

# AUTOMATED CODE-CHECKING OF BIM MODELS

ACKNOWLEDGEMENTS



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INTRODUCTION

BIM TECHNOLOGY

AUTOMATED CODE-CHECKING

WORKFLOWS & CASE STUDIES

## ABSTRACT

In countries such as China, building codes are checked manually during the building design and legal-drawings checking phase. While manual checking process always leads to ambiguity, inconsistency in assessments and delays the construction process as a whole.

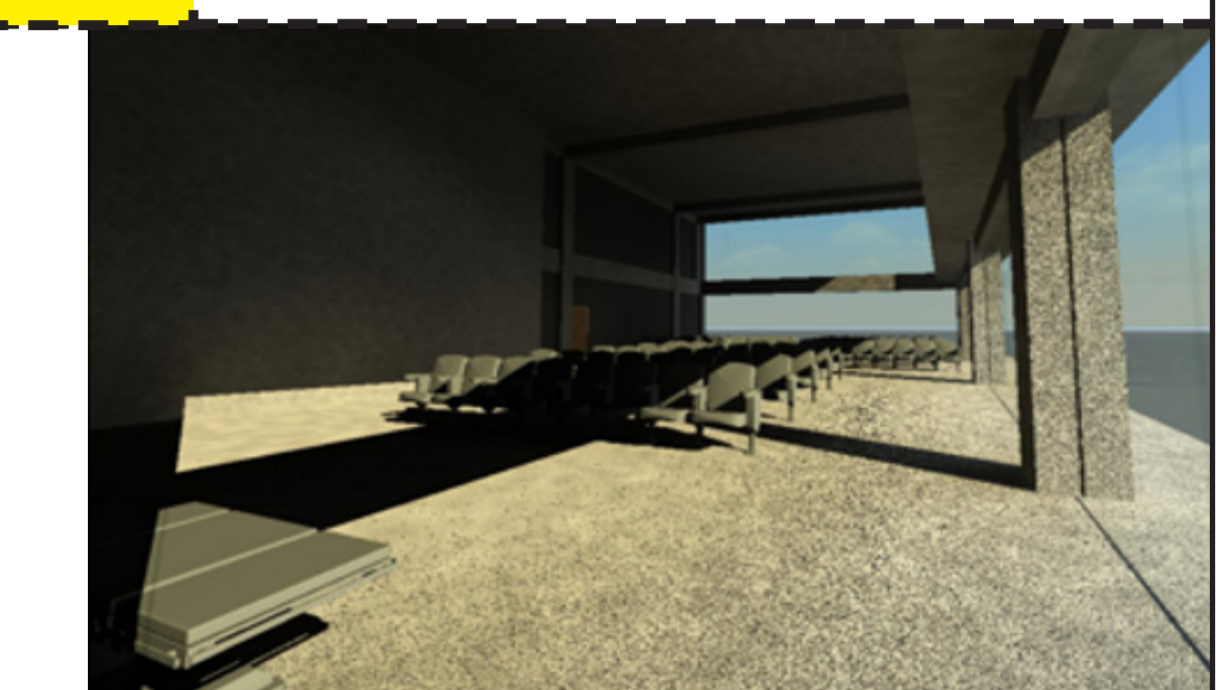
With the development of Building Information Modeling (BIM) technology, the automated compliance checking systems for building codes becomes achievable.

Based on reviewing of BIM implementation, especially current efforts and initiatives on automated code-checking process, a code-checking procedure is proposed. It combines the currently model checker with the host application and model. After researching and testing, the workflow is designed to make a link between the checking process and the model modification one. In addition, case study from prototyping is to test the process.

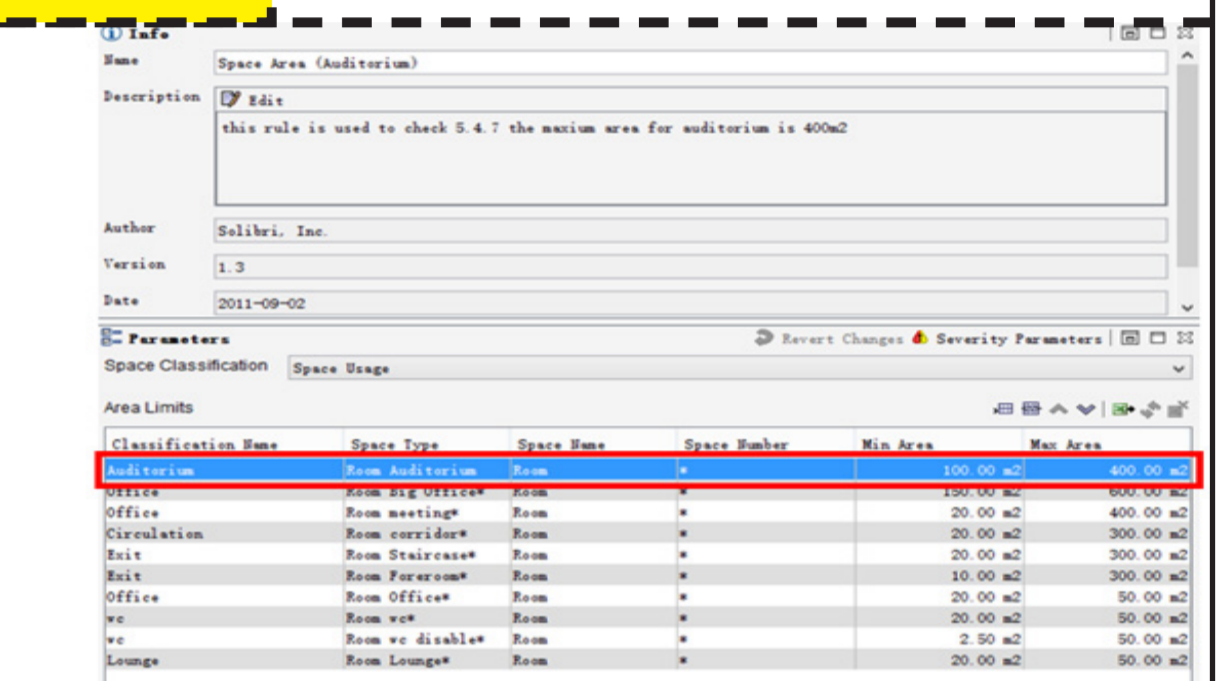
## CONCLUSION

Apply international model checking, Solibri, to Chinese project for checking Chinese building regulations;  
Build a workflow to combine the BIM modeling software and model checker application, to complete the process from model development, to code checking to model update;  
Case studies using a Chinese high-rise office building have been developed to present the workflow in practice;  
Contribute to accelerate BIM implementation in an earlier stage;  
Stimulate more seamless and lossless interoperability.

