will not be checked.

2

The assessor must check whether all the stairs that lead to a living space are classified as such. Otherwise they will not be checked.

4

The assessor must check that the doors from which people might have to escape to the street or to a safety area in case of fire have been classified as such. However Solibri Model checker will warn the assessor that the escape route cannot be calculated if no door has been classified as the fire safety exit.

6

Every dwelling must have at least one living space with a free rectangle with a width of 3 meters and an area of at least 11 square meters. The assessor does not have to do anything. Solibri Model Checker will warn the assessor if such a space is missing.

7

For the compulsory storage room for bicycles the assessor does not have to do anything. Solibri Model Checker will tell the assessor in the case no space has been classified as storage such.

8

For the compulsory outdoor area the assessor does not have to do anything. Solibri Model Checker will warn the assessor if such an area is missing.





When you manually add data (according to really detailed guidelines and requirements)

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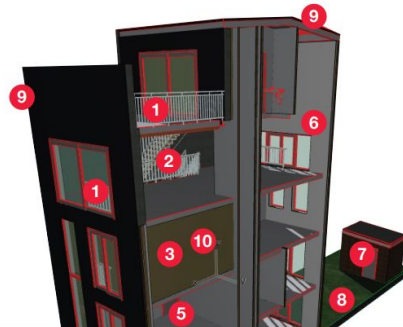
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State of the art outside Estonia

When you manually add data (according to really detailed guidelines and requirements), and then manually check in the checking-tool if the data is realistic and valid

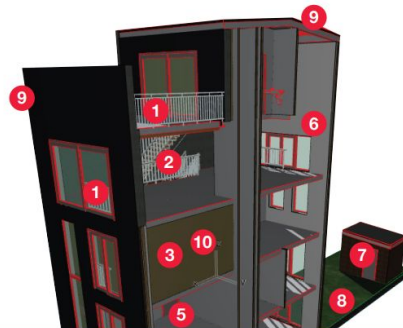
- 1 All railings must be classified as railing in the 3D model (ArchCAD).
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- 4 At least one exit of the dwelling must be classified as the fire exit of the dwelling. In the case of a house with direct access to the street this will be any door with direct access to the street. In the case of a building block it will be the access from the staircase.
IFC Property BB2012: "Uitgang woning" as TRUE.

- 7 A dwelling must contain one storage space for bicycles, which can be reached from the street. At least one space must be classified as such.
IFC Property: "BB2012": "Bergruimte" as TRUE.

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IFC Property: "BB2012": "Thermische schil as TRUE, enter value in "Thermal transmittance" box.



- 1 The assessor must check whether all railings are classified as such. Otherwise they will not be checked.
- 2 The assessor must check whether all the stairs that lead to a living space are classified as such. Otherwise they will not be checked.



- 4 The assessor must check that the doors from which people might have to escape to the street or to a safety area in case of fire have been classified as such. However Solibri Model checker will warn the assessor that the escape route cannot be calculated if no door has been classified as the fire safety exit.

- 6 Every dwelling must have one living space with a minimum area of 16 square meters and an area of at least 10 square meters. The assessor does not have to do anything. Solibri Model checker will warn the assessor if the living space area is missing.

- 7 For the compulsory bicycle storage, the assessor does not have to do anything. Solibri Model checker will warn the assessor if the bicycle storage has not been classified as such.

- 8 For the compulsory bicycle storage, the assessor does not have to do anything. Solibri Model checker will warn the assessor if the bicycle storage has not been classified as such.



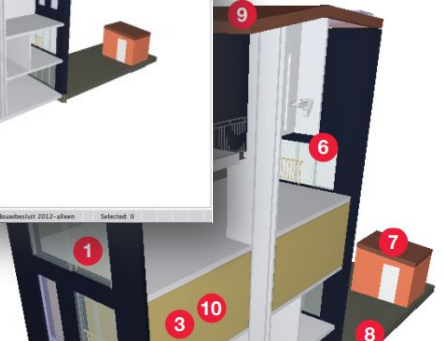
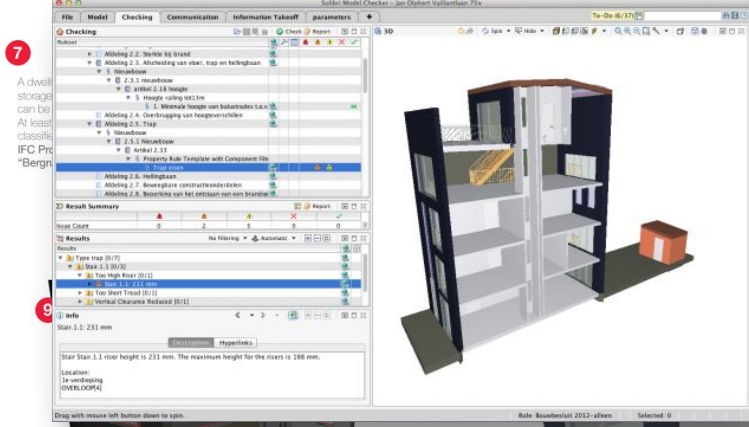
State of the art outside Estonia

When you manually add data (according to really detailed guidelines and requirements), and then manually check in the checking-tool if the data is realistic and valid, then you can check it automatically very fast.

