Consultative stakeholder meeting
July 11, 2019
Tallinn, Estonia

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

see it. get it. do it.

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
Deliverable 4: Proof of concept solutions

Work-plan

Deliverable 1: Inception report
- Quickscan
- Interviews
- BIM checks
- SWOT-analysis
- Specify two processes
- Draft technical report
- Consultative stakeholder meeting

Deliverable 2: Technical report
- Design UX based on process flow from D2
- Build POC based on results from D2
- Drafts UX flows & POCs
- Consultative meeting + report on stakeholder consultations

Deliverable 3: UX interaction flows

Deliverable 4: Proof of concept solutions

Deliverable 5: Summary of support
- Testing period for Proof of Concepts
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
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
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
A state of BIM in Estonia
A state of BIM in Estonia
Conclusions
“A state of BIM in Estonia”

- High level leading group
- Large peloton
- Little laggers
- High level of IFC expertise
- All the necessary ingredients to unlock full potential of BIM-based checking
A state of BIM in Estonia

- 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 Talinn & Tartu
A state of BIM in Estonia

- 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
State of the art outside Estonia

Rule checking vs compliance checking

- Preparation of the Building Model Data
- Translation of the Rules in a Machine-Readable Language
- Execution of the Checking Process
- Preparation and Representation of the Checking Results
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
State of the art outside Estonia

1. All railings must be classified as railing in the 3D model (Archicad).
2. All the stairs in a dwelling to reach encircled spaces meant for people to stay, (Verblijfruimte), such as a bed room, a living room, kitchen, office, bath room or toilet, must be classified as such.
   IFC Property: "BB2012": "Trappen 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 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": "Bergriemte" as TRUE.
9. Floors, 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.

3. 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.

4. Every dwelling must have at least one living space with a free rectangle with a width of 9 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 space is missing.

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

6. 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.
State of the art outside Estonia

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

Value $0R$ of wall $x$ does not meet requirement $R_c > x$. 

Consultative stakeholder meeting July 11, 2019, Tallinn
State of the art outside Estonia

Examples
State of the art outside Estonia
State of the art outside Estonia

Examples
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

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

---

**Consultative stakeholder meeting July 11 2019, Tallinn**

**Type of checks**

<table>
<thead>
<tr>
<th>Analyses</th>
<th>Example of the check from the building decree</th>
<th>BIM Characteristics when solved Rule based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyses</td>
<td>Accessibility: “Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking</td>
</tr>
</tbody>
</table>
# Type of checks

<table>
<thead>
<tr>
<th>Type</th>
<th>Example of the check from the building decree</th>
<th>BIM Characteristics when solved Rule based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyses</td>
<td>Accessibility: “Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking</td>
</tr>
<tr>
<td>Entity based checks</td>
<td>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”</td>
<td>Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)</td>
</tr>
</tbody>
</table>
# Type of checks

