

Claimed Advantages and Disadvantages of (dedicated) Model Transformation Languages: A Systematic Literature Review

Stefan Götz,¹ Matthias Tichy,¹ Raffaella Groner¹

Abstract: There exists a plethora of claims about the advantages and disadvantages of model transformation languages compared to general purpose programming languages. With our work, published at the Software and Systems Modelling Journal in 2020 [GTG20], we aim to create an overview over these claims in literature and systematize evidence thereof. For this purpose we conducted a systematic literature review by following a systematic process for searching and selecting relevant publications and extracting data. We selected a total of 58 publications, categorized claims about model transformation languages into 14 separate groups and conceived a representation to track claims and evidence through literature. From our results we conclude that: (i) current literature claims many advantages of model transformation languages but also points towards certain deficits and (ii) there is insufficient evidence for claimed advantages and disadvantages and (iii) a lack of research interest into the verification of claims.

Keywords: Model Transformation Language; DSL; Model Transformation; MDSE; advantages; disadvantages; SLR

Ever since the dawn of Model-Driven Engineering at the beginning of the century, model transformations, supported by dedicated transformation languages [Hi13], have been an integral part of model-driven development. Model transformation languages (MTLs) have ever since been associated with advantages for the development of model transformations compared to general purpose programming languages. Many of these advantages are reiterated time and time again throughout literature often without any actual evidence to support the statements. This makes it difficult for readers to grasp which properties of MTLs are verifiably true and which might still only be of visionary nature. The **goal** of our study is to identify and categorize claims about advantages and disadvantages of model transformation languages made throughout the literature and to gather available evidence thereof. For this purpose we performed a systematic review [BSP16] of claims about model transformation languages and evidence for those claims in literature. Lastly, we analysed and discussed the extracted claims and evidence to: (i) provide an overview over claimed advantages and disadvantages and their origin, (ii) the current state of evidence thereof and (iii) identify areas where further research is necessary.

Of the 58 selected publication 32 publications mention advantages and 36 publications mention disadvantages. Moreover *four* publications provide empirical evidence for either advantages or disadvantages while 12 publications use citations to support their claims and 14

¹ Ulm University, Institute for Software Engineering and Compiler Construction, James-Franck-Ring 1, 89081 Ulm, Germany stefan.goetz@uni-ulm.de

publications use other means such as examples and experience of the authors to back up their statements. In total we were able to extract 127 claims about model transformation languages which we were able to sort into 14 different categories. The categories include properties that are expected to show up such as *performance*, *expressiveness* and *comprehensibility* but also less obvious groups such as *verification* or *versatility*. An effort by us to categorize the extracted claims along existing taxonomies of model transformation language features failed because ~70% of all claims are made broadly and without reference to specific features of MTLs that aid the advantage or disadvantage. Regarding the state of evidence we found that current literature exhibits a deficit in evidence (empirical or otherwise) for asserted properties of MTLs. We also identified several potential reasons and barriers for why current literature lacks evidence. First there is the fact that designing and conducting rigorous studies to examine model transformation languages requires a substantial amount of time and effort. A fact that is further hampered by the lack of easily available study subjects. Next is the fallacy that because MTLs are DSLs they bear the same advantages that other DSLs exhibit. We believe that the benefits attributed to DSLs can only point to potential advantages that MTLs may have, rather than being a certainty. Lastly there is the effect, that statements can become ‘established’ facts by virtue of being reiterated often enough or being cited multiple times without the cited source actually providing any evidence. This can lead to a distorted factual picture and makes it often impossible to find the origin of a claim.

We conclude that: (i) current literature claims many advantages of MTLs but also points towards deficits owed to the mostly experimental nature of the languages and its limited domain, (ii) there is insufficient evidence for and (iii) research about properties of model transformation languages. Our results suggest a lack of effort put into the evaluation of model transformation languages and their potential advantages or disadvantages. We believe that a significant portion of current research efforts that are being invested into the development of new features should instead be spent on evaluating the state of the art in hopes of ascertaining both what current MTLs are lacking most and where their strengths really lie. We also suggest that in future publications, claims on benefits and disadvantages of model transformation languages be made more specific and include mentions of the features that aid or hamper the benefits. This will allow a more nuanced and focused discussion of the issue and make statements less vulnerable to basic scrutiny.

Bibliography

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