

# NFR4MDD: Questionnaire

*“How do companies deal with NFRs in MDD”*

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## Pre-interview questionnaire

Have you...

- successfully finished, at least, one MDD project...
- in the company mentioned...
- acting as software engineer...
- and the project involved models, metamodels, and transformations?

**YES / NO**

(if you answered 'yes' you are a suitable participant for this study)



## Participant contact information

Name (\*): \_\_\_\_\_

e-Mail (\*): \_\_\_\_\_

(\* ) This information is optional and will not be disclosed. If this information is provided, a report with the results of the study will be sent to the participant.

## Company profile

Company size:

- SME (approximate number of employees: \_\_\_\_\_ )
- Big company

Domain of the company: \_\_\_\_\_

Years using **MDD** (by you or other co-workers): \_\_\_\_\_

Approximate number of **MDD** projects (by you or other co-workers): \_\_\_\_\_

## Academic background of the participant

Academic specialization:

- Computer Science / Informatics / Systems Engineering /...
- Other: \_\_\_\_\_

Highest academic degree:

- Bachelor
- Master
- PhD.

Other titles, courses, or certifications: \_\_\_\_\_

## Professional experience of the participant

Years in this company (you): \_\_\_\_\_

Number of projects in which you have participated (you): \_\_\_\_\_

Years using **MDD** in this company (you): \_\_\_\_\_

Number of **MDD** projects in which you have participated (you): \_\_\_\_\_



# Interview questionnaire

## General principles for executing the interview:

- *All questions should be considered open.* If the participant has additional insightful information to add let him do it (unless it is something that will be asked later in the interview).
- *Do not hesitate to ask to the participant for more details.* If you consider that there is some particular topic that is interesting and will add value to the research, go deep into the details.

## Instructions for the interviewer:

1. Ask the participant in which language wants to do the interview.
2. Let the participants know that they do not need to prove anything, they are not being evaluated, and that they can ask for any clarification.
3. Let the participants know that the answers will be used anonymously.
4. Ask the participant for explicit permission to record the interview (explain, if necessary, that recording the interview is very important for the study because it allows us to perform a better analysis)

1. Can you briefly describe what Model-Driven Development is for your company?

## Relation with RQs:

There is no RQ related to this question. It is contextual. The aim of this question is to capture the MDD concept as it is understood in the interviewed companies.

## Instructions for the interviewer:

- Note for subquestion 'b':
    - If necessary, provide the options listed and explain them (defs. below).
    - Only one answer is expected.
1. Let the participants explain freely what MDD is for them (**subquestion a**).
  2. Try to fit the definition provided into one of the listed options (**subquestion b**):
    - **MDA**: MDD but limited to OMG standards. Models are a key element of the process (i.e., model transformations are present).
    - **MDD**: Only development (not limited to OMG standards). Models are a key element of the process (i.e., model transformations are present).
    - **MDE**: Models are used for one or more of the engineering activities in software production (e.g., development, testing, monitoring, etc.). Models are a key element of the process (i.e., model transformations are present).
    - **MBE**: Relaxed view of MDE, models are present, but not necessarily as key



elements of the process.

**Some remarks:**

- If necessary, explain all of them and let the participant choose.
  - If more than one paradigm is used in the company, please note the most used.
  - If the selected paradigm is MBE or MDE, clarify that we are specifically interested in the development activities that involve modelling and transformation of models. Being the case, remark to the participants that they should focus their answers to the interests of the study.
3. Finally, to complete this question, we want to know if the MDD adopted in the company has some special characteristic (subquestion c)

**Subquestions:**

- a. **(Q1 repeated):** "Can you briefly describe what model-driven development is for your company?"
- b. Which of the following fits best with the MDD practice in your company?
- Model-Driven Architecture (MDA)
  - Model-Driven Development (MDD)
  - Model-Driven Engineering (MDE)
  - Model-Based Engineering (MBE)
- c. Is there any specific characteristic that makes the MDD adopted in your company "special" (in comparison to the commonly known MDD paradigms: MDA, MDD, MDE)?

2. Can you briefly describe what a Non-Functional Requirement is for your company?

**Relation with RQs:**

There is no RQ related to this question, it is contextual. The aim of this question is to capture the NFR concept as it is understood in the interviewed companies.

**Instructions for the interviewer:**

1. Let the participants explain freely what a NFR is for them (**subquestion a**). If the participant seems unfamiliar with the concept you can provide them examples of types of NFRs (see list below).
2. Determine if they classify the NFRs according to some taxonomy. If yes, determine the origin of the taxonomy and if it is specific to the company domain (**subquestion b**).
3. To finish this question, we want to determine what NFRs are important, and for those how recurrent are in the company project and how critical are considered (**subquestion c**).