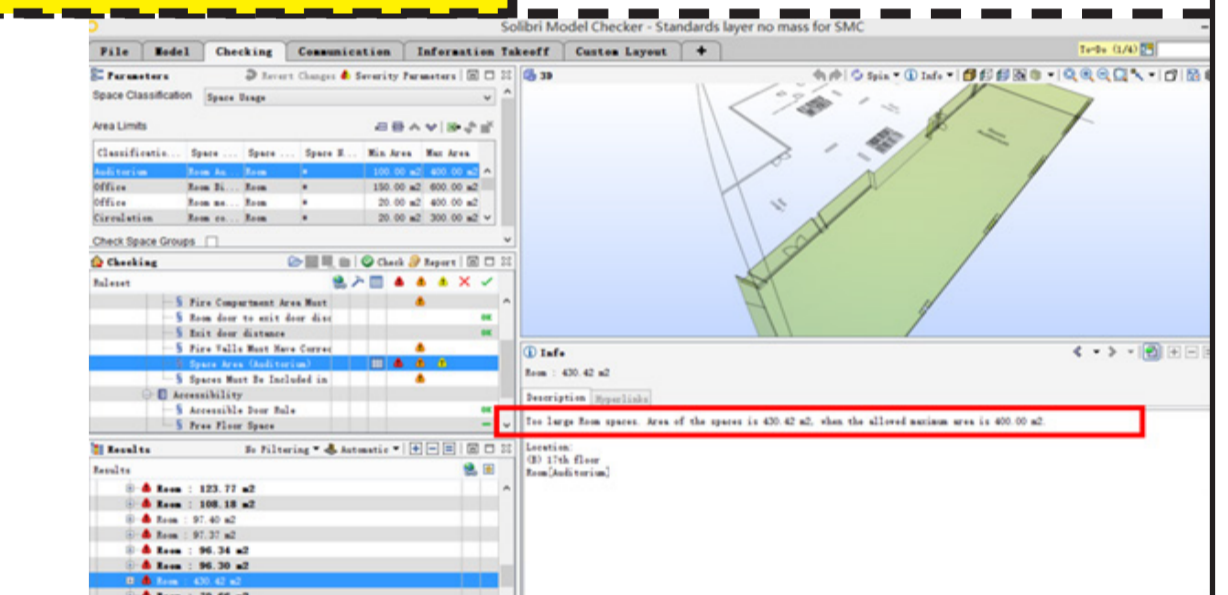
## MODEL DEVELOPMENT



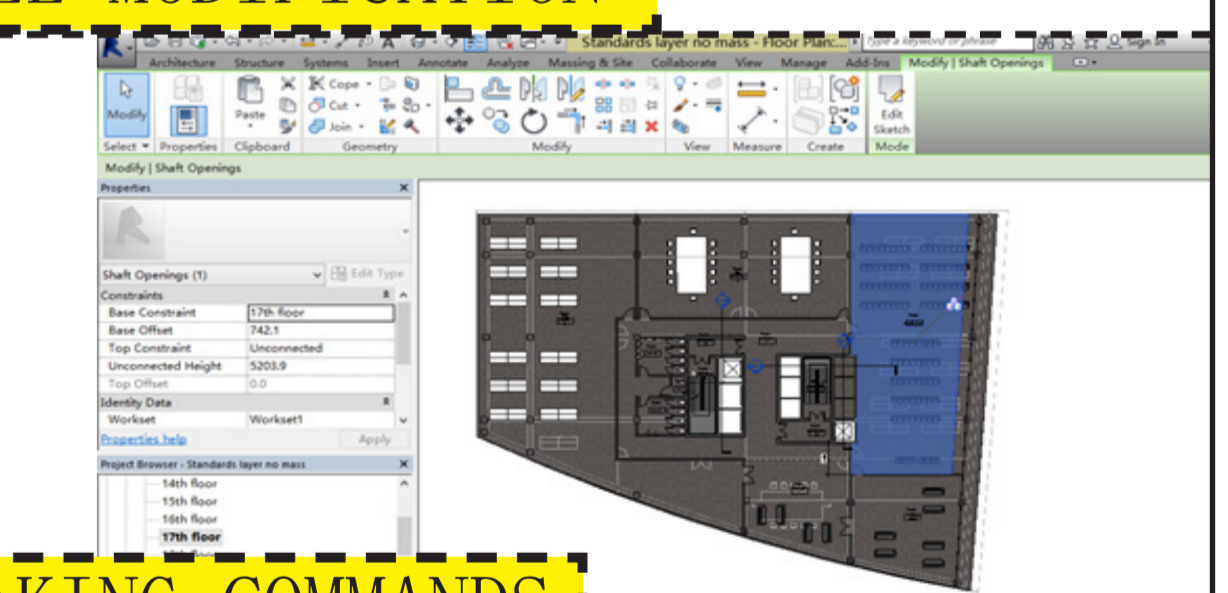
## RULE INTERPRETATION



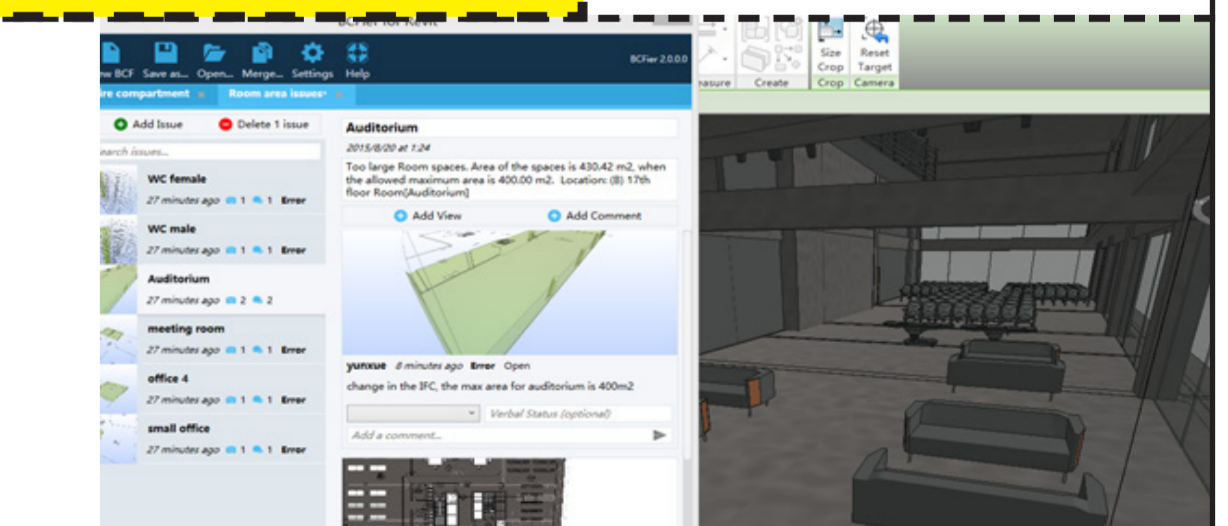
## RULE AUTOMATED CHECKING



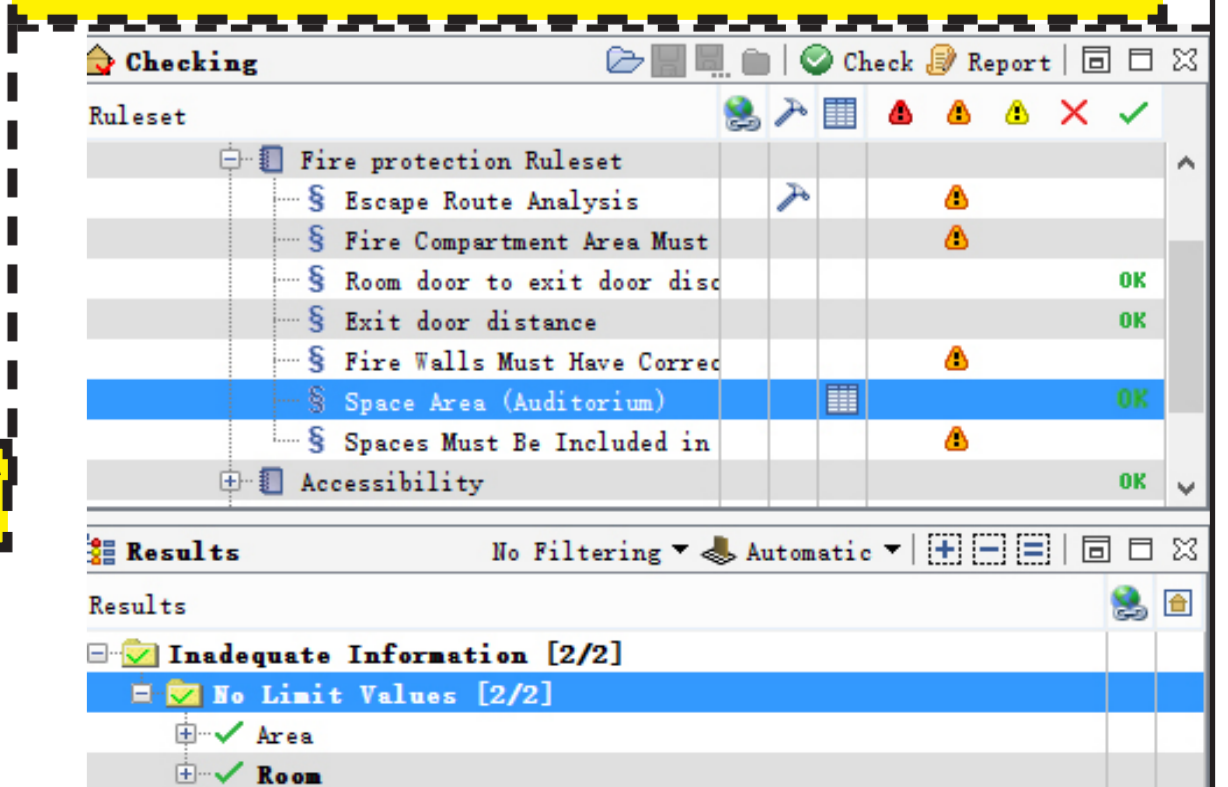
