# Survey on Best Practices for Artifact Development and Sharing in Model Driven Engineering Research

This survey is part of a scientific study conducted by Carlos Diego Nascimento Damasceno <<u>d.damasceno@cs.ru.nl</u>> and Daniel Strüber at Radboud University, The Netherlands.

The goal of this study is to evaluate a set of practices for artifact development and sharing in Model-Driven Engineering (MDE) research. The information collected will be used to identify useful practices for artifact development and sharing from the perspective of the MDE community and to improve the quality of artifacts from MDE research projects.

The target group of this study are practitioners and researchers with experience in MDE. By participating, you have the opportunity to reflect about your own practices related to artifact sharing. Your participation in the experiment is entirely voluntary. We will store and work with the results in an anonymized manner, using external data sources.

\*Required

#### **Procedures**

This survey should take about 15 minutes to be completed and will involve the following steps:

- 1) We will ask your experiences on artifact development and sharing in MDE research. (Page 2)
- 2) We will ask your opinion about the relevance a set of practices for artifact sharing. (Pages 4-10)
- 3) We will ask you to evaluate the clarity, completeness, and relevance of our set of practices. (Page 11)

#### Use of Data

At the end of the survey, we will ask to optionally specify your e-mail address, which would allow us to inform you about the results of the study in case you're interested in them.

We will remove your e-mail address and other identifiable information from your data before using it for analysis. We may use the anonymized data for our future research studies, and we may distribute the anonymized data to other researchers for further studies. We will do this without getting additional informed consent from you (or your legally authorized representative). Sharing of data with other researchers will only be done in such a manner that you will not be identified.

#### If you want to start the survey, please click next!

You may discontinue participation at any time.

Personal Experiences on Sharing Artifacts in MDE Research Projects

1.	Gender *
	Mark only one oval.
	Female
	Male
	Other:
2.	Which of these options is most suitable to describe your current primary role? *
	Mark only one oval.
	Academic researcher (pre-PhD level)
	Academic researcher (post-doc level)
	Academic researcher (professor level)
	Industrial Researcher
	Industrial Practitioner
	Other:
3.	How would you rate your experience in artifact development and sharing in MDE research projects? *
	Mark only one oval.
	1 2 3 4 5
	Not experienced Very experienced
4.	How would you rate your experience in reusing artifacts from MDE research
	projects? *
	Mark only one oval.
	1 2 3 4 5
	Not experienced Very experienced

5.	Have you ever submitted an artifact for evaluation to some conference, workshop, or journal? *
	Mark only one oval.
	Yes
	No
6.	Have you ever contacted other researchers for help on reusing their artifacts? *
	Mark only one oval.
	Yes
	No
7.	Have you ever been contacted by other researchers interested to reuse some artifact you shared? *
	Mark only one oval.
	Yes
	No
8.	Which challenges have you encountered during the sharing and use of artifacts in MDE research projects?
	Challenges are issues that make the sharing and use of artifacts difficult. If you have encountered multiple challenges, please start a new line for each.

Identifying
Useful
Practices
for
Artifact
Sharing in
MDE
Research
Projects

Developing useful artifacts is challenging as researchers may have different expectations, depending on their role and experience. To understand this process, we will ask your opinion about a set of factual questions (i.e., what, why, where, who, when, how, how much/many) presented as guidelines for creating and sharing MDE research artifacts. Each factual question will include various research practices that should address their respective questions. Bellow, we show an example of the questions and practices that you will evaluate in this survey.

### Overview of the Factual Questions and Practices

We consider the following factual questions:

- 1) What?
- 2) Why?
- 3) Where?
- 4) Who?
- 5) When?
- 6) How?
- 7) How much/many?

For each question, we have one or more sub-questions, such as, for "1) What":

- 1.1) What is it all about?
- 1.2) What does it have?
- 1.3) What concepts and technologies underpin the artifact?

Per sub-question, we have a set of practices, such as:

- The artifact shall indicate its name
- The artifact shall indicate the context of its development (e.g., domain, problem, project)
- The artifact shall indicate the main functionalities supported (e.g., language support, code generation, model analysis)

We will ask you to rate the relevance of each practice as "essential", "relevant", "unnecessary" or "no answer". In total, we have 7 factual questions, 19 sub-questions, and 85 practices. In our dry runs, completing the questionnaire took around 15 minutes.

