

BIM-Tool: Modeling and Reasoning Support for Strategic Business Models

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Abstract. The BIM-Tool provides graphical modeling and analysis support for the Business Intelligence Model (BIM). BIM-Tool is a standalone application built on top of Eclipse. The tool supports two kinds of automated reasoning: (1) bottom-up “what-if” analysis: given input labels about some elements of a BIM model (for example, success/failure for leaf goals), do these propagate to other elements in the model?; and (2) top-down “is it possible?” analysis: is there a plan that leads to the satisfaction of goals, occurrence/non-occurrence of situations? BIM-Tool answers these questions through an encoding of BIM models in disjunctive datalog programs.

1 The Business Intelligence Model

The *Business Intelligence Model* (BIM) [1,2] is a goal-oriented language for modeling organizational strategies. BIM relies on a set of modeling primitives that decision makers are familiar with, such as goal, task/process, indicator, situation, and influence relations among them. BIM is intended to support the notions from SWOT (*Strengths, Weaknesses, Opportunities, Threats*) analysis by modeling the internal and external factors (situations) that are (un)favorable for fulfilling strategic business goals.

Some of the primitives of BIM (goals, tasks, refinement) are adopted from *i**. Unlike *i**, BIM does not support strategic dependencies, for BIM focuses on the high-level strategic goals of the organization, and does not ascribe goals to specific actors. BIM does not distinguish between hard- and soft-goals; rather, it includes measurable indicators that determine the degree of satisfaction of goals.

BIM is endowed with a formal semantics [3] that enables a variety of automatic reasoning techniques [2]: (i) goal analysis (both top-down and bottom-up), (ii) probabilistic evaluation of strategies, and (iii) reasoning with composite and qualitative indicators.

2 BIM-Tool

The BIM-Tool aims to provide a comprehensive graphical modeling and analysis support for BIM. BIM-Tool is a standalone Rich Client Platform application built on top of Eclipse that exploits the Eclipse Graphical Modeling Project (GMP) framework ¹

¹ <http://www.eclipse.org/modeling/gmp/?project=gmf-tooling>

for metamodel-based development of graphical modeling environments. The analysis procedures are implemented through an encoding in disjunctive datalog programs.

The main features of BIM-Tool are as follows:

- Creating graphical models using the latest version of BIM [2]. The models are checked for syntactic validity while the elements and links are drawn, through the evaluation of OCL constraints.
- Automated reasoning about “what-if” scenarios using the bottom-up algorithms described in [3]. Given evidence (labels) about the satisfaction, denial, and pursuit of BIM elements (goals, situation, indicators, domain assumptions), our analysis propagates the input evidence through refinement and influence relationships in the model. The output is shown in a window at the bottom of the application.

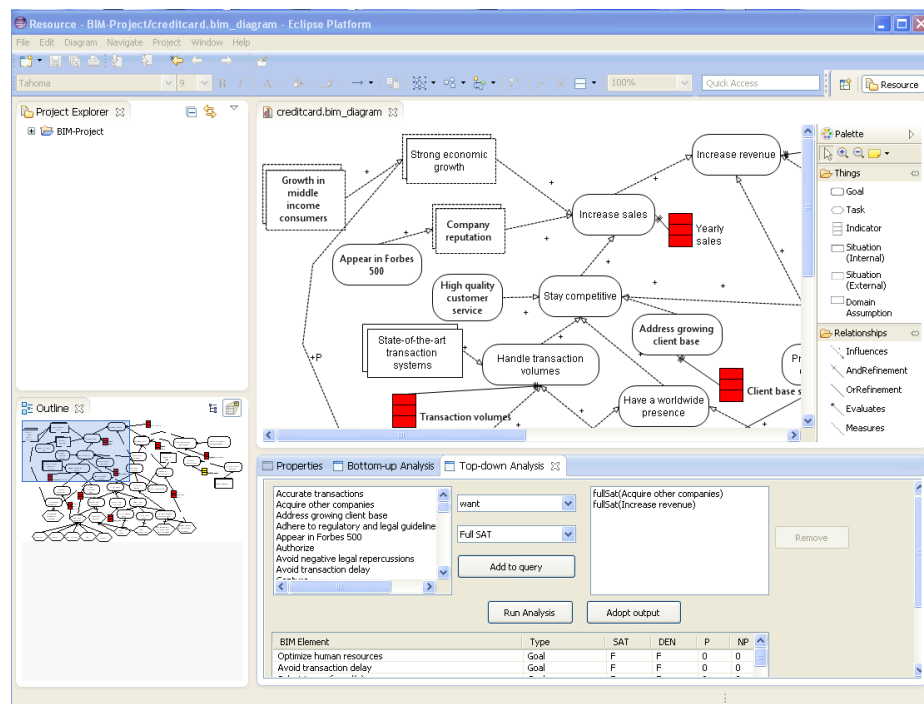


Fig. 1. BIM-Tool screenshot: running a top-down “is it possible?” analysis

- Automated reasoning about “is it possible?” scenarios. The analyst specifies a query that is expressed as a logical conjunction of BIM elements that the analyst wants to partially/totally satisfy/deny. The analyst can also specify that she wants to avoid the partial/total satisfaction/denial of some of the elements in the query. The tool returns a possible strategy—evidence and pursuit assignments—that satisfies the query, if such a strategy exists. Figure 1 shows the tool in action, while answering

a query of the “is it possible?” type. The results are shown in the table at the very bottom of the screenshot.

- Supporting the organization of models in projects, zooming, navigating the diagrams, concurrent handling of multiple diagrams, and exporting diagrams to a variety of image formats (both raster and vector). These functionalities are provided by including appropriate Eclipse plugins.

The tool is publicly available from the website www.cs.toronto.edu/~jm/bim/. Currently, the released versions support Microsoft Windows (both 32 and 64 bits) and Linux distributions (32 bits). The website includes basic usage tutorials through screencasts. One screencast is about how to model BIM diagrams, while other two screencasts show the two supported reasoning techniques. Readers can refer to existing BIM publications for information about the BIM language and reasoning [3,2,1].

3 Limitations and Outlook

The tool is intended to be a proof-of-concept prototype. As such, it can be freely downloaded and used, but it is not ready for industrial adoption. Additionally, BIM-Tool is currently supporting only a subset of the reasoning techniques developed for and adapted to the BIM language.

Our future work includes addressing current limitations of the tool, making it more robust for usage by practitioners (extensive testing is required), exploring interoperability with other tools (e.g., importing goal models from other tools), providing additional tutorials and more extensive documentation about the tool, and supporting the Mac OS operating system.

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References

1. Daniele Barone, Thodoros Topaloglou, and John Mylopoulos. Business intelligence modeling in action: a hospital case study. In *Advanced Information Systems Engineering*, pages 502–517. Springer, 2012.
2. Jennifer Horkoff, Daniele Barone, Lei Jiang, Eric Yu, Daniel Amyot, Alex Borgida, and John Mylopoulos. Strategic business modeling: representation and reasoning. *Software & Systems Modeling*, pages 1–27, 2012.
3. Jennifer Horkoff, Alex Borgida, John Mylopoulos, Daniele Barone, Lei Jiang, Eric Yu, and Daniel Amyot. Making data meaningful: The business intelligence model and its formal semantics in description logics. In *On the Move to Meaningful Internet Systems: OTM 2012*, pages 700–717. Springer, 2012.