## MODEL MODIFICATION



## MAKING COMMANDS

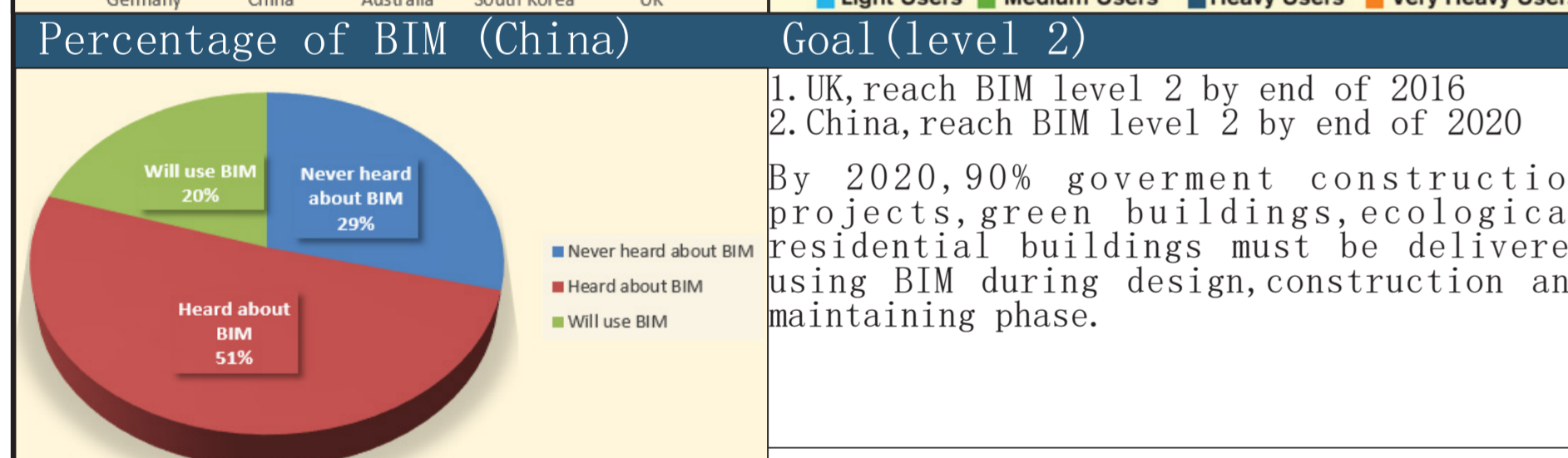
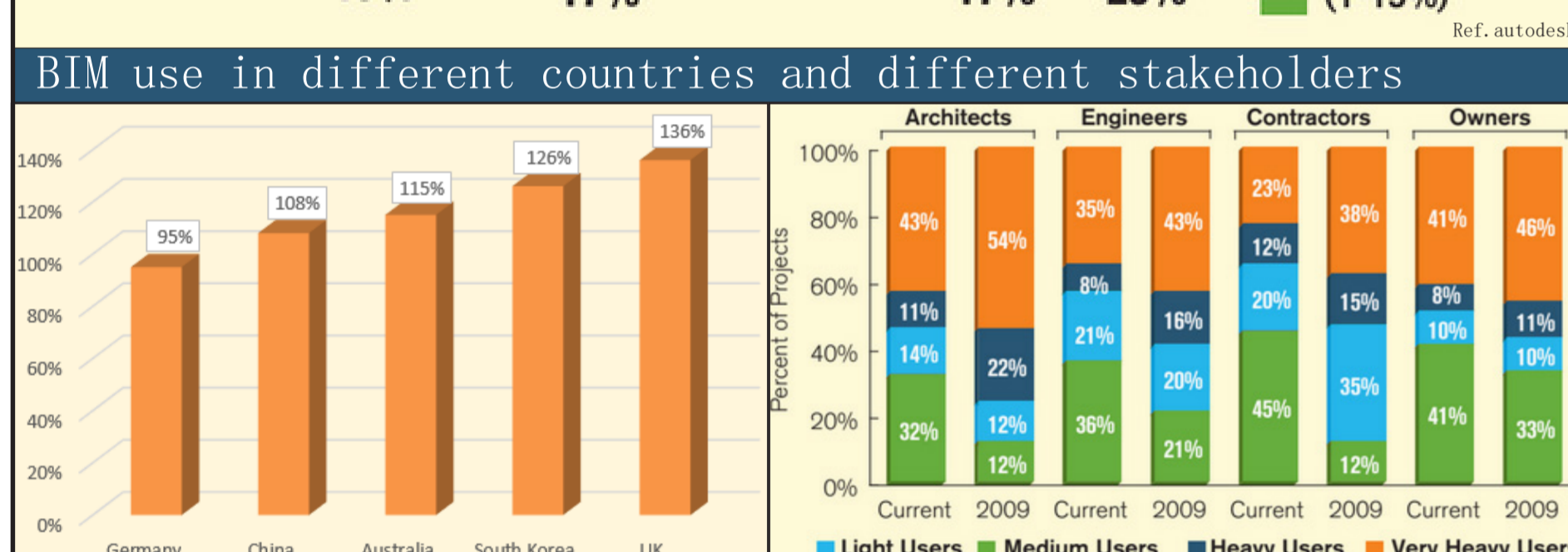
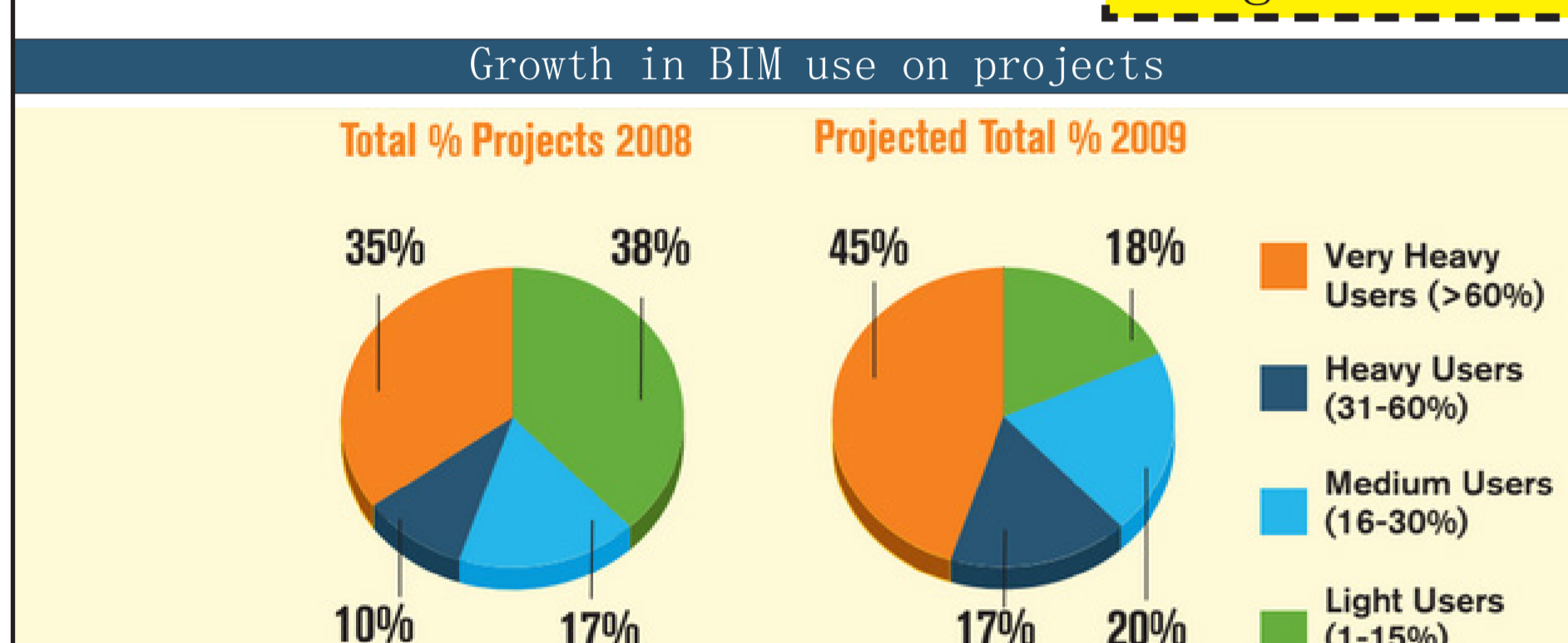


## MODIFICATION and RECHECKING