<table>
<thead>
<tr>
<th>Type</th>
<th>Example of the check from the building decree</th>
<th>BIM Characteristics when solved Rule based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyses</td>
<td>Accessibility: “Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking</td>
</tr>
<tr>
<td>Entity based checks</td>
<td>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”</td>
<td>Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)</td>
</tr>
<tr>
<td>Multiple entities based check</td>
<td>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</td>
<td>The model needs to have correct semantic relations between multiple objects in the datasets</td>
</tr>
<tr>
<td>Type</td>
<td>Example of the check from the building decree</td>
<td>BIM Characteristics when solved Rule based</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Analyses</td>
<td>Accessibility: “Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking</td>
</tr>
<tr>
<td>Entity based checks</td>
<td>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”</td>
<td>Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)</td>
</tr>
<tr>
<td>Multiple entities based check</td>
<td>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</td>
<td>The model needs to have correct semantic relations between multiple objects in the datasets</td>
</tr>
<tr>
<td>Simulation</td>
<td>Safety barriers: “Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking; integrated approach (agents) is needed.</td>
</tr>
<tr>
<td>Type</td>
<td>Example of the check from the building decree</td>
<td>BIM Characteristics when solved Rule based</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Analyses</td>
<td>Accessibility: “Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking</td>
</tr>
<tr>
<td>Entity based checks</td>
<td>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”</td>
<td>Not following Modelling guidelines will create a false positive result. (Using IfcProxyElement instead of IfcRamp)</td>
</tr>
<tr>
<td>Multiple entities based check</td>
<td>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</td>
<td>The model needs to have correct semantic relations between multiple objects in the datasets</td>
</tr>
<tr>
<td>Simulation</td>
<td>Safety barriers: “Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided”</td>
<td>Info not in a typical IFC/BIM model; check cannot be done with rule checking; integrated approach (agents) is needed.</td>
</tr>
<tr>
<td>Property based checks</td>
<td>“For every 10 car park lots provided, there should be at least 1 accessible car park lot provided for wheelchair users”</td>
<td>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.</td>
</tr>
</tbody>
</table>
## State of the art outside Estonia

### Summary

<table>
<thead>
<tr>
<th>Process digitization</th>
<th>Descriptive checking</th>
<th>Computational (algorithm) checking</th>
<th>“AI”?</th>
</tr>
</thead>
</table>

Effort to create BIM according to requirements
State of the art outside Estonia

Summary

Complexity of the solution and technology
Effort to create BIM according to requirements

Process digitization
Descriptive checking
Computational (algorithm) checking
“AI”?
State of the art outside Estonia
State of the art outside Estonia

The Netherlands
State of the art outside Estonia

Goal: improve reliability and productivity

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
Conclusions and recommendations
Conclusions and recommendations
Conclusions and recommendations

Process implementation

- Submit application
- Application storage
- Inspect results automated checks
- Manual/visual checks
- Approve?
- Reject
- Attach rejection letter
- Accept changes
- Approved
Conclusions and recommendations

- Web-based
- Easy interface
- Open standards
- Should work based on nominal Estonian IFC input
<table>
<thead>
<tr>
<th>Type</th>
<th>Building Decree?</th>
<th>Impact in Estonia?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyses</td>
<td>Minimum headroom of 2m along circulation routes and minimum corridor clear width of 1.5m for barrier free access route</td>
<td></td>
</tr>
<tr>
<td>Entity based checks</td>
<td>The barrier free access route must not have any sudden change in level. Ramps that mitigate level changes has to comply with a table</td>
<td></td>
</tr>
<tr>
<td>Multiple entities based check</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Simulation</td>
<td>Where there is a drop of more than 1m, a safety barrier with a minimum height of 1.0m should be provided</td>
<td></td>
</tr>
<tr>
<td>Property based checks</td>
<td>For every 10 car park lots provided, there should be at least 1 accessible car park lot for wheelchair users</td>
<td>Maybe something with the specific Estonian Property Sets?</td>
</tr>
<tr>
<td>Area checks</td>
<td>Check if design fits in zoning plan</td>
<td></td>
</tr>
<tr>
<td>Anything else?</td>
<td>Something that saves a lot of time, or will ease a common issue…?</td>
<td></td>
</tr>
</tbody>
</table>
Questions or comments

Let's check your input at the Mentimeter
Next steps

Official start
Kick off meeting

**Deliverable 1: Inception report**
Quickscan
Interviews
BIM checks
SWOT-analysis
Specify two processes
Draft technical report
Consultative stakeholder meeting

**Deliverable 2: Technical report**
Design UX based on process flow from D2
Build POC based on results from D2
Drafts UX flows & POCs
Consultative meeting + report on stakeholder consultations

**Deliverable 3: UX interaction flows**

**Deliverable 4: Proof of concept solutions**

**Deliverable 5: Summary of support**
Testing period for Proof of Concepts