- 1 All railings must be classified as railing in the 3D model (ArchiCAD).
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- 6 Every dwelling must have one living space with a minimum area of 36 square meters and an area of at least 10 square meters for the kitchen. The assessor does not check anything. Solibri Model Checker will warn the assessor if the area is missing.

- 7 For the compulsory bicycle parking the assessor has to do anything. Solibri Model Checker will warn the assessor in the case the bicycle parking has not been classified as such.

- 8 For the compulsory bicycle parking the assessor has to do anything. Solibri Model Checker will warn the assessor in the case the bicycle parking has not been classified as such.



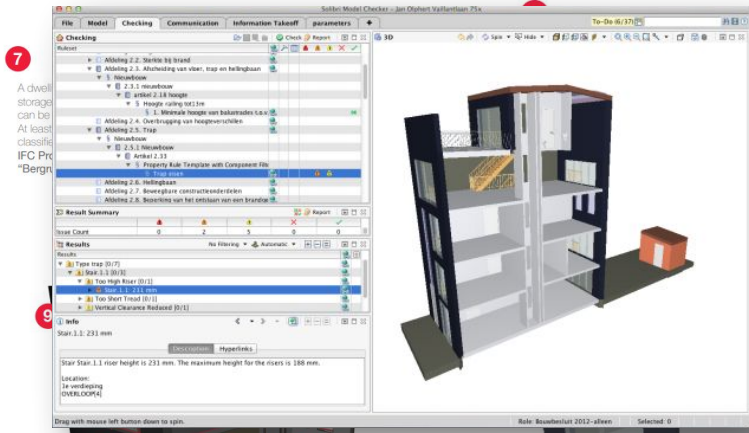
State of the art outside Estonia

When you manually add data (according to really detailed guidelines and requirements), and then manually check in the checking-tool if the data is realistic and valid, then you can check it automatically very fast. For a couple of permits requirements.

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- 6 Every dwelling must have one living space with a rectangle with a width of at least 10 meters and an area of at least 10 square meters. The assessor does not warn anything. Solibri Model checker will warn the assessor if the area is missing.

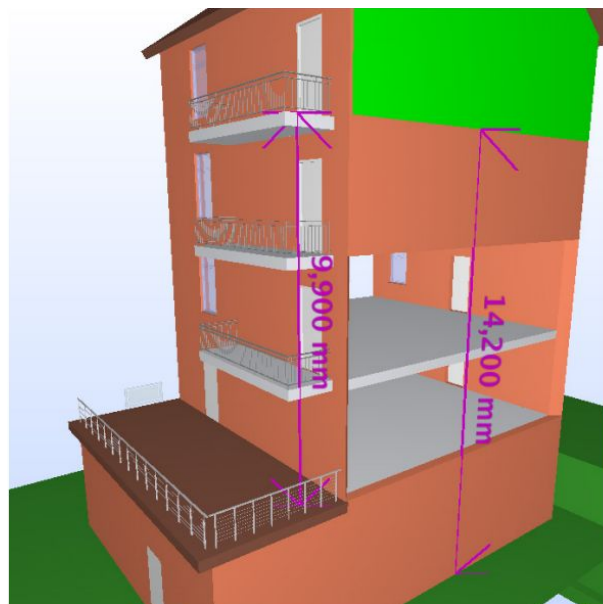
- 7 For the compulsory requirements for bicycles the assessor has to do anything. Solibri Model Checker will warn the assessor in the case where the space has not been classified as such.

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State of the art outside Estonia

When you manually add data (according to really detailed guidelines and requirements), and then manually check in the checking-tool if the data is realistic and valid, then you can check it automatically very fast.
For a couple of permits requirements.
With a lot of exceptions.





Examples

State of the art outside Estonia



E-5

Wall.3.22

Value 0R of Wall.3.22 does not fulfill the requirement thermal resistance = 13 R.

Soibri Model Checker Report for:

International Code Council - Code Checking Demo

Building Model: LBNL-BLIS Office Building

Jurisdiction: Richmond, VA

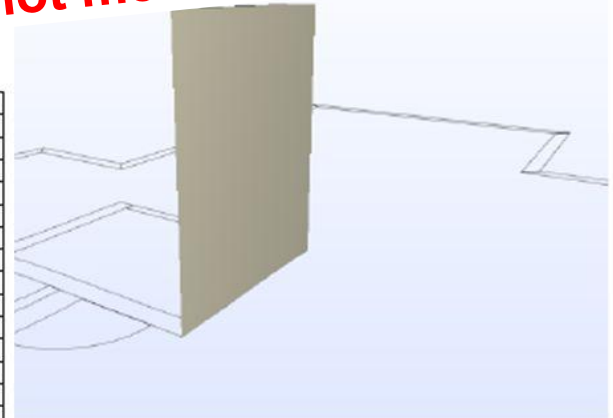
Or

Da

Rc > x

Sec	Requirements	Summary Comments
502.2.1	Insulation and fenestration criteria	Passed
502.2(1)	Building envelope requirements - Opaque Assemblies	Issues
(502.2.3	Above grade walls)	Not checked
(502.2.4	Below grade walls)	Not checked
502.3.2	Building envelope requirements - Fenestration	Passed
(502.4.1	Air leakage - Windows & Doors)	Not checked
(502.4.2(a)	Air leakage - curtain walls/storefronts)	Not checked
(502.4.2(b)	Air leakage - entry doors)	Not checked
(502.4.4	Outdoor air intake & exhaust)	Not checked
(502.4.5	Loading dock weatherseals)	Not checked
502.4.6	Vestibules	Passed
502.4.7	Recessed luminaires	Passed
502.5	Moisture control	Issues