Examples of types of NFRs (based on ISO/IEC 25010:2010):

- **Functional suitability:** Functional completeness, Functional correctness, Functional appropriateness
- **Performance efficiency:** Time behaviour, Resource utilisation
- **Compatibility:** Co-existence, Interoperability
- **Usability:** Appropriateness recognisability, Learnability, Operability, User error



protection, User interface aesthetics, Accessibility

- **Reliability:** Maturity, Availability, Fault tolerance, Recoverability
- **Security:** Confidentiality, Integrity, Non-repudiation, Accountability, Authenticity
- **Maintainability:** Modularity, Reusability, Analysability, Modifiability, Testability
- **Portability:** Adaptability, Installability, Replaceability

**Subquestions:**

- a. **(Q2 repeated):** "Can you briefly describe what a Non-Functional Requirement is for your company?"
- b. Does your company rely on a predefined classification of non-functional requirements?
  - i. Where does this classification comes from (e.g., some standard)?
  - ii. Is it specific for the particular domain of your company?
- c. What Non-Functional Requirements would you consider as the most important for the software systems that your company delivers?
  - i. Are these requirements always present in your company projects?
  - ii. Would you say that these requirements need to be fulfilled (i.e., the project cannot successfully finish without satisfying them)?

3. What is the current level of adoption of Model-Driven Development in the company?

**Relation with RQs:**

This question will also be used to answer (partially) the RQ1, and in particular the RQ1.1 (subquestion 'a'):

- **RQ1 "In which context is MDD adopted by companies?"**
- RQ1.1 "What factors motivate or discourage the adoption of MDD?"

**Instructions for the interviewer:**

- Note for subquestion 'a' and 'b':
    - Provide the options listed and explain them.
    - Only one answer is expected.
1. Determine the level of adoption (**subquestion 'a'**).
    - **Level 1: Ad-Hoc Modelling.** Situations where modelling practices are sporadically used. This means that the company is performing traditional software development, and employees may use some models for their own help, but no company policy or common understanding applies.
    - **Level 2: Basic MDD.** The company uses models in each project developed. The final code and documentation shall comply with the system specification modelled. This alignment may be manual or automatic. In this level models include both, business and technical concepts.
    - **Level 3: Initial MDD.** In this level the business models are separated from the technical models. Business models are manually converted to technical models, but technical models are converted to code automatically. The company defines rules and guidelines for the models (to facilitate communication)



- **Level 4: Integrated MDD.** Domain concepts are represented by means of a domain model using DSLs. Domain, business and technical concepts are separated. In this maturity level, two types of technical models are developed: the ones that model the core infrastructure shared by all products in a product family, and the technical (for infrastructure reusability). Models are also used in testing to verify them for early correcting design issues.
  - **Level 5: Ultimate MDD.** The company achieved a complete MDD adoption and reaped its benefits, there is a need to have a system family engineering mind-set, which means to have a common set of MDD assets (transformations, domain models, metamodels, ...) that are reusable in the company. Models are executable, so the focus of the company efforts is on the models and not on code programming. Entire company knowledge is capitalised in models.
2. Determine how common is the use of MDD (**subquestion 'b'**).

#### Subquestions:

- a. **(Q3 repeated):** "What is the current level of adoption of MDD in the company?"
- Level 1: Ad-Hoc Modelling
  - Level 2: Basic MDD
  - Level 3: Initial MDD
  - Level 4: Integrated MDD
  - Level 5: Ultimate MDD
- b. How common is MDD paradigm in your company?
- It is applied in a project basis (i.e., only when the project seems appropriate)
  - It depends on the development team (some development teams master MDD, others do not use it)
  - Other: \_\_\_\_\_

4. Why did your company adopt model-driven development?

#### Relation with RQs:

This question will be used to answer the RQ1, and in particular RQ1.1 from the company point of view (subquestion 'a', 'b', 'c', 'd') and, if the NFRs are mentioned, RQ1.2 ('a', 'b', 'c', 'd'):

- **RQ1 "In which context is MDD adopted by companies?"**
- RQ1.1 "What factors motivate or discourage the adoption of MDD?"
- RQ1.2 "Which types of NFRs are linked to these factors?"

#### Instructions for the interviewer:

- Note for subquestion 'a', 'c', 'd':
  - Do not provide the options listed, unless the participant cannot provide a valid answer.
  - If the answer provided is similar to one of the listed options, certify that they meant that.
  - They can provide more than one answer.



1. Identify the adoption reasons (**subquestion 'a'**).
2. Determine which the primary reason was (**subquestion 'b'**).
3. Identify the benefits of adopting MDD (**subquestion 'c'**).
4. Identify the challenges of adopting MDD (**subquestion 'd'**).

**Remarks:**

- This question (and subquestions) should be answered from the company point of view. This means that we want to explore economic (i.e., costs), logistics, and other non-technical reasons.