## BACKGROUND

### Urge for BIM



## Regulation checking

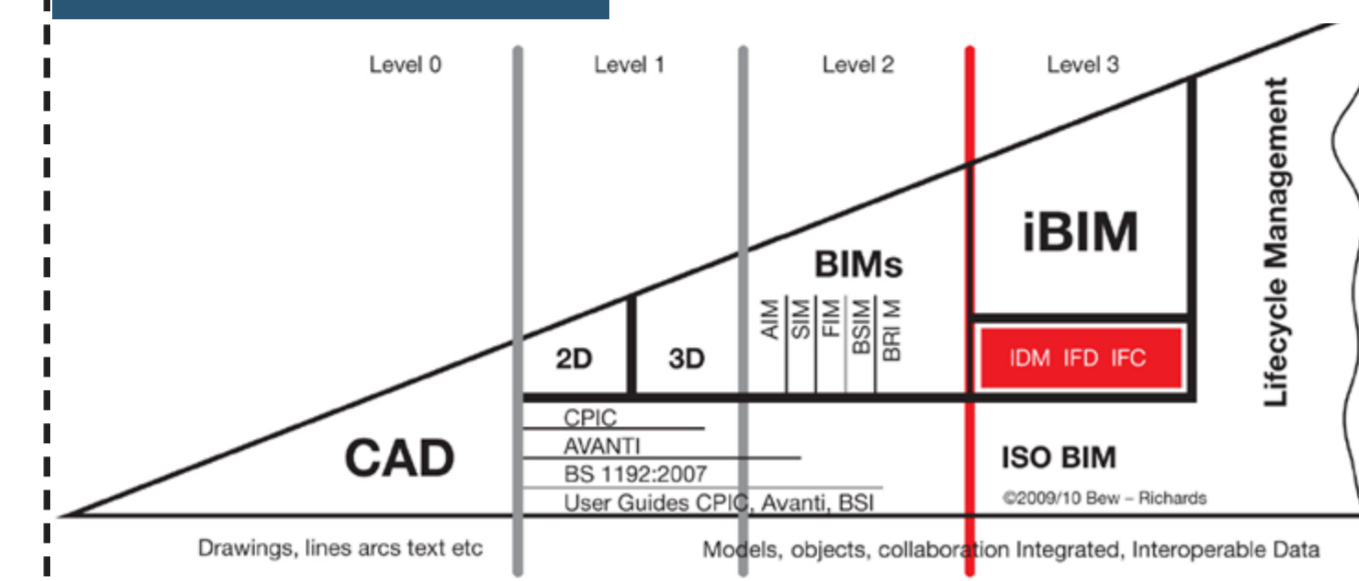
Current Regulation checking situation  
Compulsory phase to checking the building codes before carrying out any work on site.