#### **Important**

If you believe there is any important factual question missing, at the end of each section you will have the chance to share suggestions. At the end of the questionnaire we will also ask you to rate the completeness, relevance, and clarity of our factual questions and practices and leave additional remarks. This will help us to improve our guidelines.

1) What? artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "What" factual questions:  $\frac{1}{2} \int_{-\infty}^{\infty} \frac{1}{2} \int_{-$ 

In this section, we will ask your opinion about the relevance of different practices for

- 1.1) What is it all about?
- 1.2) What does it have?
- 1.3) What concepts and technologies underpin the artifact?

At the end of this section, you will have the chance to recommend additional "What" factual questions you see as important for gathering basic information about a MDE research artifact.

9.	1.1)	What	is it	all	about? *
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The artifact shall indicate...

Mark only one oval per row.

	Essential	Desirable	Unnecessary	No answer
its name				
the context of its development (e.g., domain, problem, project)				
its main functionalities supported (e.g., modelling language, code generation, model analysis)				
the relation with its associated paper				

# 10. 1.2) What does it have? \*

The artifact shall provide...

	Essential	Desirable	Unnecessary	No answer
a description of its directory structure and content				
everything required for replications (i.e., complete)				
no more assets than necessary for replications (i.e., concise)				
a preprint of its associated article				

11. 1.3) What concepts and technologies underpin the artifact? \*
The artifact shall indicate...

	Essential	Desirable	Unnecessary	No answer
the theories that underpin its creation (e.g., formalisms, semantics)				
the modeling languages used to develop it (e.g., UML, xtUML, SysML, BPMN)				
the meta-modeling languages used to develop it (e.g., EMOF, CMOF, ECore/EMF, KM3)				
the standards and/or specifications used to develop it (e.g., ISO, CMI, XMI, CWM, HUTN, JMI, DD, OCL)				
the programming/markup language used to develop it				
the libraries, dependencies, and frameworks used to develop it and their respective versions (e.g., Eclipse release)				
Which factual questions would you	say are mis	ssing in the	e "What" persp	ective?



In this section, we will ask your opinion about the relevance of different practices for artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "Why" factual questions:

2.1) Why it was created?

At the end of this section, you will have the chance to recommend additional "Why" factual questions you see as important for gathering basic information about a MDE research artifact.

## 13. 2.1) Why it was created? \*

The artifact shall indicate...

Mark only one oval per row.

	Essential	Desirable	Unnecessary	No answer
the motivation for its development				
its objective/goal (e.g., verify claims, replicability, reusability, a whole new library/framework)				
its advantages and/or novelty (e.g., algorithm, language, method)				

14.	Which factual questions would you say are missing in the "Why" perspective?

3) Where? In this section, we will ask your opinion about the relevance of different practices for artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "Where" factual questions:

- 3.1) Where is it hosted?
- 3.2) Where shall I cite?
- 3.3) Where to find related work?

At the end of this section, you will have the chance to recommend additional "Where" factual questions you see as important for gathering basic information about a MDE research artifact.

15. 3.1) Where is it hosted?	۱? ۶
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The artifact shall be hosted in a repository that...

Mark only one oval per row.

	Essential	Desirable	Unnecessary	No answer
is open and public (e.g., GitHub, BitBucket, Zenodo, Figshare)				
is indexed and findable by search engines (e.g., GitHub, BitBucket, Zenodo, Figshare)				
archives data for long-term and permanent access (e.g., Zenodo, Figshare)				

# 16. 3.2) Where shall I cite? \*

The artifact shall provide...

	Essential	Desirable	Unnecessary	No answer
an explicit format for citation (e.g., in a CITATION file)				
its citation information in BibTeX format				
an URL for citation				
a DOI for citation				

17. 3.3) Where to find related work? \*

The artifact shall give...

Mark only one oval per row.

t to data obtained from other ces (e.g., cited authors, paper,			Unnecessary	No answer
sitory)				
ences about key concepts (e.g., rs, surveys, wiki, reports)				
ences to studies using it (e.g., on uses, integrated with)				
ences to related acts/projects				
ences using in-code citation (e.g., header)				
n ractual questions would you	say are mi	ssing in the	vvnere pers	pective
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questions you see as important for gathering basic information about a MDE research

artifact.