Value 0R of wall x does not meet requirement

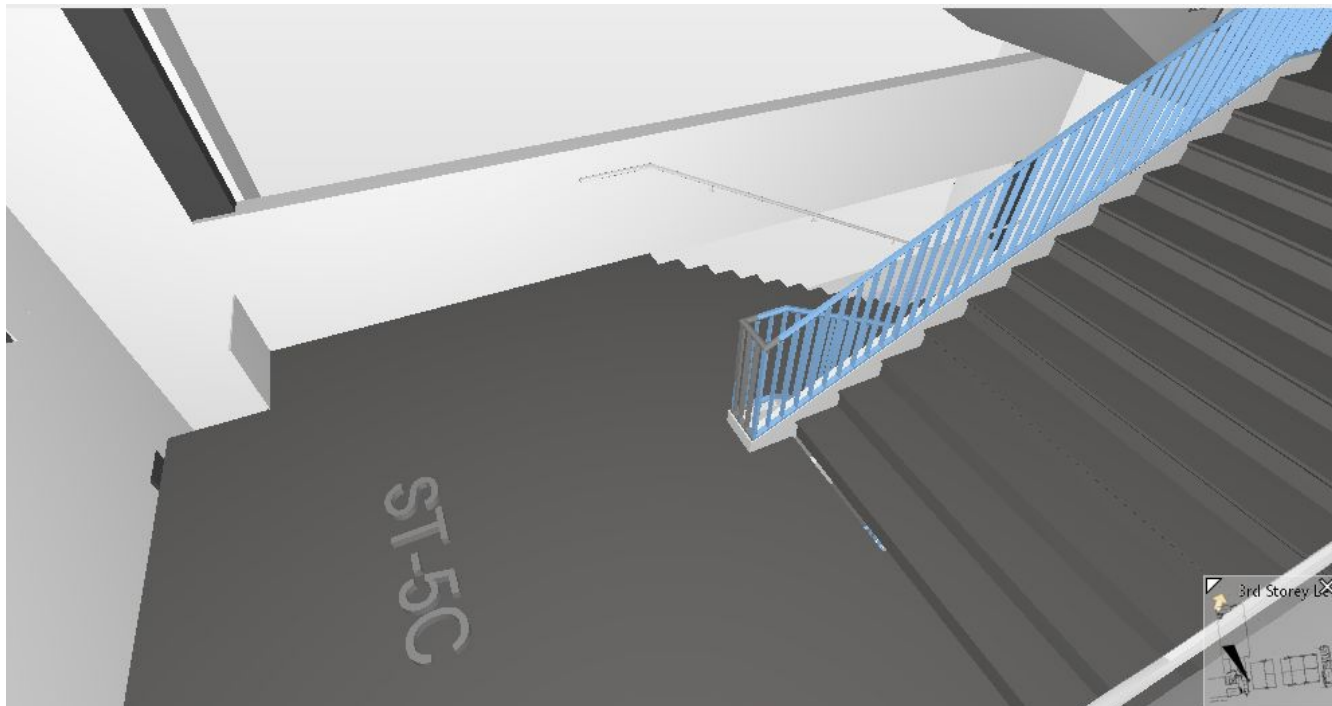


Wall.3.22 (guid 2QLSEJWYvCxuya2zWNBEMU) located at (12'-2 5/8";44'-10 3/4";31'-5 15/16"), type = E-5, layer = A-WALL-EXTR, storey = ROOF 1