## METHODOLOGY

- Review of BIM implementation and current development of automatic code-checking system;
- Review of a survey about BIM implementation situation in China;
- Workflow proposal to combine both of the automated code-checking process and of model modification one;
- Original case studies to test the workflow.

## BIM LEVEL



The Bew-Richards maturity model (NBS, 2013)

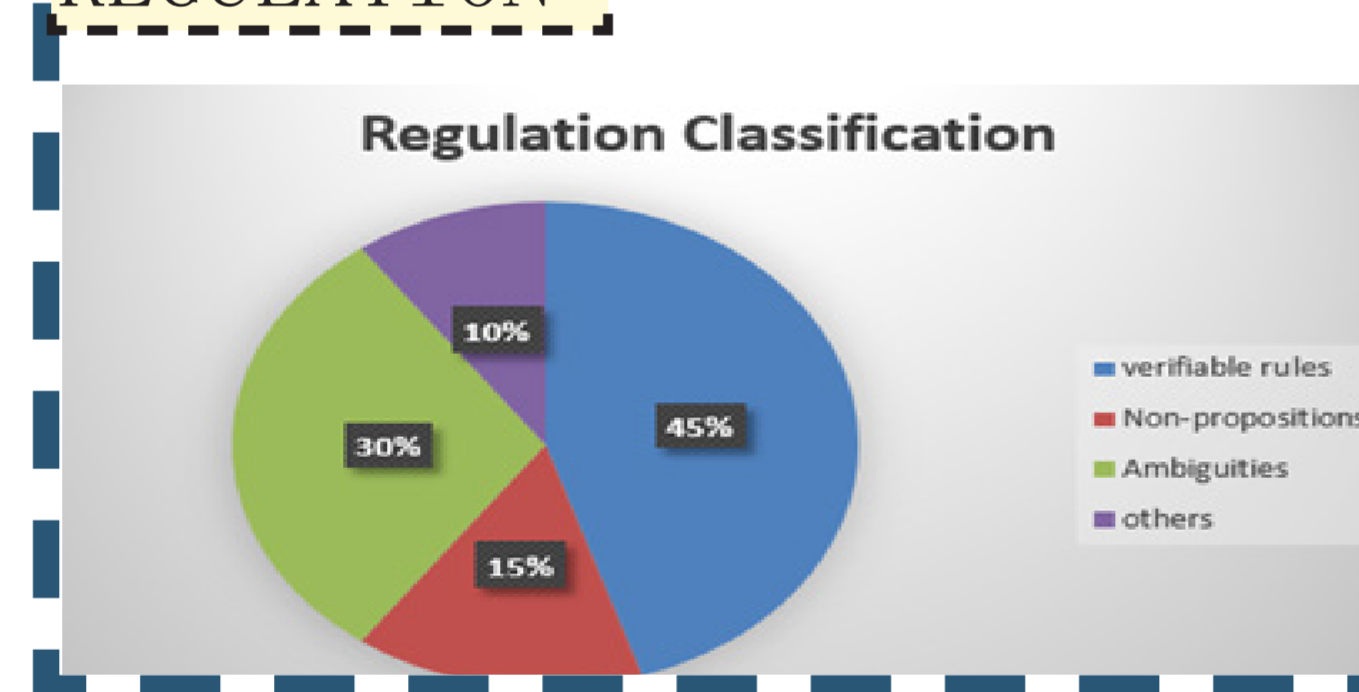
LEVEL 0 NO COLLABORATION  
a paper-based process with CAD drawings

LEVEL 1 MIXTURE OUTPUT  
CAD for 2D drawing; Sketchup, 3Dmax, Rhino for model

LEVEL 2 COLLABORATIVE WORKING  
BIM tools for 3D visualization; a common file format for data sharing, storage, update etc.