19. 4.1) Who could use it
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The artifact shall...

	Essential	Desirable	Unnecessary	No answer
be deposited under an explicit open license (e.g., reported in a LICENSE file)				
have files made available using open/non-proprietary formats (e.g., JSON, open XML schema)				
indicate a list of potential users (e.g., professionals, researchers, industry sectors)				
be developed using open, well- maintained, and documented libraries or dependencies				

22.

20.	4.2)	Who	are	the	authors?	t
20.	4.2)	Who	are	the	authors?	۱

The artifact shall provide...

	Essential	Desirable	Unnecessary	No answer
a communication channel for interacting with the community (e.g., forum, mailing list, issue tracker, IRC, Slack, Discord)				
the names of its authors				
the institution of its authors				
the contact details of its authors (e.g., email address, ResearchGate, Linkedin, website)				
the ORCID of its authors				
the level of experience of its authors (e.g., bio, degree, position)				
4.3) Who funded this project? * The artifact shall indicate  Mark only one oval per row.				
	Essential	Desirable	Unnecessary	No answer
the funding agencies that supported the project (e.g., ERC, NWO, CNPq, DFG, EPSRC, NSF)				
Which factual questions would you	say are mis	ssing in the	"Who" perspe	ective?



In this section, we will ask your opinion about the relevance of different practices for artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "When" factual questions:

- 5.1) When did changes happen?
- 5.2) When do future changes shall happen?

At the end of this section, you will have the chance to recommend additional "When" factual questions you see as important for gathering basic information about a MDE research artifact.

## 23. 5.1) When did changes happen? \*

Changes to the artifact shall be...

Mark only one oval per row.

	Essential	Desirable	Unnecessary	No answer
tracked using version control (e.g., GitHub, GitLab, BitBucket)				
small (e.g., concise, cohesive edits)				
explained (e.g., via CHANGELOG or commit messages)				
labelled using tags and/or release identifiers to allow referencing and retrieval of specific versions				

## 24. 5.2) When do future changes shall happen? \*

The artifact shall provide...

	Essential	Desirable	Unnecessary	No answer
a timeline for future goals and planned updates (e.g., frequency, next steps, future work plans)				
means for receiving change requests and feedback from users (e.g., bug fixes, pull requests)				

25.	Which factual questions would you say are missing in the "When" perspective?

6) How? In this section, we will ask your opinion about the relevance of different practices for artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "How" factual questions:

- 6.1) How is it organized?
- 6.2) How to set up a running environment?
- 6.3) How to get started?
- 6.4) How to replicate the experiment?
- 6.5) How to run the analysis of results?
- 6.6) How could it be repurposed?

At the end of this section, you will have the chance to recommend additional "How" factual questions you see as important for gathering basic information about a MDE research artifact.

# 26. 6.1) How is it organized? \*

	Essential	Desirable	Unnecessary	No answer
Tabular data files shall follow analysis-friendly formats (e.g., the column is variable, the row is observation, data dictionary, the meaning of column/row headers)				
Files and folders shall have self- explaining names matching content, meaning, and human abstractions (e.g., doc/, src/, results/, src/, bin/)				
The artifact shall indicate best practices used (e.g., naming or code conventions, guidelines/checklists)				
Useful metadata shall be used as part of filenames for pattern matching (e.g., yyyymmdd), where meaningful				
The artifact shall be compliant with ICT accessibility standards (e.g., Section 508, WAI)				
The experiment workflow shall be broken-down into small and simple procedures to facilitate reuse (e.g., scripts, functions)				
The artifact shall include a website or wiki-page				

# 27. 6.2) How to set up a running environment? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall provide instructions for downloading				
The artifact shall provide the open- source code				
The artifact shall provide a binary/compiled version				
The artifact shall provide a container for freezing dependencies and quickly setting up a running environment (e.g., VM, Docker)				
The artifact shall provide a step-by- step tutorial of how to build the source code				
The artifact compilation shall rely on build automation tools (e.g., make, ant)				
The artifact compilation shall rely on dependency management tools (e.g., maven, pip)				
The artifact shall provide instructions to install it				