Examples

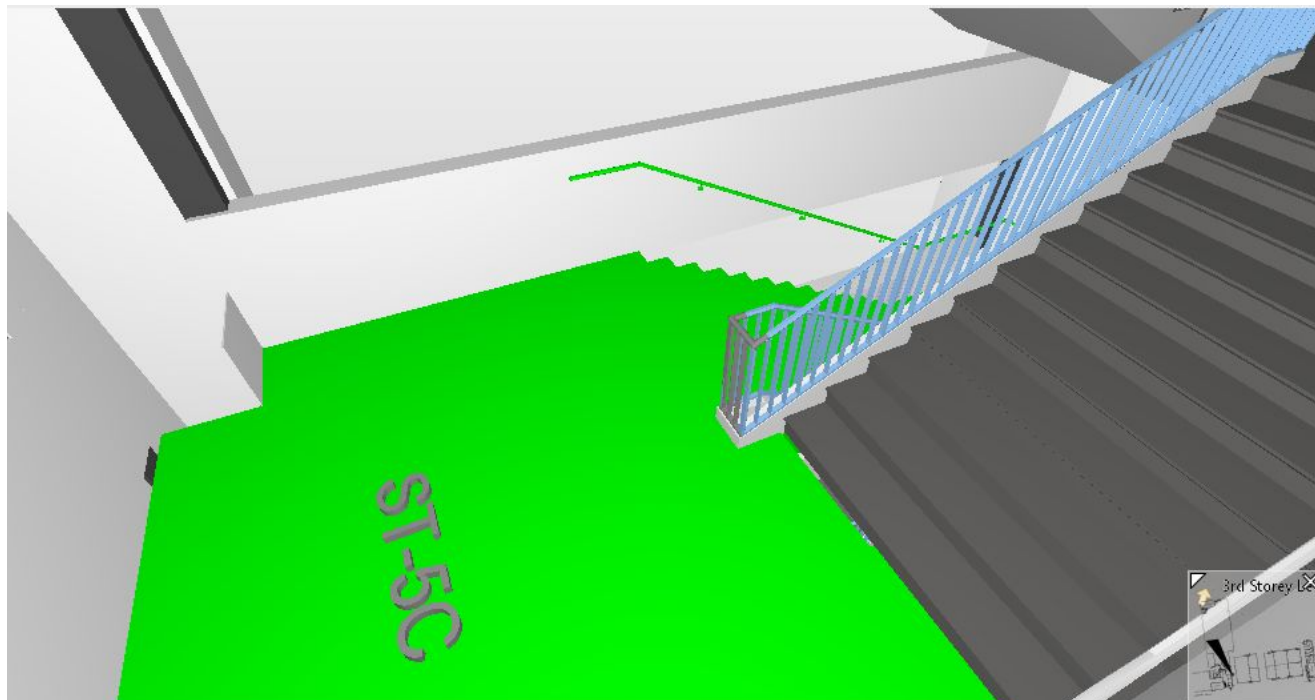
State of the art outside Estonia





Examples

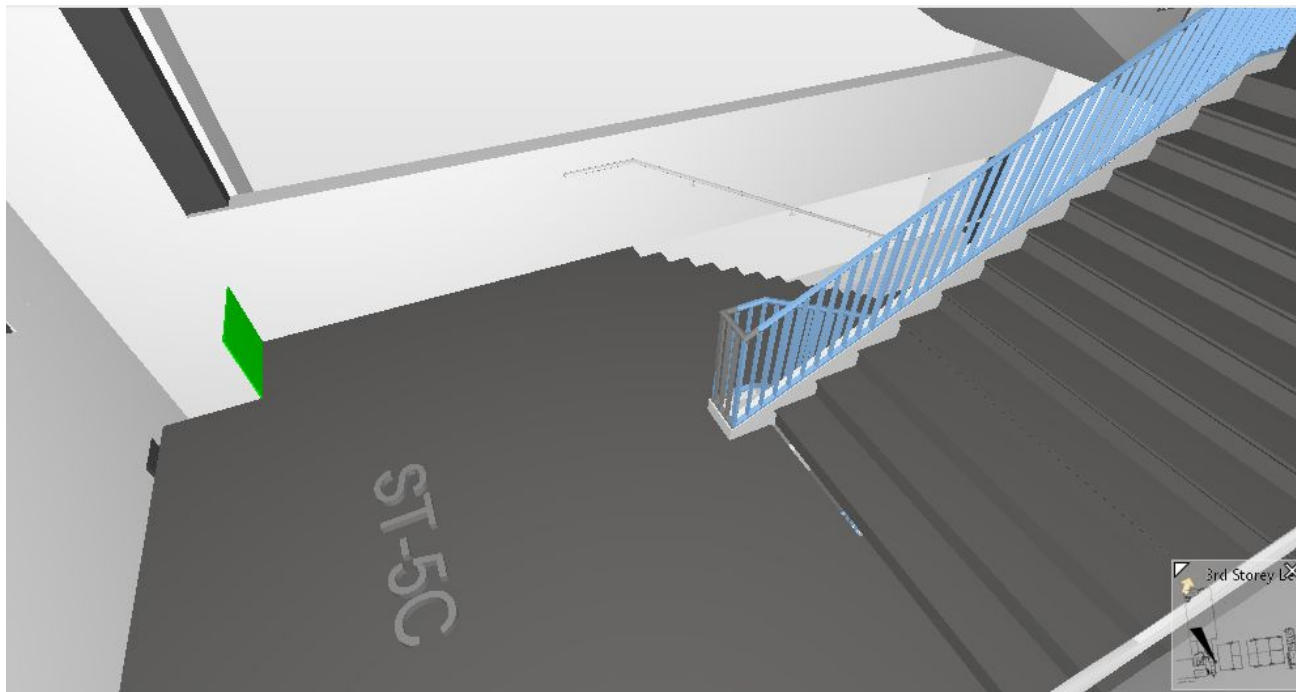
State of the art outside Estonia





Examples

State of the art outside Estonia





State of the art outside Estonia

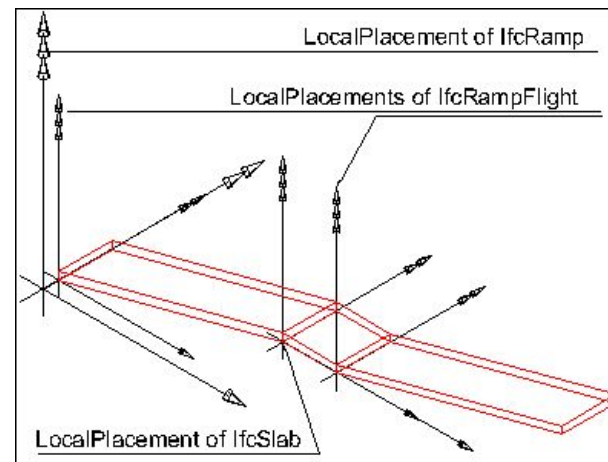
Examples

In IFC: ifcRamp

In Solibri: check ifcRamp

In practise: ifcProxy, IfcElement

So it will not be tested (false positive)





Type of checks

Type	Example of the check from the building decree	BIM Characteristics when solved Rule based
Analyses	Accessibility: "Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route"	Info not in a typical IFC/BIM model; check cannot be done with rule checking



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Entity based checks	Changes in level: "The barrier free access route must not have any sudden change in level. Ramps that mitigate level changes has to comply with a table"	Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)



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Multiple entities based check	Ventilation Ratio: The size of the window on the exterior facade of the building should be at least 5% of the size of the room space/ space it is ventilating	The model needs to have correct semantic relations between multiple objects in the datasets



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Simulation	Safety barriers: "Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided"	Info not in a typical IFC/BIM model; check cannot be done with rule checking; integrated approach (agents) is needed.