LEVEL 3 INTEGRATED WORKING  
Single shared project model

## REGULATION

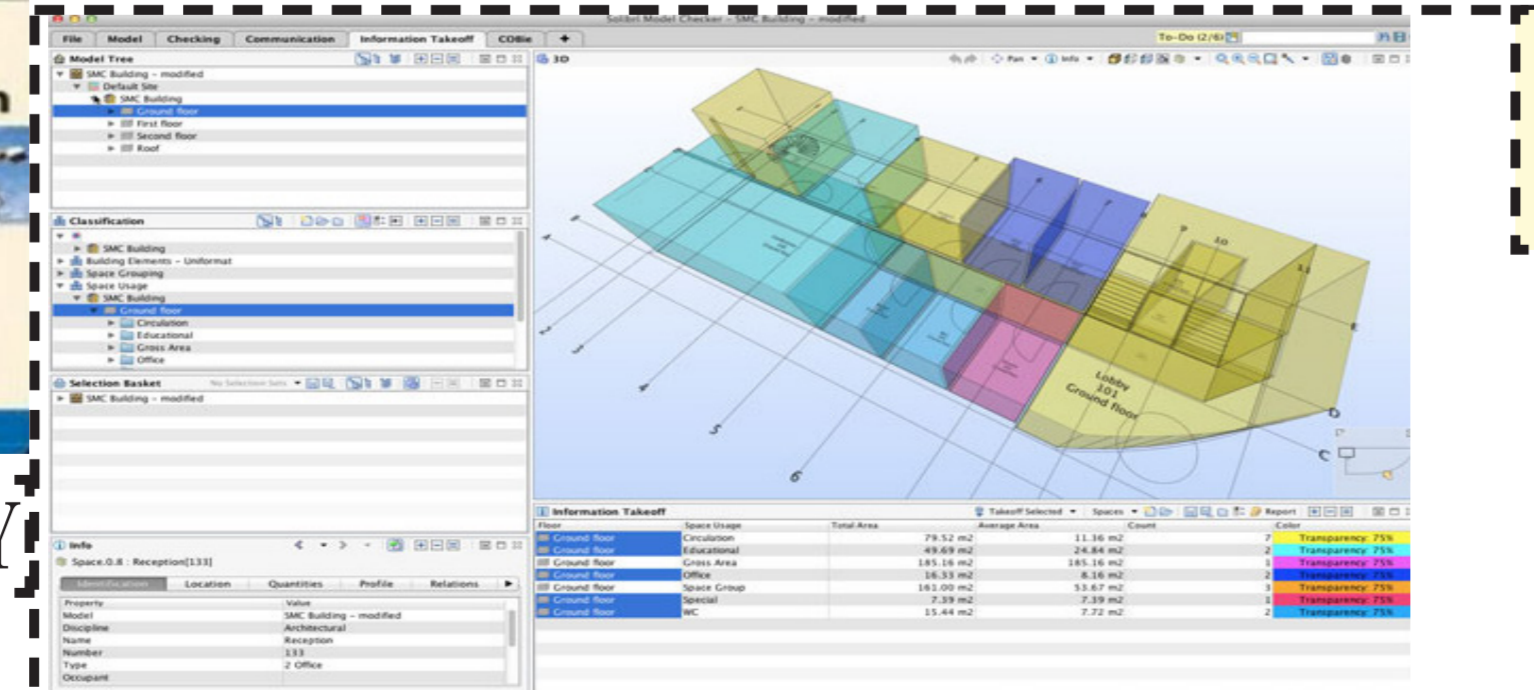


## WORKFLOW 1 CONCEPTUAL PHASE CODE CHECKING

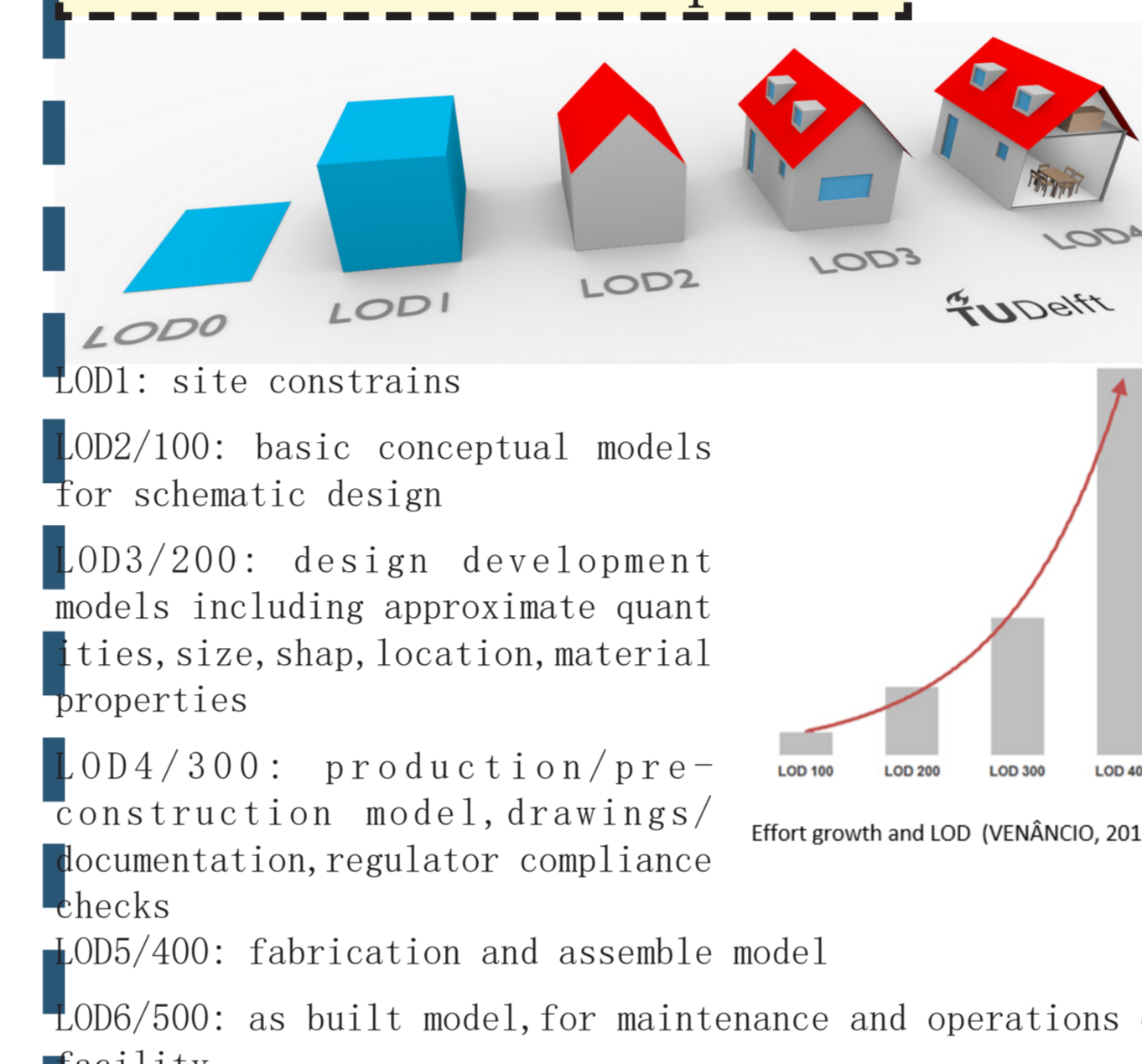
both designers could be same one, or the second designer can be someone else in the team, who is in charge of model checking. Increase interoperability between different software.