# 28. 6.3) How to get started? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall include instructions for running it on minimal test data (e.g., quick run, smoke testing)				
The artifact shall indicate the most relevant and interesting parts of the source code/artifact				
The artifact shall include step-by-step instructions for running it (e.g., README, PDF)				
The artifact shall include a video tutorial with the step-by-step for running it (e.g., Youtube, Vimeo)				

# 29. 6.4) How to replicate the experiment? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall include the complete set of test models considered				
The artifact shall provide instructions for manual/automated pre-processing of raw data for experiments (e.g., bash, python, R script)				
The artifact shall provide instructions for manual/automated replication of the complete (or at least a subset) experiment as in the paper (e.g., bash, python, R script)				
The experiment workflow shall be fully automated (including raw data processing, experiment execution, figures plotting)				
The artifact shall include the experiment results shown in its associated paper in tabular and machine-readable format (e.g., .csv, .tab)				
The artifact shall include log files produced				

# 30. 6.5) How to run the analysis of results? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall provide scripts for the automated analysis of results as in the paper (e.g., R scripts, python scripts, Jupyter notebooks)				
The artifact shall include scripts for drawing figures and/or plots as in the paper (e.g., R scripts, python scripts, Jupyter notebooks)				
The artifact shall provide a clear description of the measurement procedures and metrics used in the paper				

## 31. 6.6) How could it be repurposed? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall indicate suggestions for contributions (e.g., notes.txt, todo.txt, ways it could be repurposed, wishlist)				
The artifact documentation shall be designed considering users with minimal expertise				
The artifact shall provide details about ethical concerns in replications				
The artifact source code shall be documented (e.g., in-code comments, Javadoc)				
The artifact shall provide instructions for integration/chaining with commercial tools (e.g., Matlab, DOORS)				
The artifact shall report known issues, bugs, and limitations (e.g., issue tracker)				
Which factual questions would you	say are mi:	ssing in the	e "How" perspe	ective?



In this section, we will ask your opinion about the relevance of different practices for artifact sharing. These practices should provide means to address factual questions about artifacts in MDE research. We consider the following "How much/many" factual questions:

7.1) How many resources does it need?

At the end of this section, you will have the chance to recommend additional "How much/many" factual questions you see as important for gathering basic information about a MDE research artifact.

## 33. 7.1) How many resources does it need? \*

	Essential	Desirable	Unnecessary	No answer
The artifact shall indicate the system and environment where it was successfully evaluated (e.g., OS, CPU, RAM, GPU, Disk)				
The artifact shall indicate the minimum system and environment requirements for usage (e.g., OS, CPU, RAM, GPU, Disk)				
The artifact shall indicate the skills and/or settings required for usage (e.g., team configuration, users' skills)				
The artifact shall indicate the approximate amount of time needed				

	Please evaluate the clarity, completeness, and relevance of our set of guidelines (consisting of the factual questions and the practices in each question). As a refresher, we consider the following factual questions:  1) What?
	<ul><li>1.1) What is it all about?</li><li>1.2) What does it have?</li><li>1.3) What concepts and technologies underpin the artifact?</li></ul>
	2) Why? 2.1) Why it was created?
	3) Where? 3.1) Where is it hosted? 3.2) Where shall I cite? 3.3) Where to find related work?
Final evaluation	4) Who? 4.1) Who could use it? 4.2) Who are the authors? 4.3) Who funded this project?
	5) When? 5.1) When did changes happen? 5.2) When do future changes shall happen?
	<ul> <li>6) How?</li> <li>6.1) How is it organized?</li> <li>6.2) How to set up a running environment?</li> <li>6.3) How to get started?</li> <li>6.4) How to replicate the experiment?</li> <li>6.5) How to run the analysis of results?</li> <li>6.6) How could it be repurposed?</li> </ul>
	7) How much/many? 7.1) How many resources does it need?

35. How do you assess the clarity of these guidelines? \*

Mark only one oval.

	1	2	3	4	5	6	7	
Very unclear								Very clear

How do you as								
Mark only one o	val.							
	1	2	3	4	5	6	7	
Very incomplet	e							Very comple
How do you as	ssess the	e releva	ance of	thes	e guide	elines	*	
Mark only one o	val.							
	_							
	1	2	3	4	5	6	7	
Very irrelevant Additional rem	narks							Very relevant
Additional ren	narks							<u> </u>
Additional ren	narks							<u> </u>

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