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Entity based checks	Changes in level: "The barrier free access route must not have any sudden change in level. Ramps that mitigate level changes has to comply with a table"	Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)
Multiple entities based check	Ventilation Ratio: The size of the window on the exterior facade of the building should be at least 5% of the size of the room space/ space it is ventilating	The model needs to have correct semantic relations between multiple objects in the datasets
Simulation	Safety barriers: "Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided"	Info not in a typical IFC/BIM model; check cannot be done with rule checking; integrated approach (agents) is needed.
Property based checks	"For every 10 car park lots provided, there should be at least 1 accessible car park lot provided for wheelchair users"	This is forcing the industry to add properties to IfcSpace objects to pass the check, while they would normally not add this information this way.



Summary

State of the art outside Estonia



Process digitization

Descriptive checking

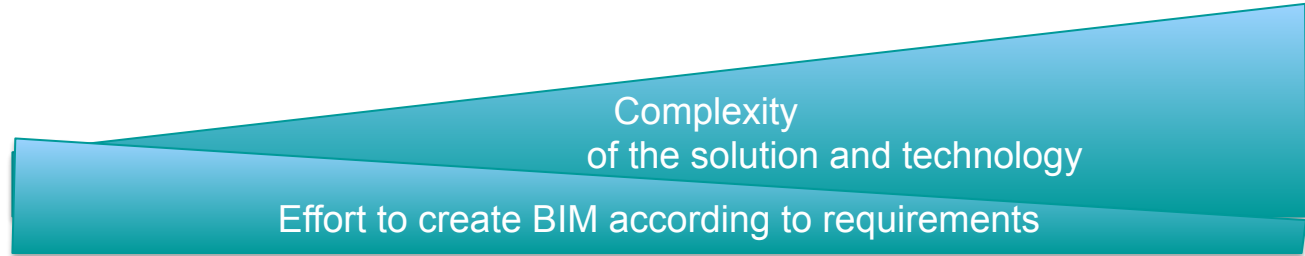
Computational (algorithm) checking

"AI"?



Summary

State of the art outside Estonia



Process digitization

Descriptive checking

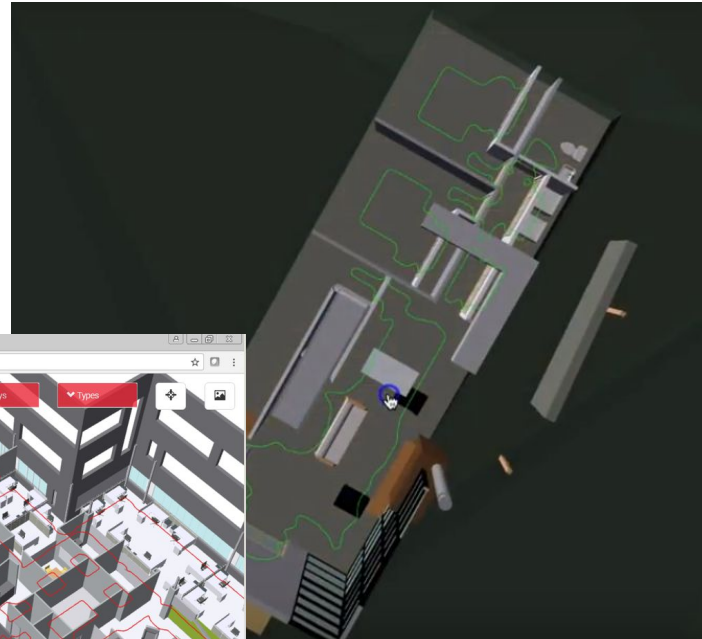
Computational (algorithm) checking

"AI"?