## WORKFLOW 2 LEGAL PHASE CODE CHECKING

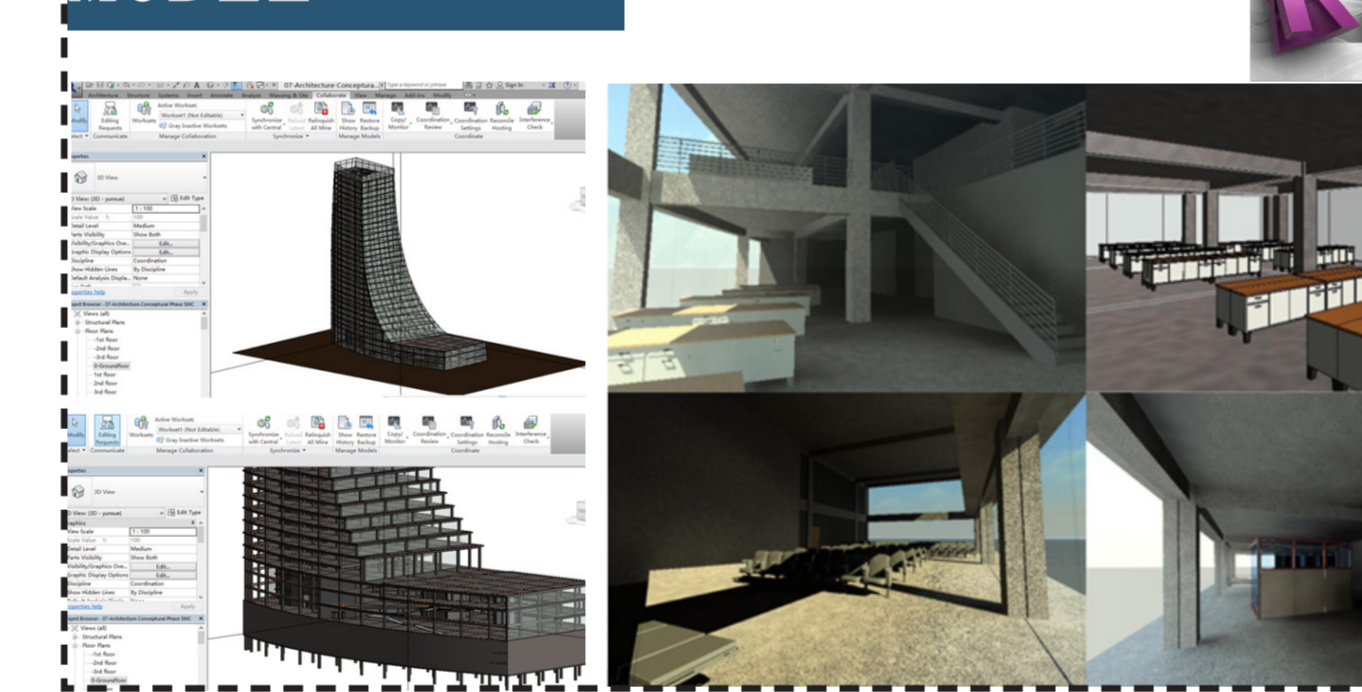
between design department and regulatory agency. It is compulsory process to check the building codes before construction on site. Increase interoperability between different stakeholders.