Singapore

State of the art outside Estonia



bimcodes
compliance checking

ADD PROJECT PROJECTS SETTINGS LOGOUT (THOMAS KRIPPEL)

Trapelo_Design_Intent / Headroom / Corridor clear width < 1/1 >
/ FLOOR 1 / HDR-0003

Code: HDR-0003

Message: Unreachable destination in circulation space

Status: **Error**

Relating building storey: FLOOR 1

Comments

15:33 Michael I don't think this is a really big problem
16:04 Michelle Yes I agree

Comment

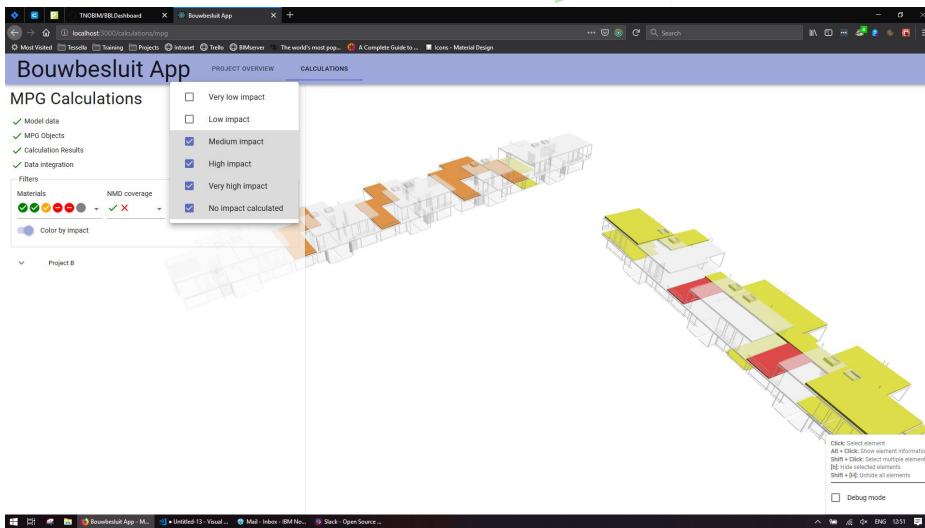
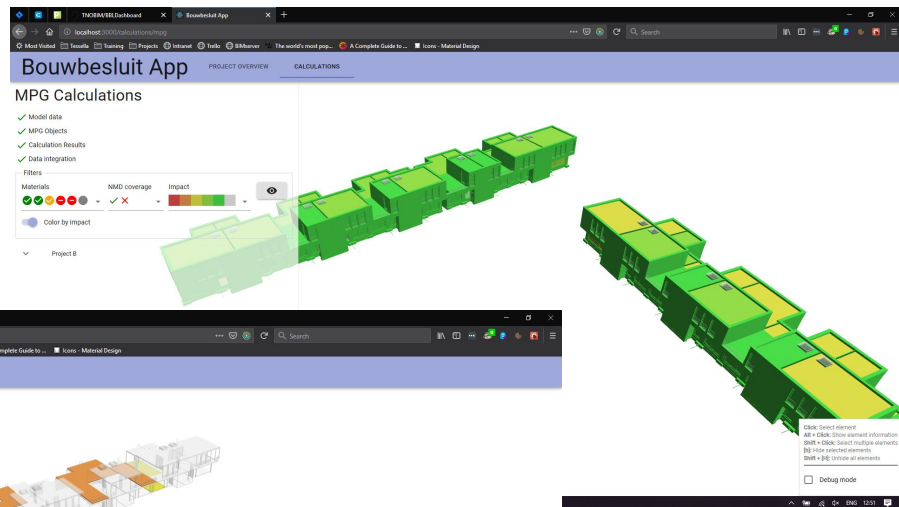
Waive

Waive



The Netherlands

State of the art outside Estonia

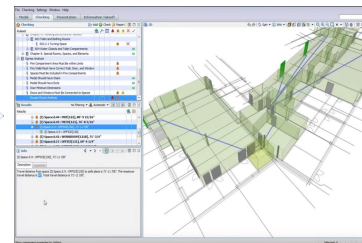
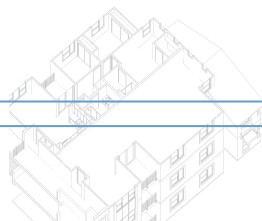




Goal: improve reliability and productivity

State of the art outside Estonia

Minimal requirements to the BIM dataset





Conclusions and recommendations

- Data standards
- Process implementation
- Technical approach
- Requirements for use of the prototype
- Reflection



Conclusions and recommendations

Data standards

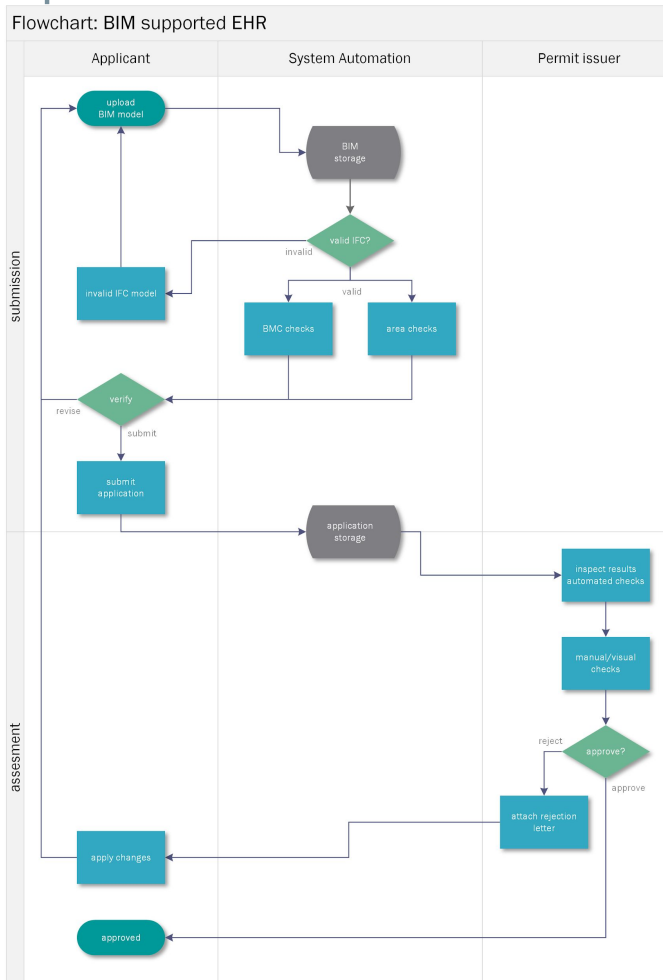
- IFC for buildings
- Future IFC for infrastructure
- CityGML for 3D city models
- ADE's for extensions of city models