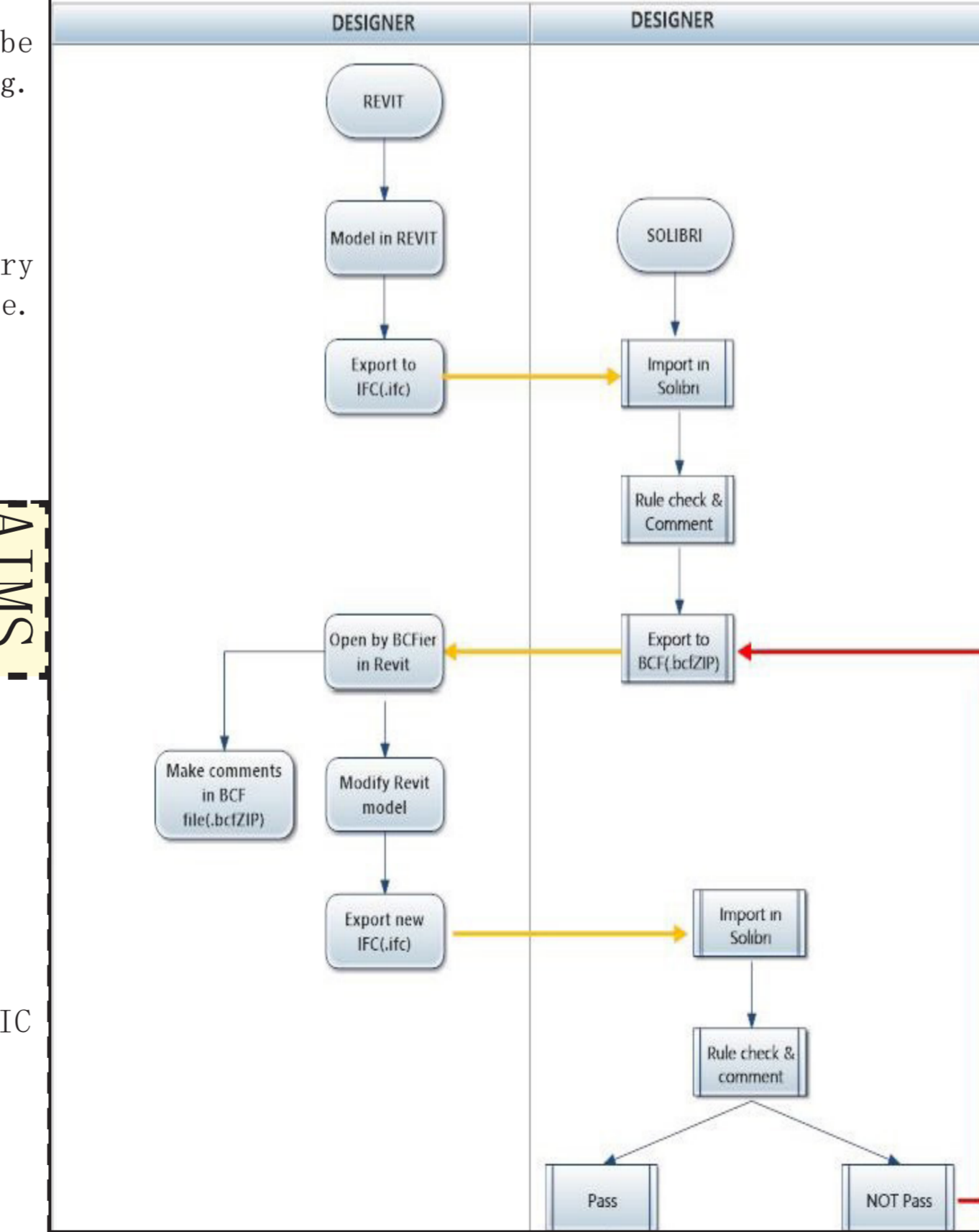
## Level Of Development



## MODEL



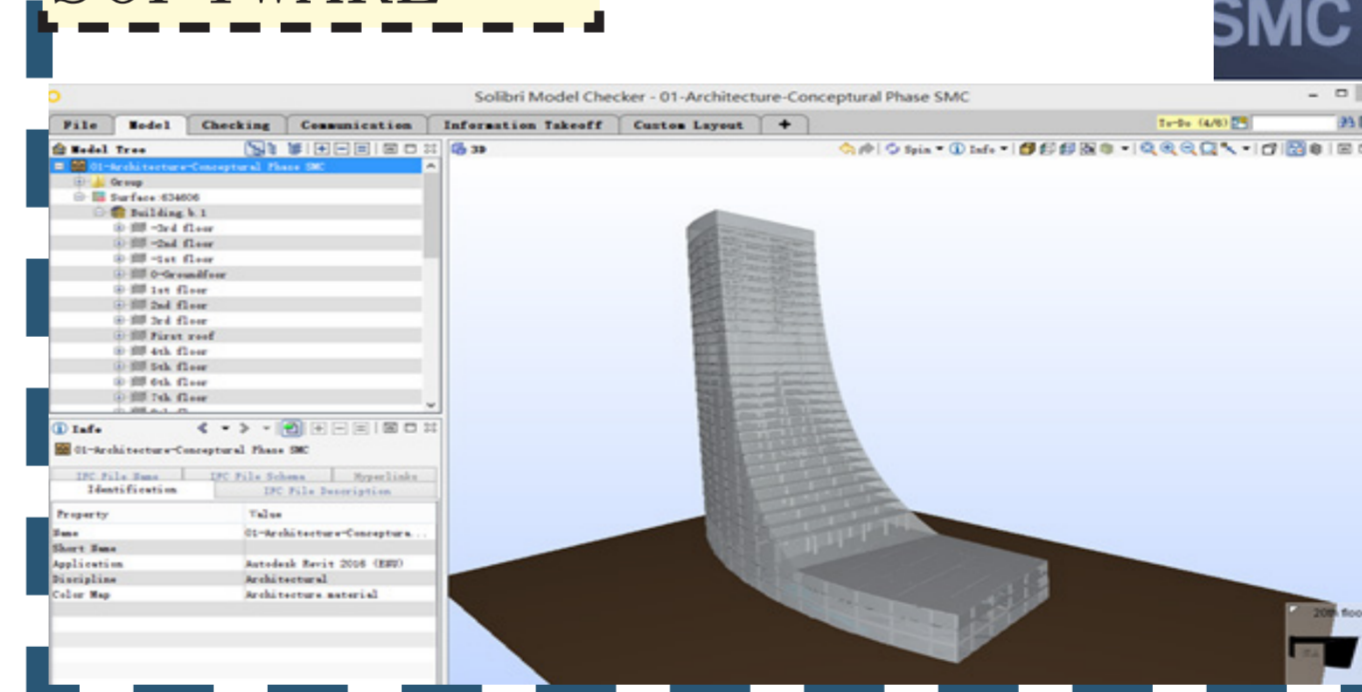
## CONCEPTUAL PHASE CHECKING



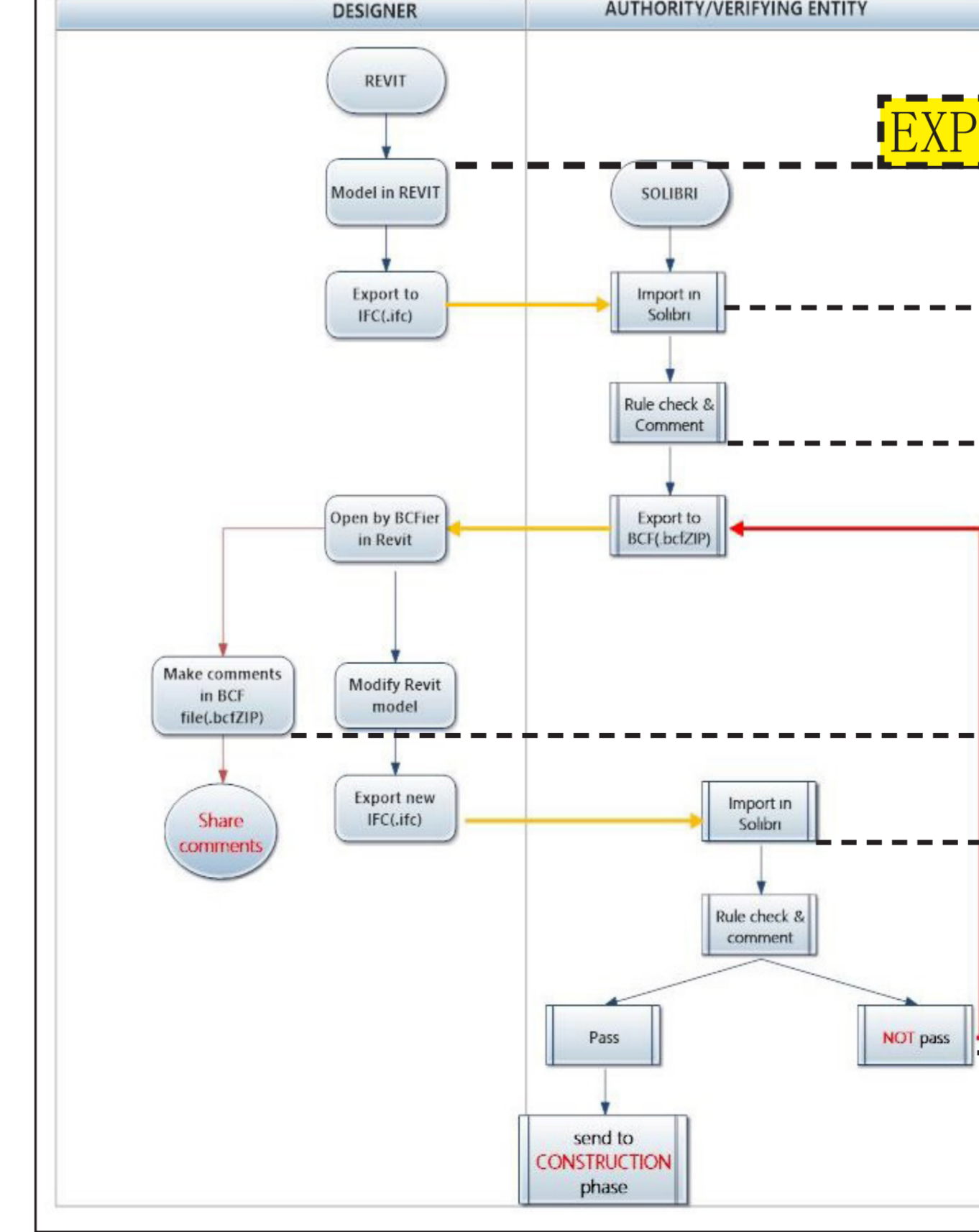
## MODELING RULES



## SOFTWARE



## LEGAL PHASE CHECKING



AIMS

- To transfer MANUALLY paper-written code checking to AUTOMATIC digital one
- Applying to Chinese building
- To combine code checking to model modification

EXPORT .ifc IN REVIT

IMPORT .ifc IN SMC

ISSUE IN SMC

BCF FILE IN REVIT

BCF FILE IN SMC

SAVE AS BCF