Process implementation

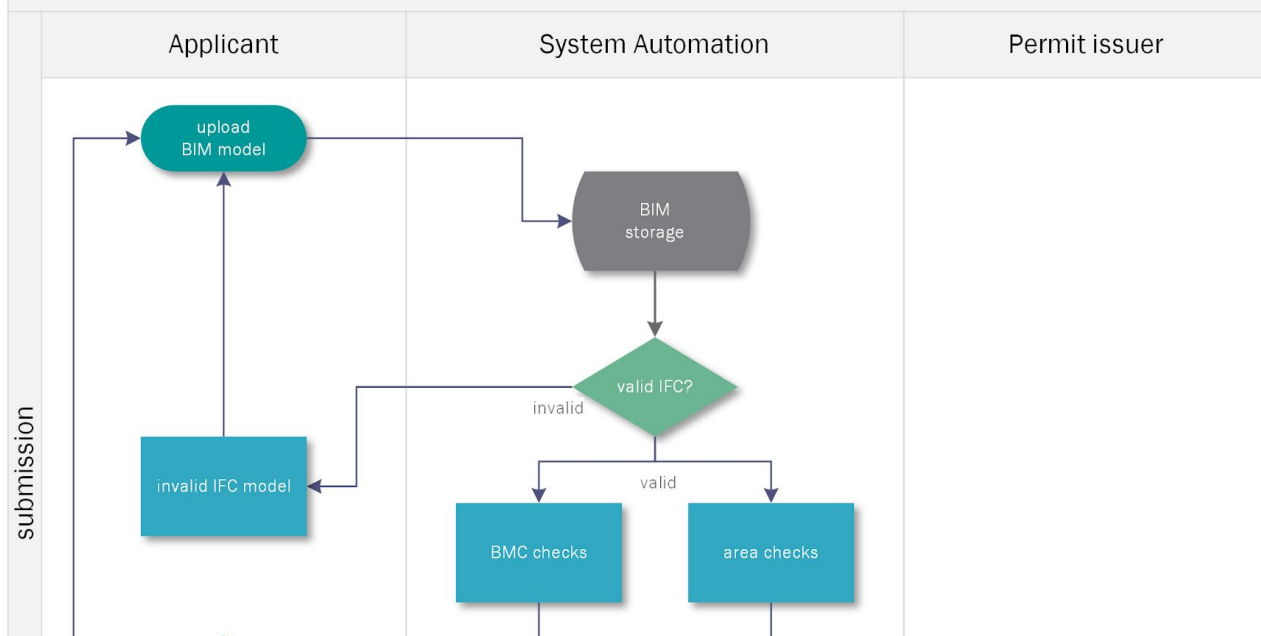
Conclusions and recommendations





Conclusions and recommendations

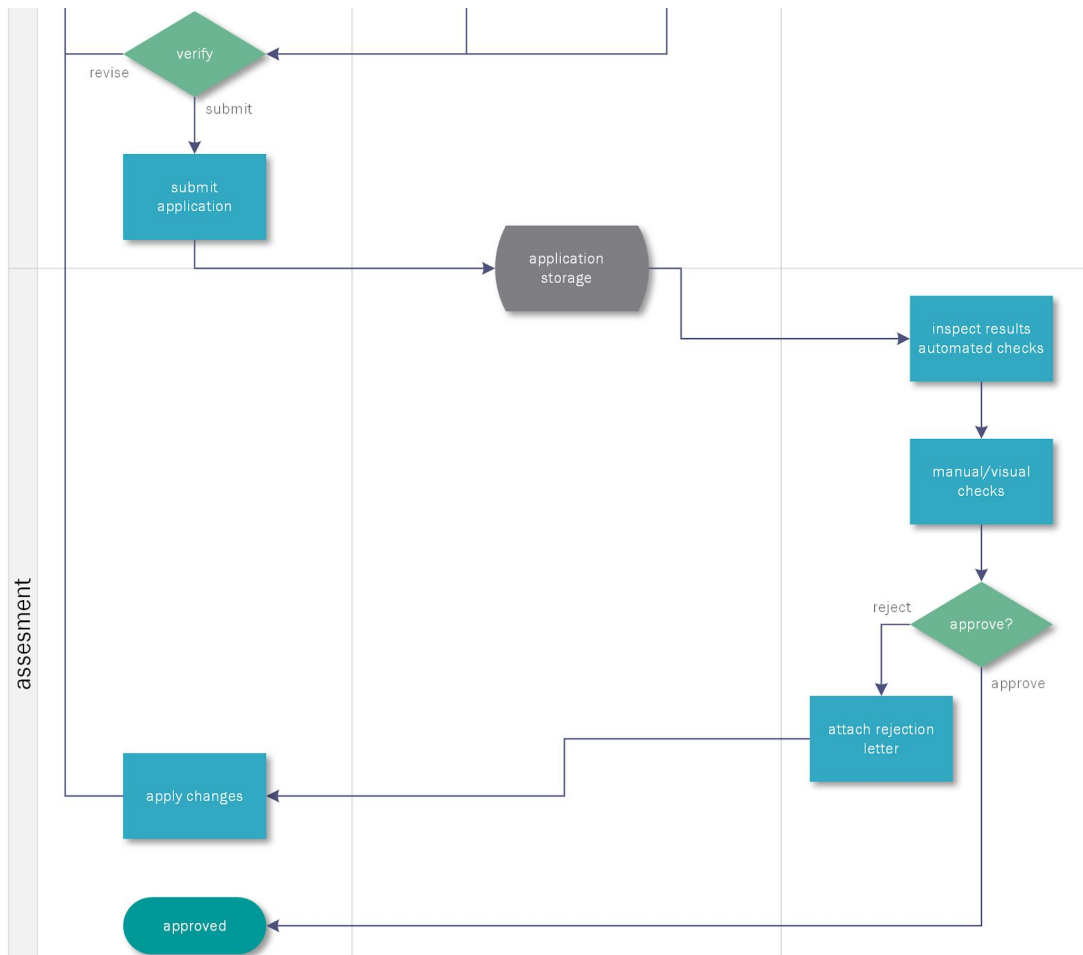
Flowchart: BIM supported EHR





Process implementation

Conclusions and recommendations





Requirements technical implementation

Conclusions and recommendations

- Web-based
- Easy interface
- Open standards
- Should work based on nominal Estonian IFC input



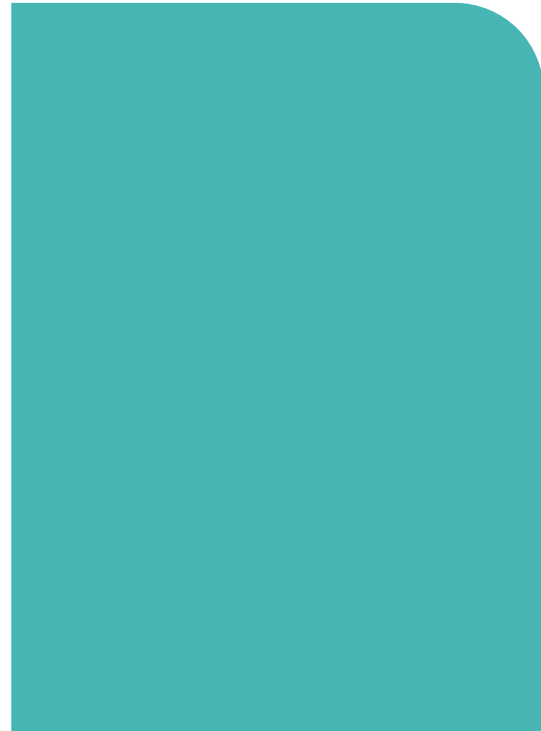
What kind of checks are most helpful?

Type	Building Decree?	Impact in Estonia?
Analyses	Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route	
Entity based checks	The barrier free access route must not have any sudden change in level. Ramps that mitigate level changes has to comply with a table	
Multiple entities based check	The size of the window on the exterior facade of the building should be at least 5% of the size of the room space/ space it is ventilating	
Simulation	Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided	
Property based checks	For every 10 car park lots provided, there should be at least 1 accessible car park lot for wheelchair users	Maybe something with the specific Estonian Property Sets?
Area checks	Check if design fits in zoning plan	
Anything else?	Something that saves a lot of time, or will ease a common issue...?	



Questions or comments

Let's check your input at the Mentimeter





Next steps