**Subquestions:**

- a. **(Q4 repeated):** "Why did your company adopt model-driven development?"
  - It was decided as a company policy (technical or non-technical argumentation was given)
  - It was requested in one project by the client and then we used it in other projects
  - It was suggested by the developers of the company as a way to speed up the development process
  - Other: \_\_\_\_\_
- b. Which is the primary reason for adopting MDD?
- c. What benefits did your company experience, once MDD was adopted?
  - Improve the development process
  - Improve the maintainability of the software products
  - Improve the reusability of the software products
  - Reduce the number of bugs in common tasks
  - Improve the documentation
  - Reduce the development costs
  - Other: \_\_\_\_\_
- d. Which are the challenges for the company once MDD is adopted?
  - Steep learning curve
  - Lack of confidence in MDD
  - Reduced set of available MDD tools
  - Reduced set of supported technologies
  - Lack of support for NFRs
  - Other: \_\_\_\_\_

5. In your experience, what are the reasons that make a project 'well-fit' or 'inadequate' for model-driven development?

**Relation with RQs:**

This question will be used to answer RQ1, and in particular RQ1.1 (subquestion 'a' and 'b') from the project point of view, RQ1.2 (subquestion 'd' and 'e') and RQ1.3 (subquestion 'c').

- **RQ1 "In which context is MDD adopted by companies?"**
- RQ1.1 "What factors motivate or discourage the adoption of MDD?"
- RQ1.2 "Which types of NFRs are linked to these factors?"





- RQ1.3 "To what extent are NFRs relevant for those projects that adopt MDD?"

**Remarks:**

- This question (and subquestions) should be answered from the project point of view. This means that we want to explore, requirements, software domains, and other technical reasons.

**Instructions for the interviewer:**

- Note for subquestion 'c':
  - You should provide the options listed.
  - Only one answer is expected.
- 1. Let the participants answer the main question (**subquestion 'a'**). Make sure they provide both: 'well-fit' reasons and 'inadequate' reasons.
  - If they ask what do we mean by "factors" tell them that "anything that comes to their mind" when they have to decide to use or not use MDD for one particular project.
- 2. Identify if there is a domain where MDD fits better, and why this happens (**subquestion 'b'**). They may just say that there is no specific domain.
- 3. Determine how important were the NFRs in those projects that used MDD (**subquestion 'c'**). This can be also reinforced by their project experiences.
- 4. Ask **subquestion 'd'**. Here is important to have real examples of NFRs that were present in MDD projects. Make sure they provide examples of both: bad and good
  - Note that we are not asking how they satisfied these NFRs, this will be asked later (Q7, Q8, Q9, and Q10).
- 5. Ask **subquestion 'e'**. Make emphasis that we are asking for their opinion and that the question refers to NFRs in general (any type).
  - Make sure that they position their opinion as positive (i.e., MDD works well with NFRs) or negative (i.e., MDD does not work well with NFRs)

**Subquestions:**

- a. **(Q5 repeated):** "In your experience, what are the reasons that make a project 'well-fit' or 'inadequate' for model-driven development?"
  - i. What are the 'well-fit' reasons?
  - ii. What are the 'inadequate' reasons?
- b. Do the 'well-fit' projects belong to a common domain?
  - i. What domain?
  - ii. Why is this domain better suited for MDD?
- c. How relevant are NFRs in the projects that 'well-fit' with MDD?
  - Less important than functional requirements
  - Equality important as functional requirements
  - More important than functional requirements
- d. Please, provide examples of NFRs that are well-fitted (i.e., can be satisfied) and inadequate (become an issue) when developing with MDD in general.
  - i. What NFRs are 'well-fit' for MDD? (Why?)
  - ii. What NFRs are 'inadequate' for MDD? (Why?)
- e. To close this question, what is your general opinion about how well or bad the NFRs



are supported in MDD?

6. Can you briefly summarize one successfully finalized project in which you used model-driven development?

**Relation with RQs:**

Primarily, this question will provide first-hand experience (context information) of how companies use of MDD. It also will be used to answer (partially) the RQ1, in particular RQ1.2 (subquestion 'e') and RQ1.3 (subquestion 'h') :

- **RQ1 "In which context is MDD adopted by companies?"**
- RQ1.2 "Which types of NFRs are linked to these factors?"
- RQ1.3 "To what extent are NFRs relevant for those projects that adopt MDD?"

**Instructions for the interviewer:**

1. Let the participants provide a summary of the project (**subquestion 'a'**).
2. Identify the role of the participant in the project (**subquestion 'b'**).
3. Determine the project characteristics (if they have not been already stated) (**subquestion 'c'**).
4. Related to the previous question (Q5). Determine if the reasons are the same or are different ones (**subquestion 'd'**). If different, try to understand why.
5. Determine the relevant NFRs in the project (independently if they were handled by MDD or not). In other words, which NFRs were the most important for the project? (**subquestion 'e'**)
6. As contextual information, determine the techniques and tools used in the project (**subquestion 'f'**).
7. To check that they really provide a success example, ask their opinion about why the project was a success (**subquestion 'g'**).
8. The last question is to link the success of the project and the level of satisfaction of the NFRs (here we can determine how important were the "relevant" NFRs). Finally, if the NFRs were satisfied, determine if this satisfaction was obtained due to the use of MDD. There is no need to ask how they were satisfied because this is asked latter (**subquestion 'h'**).

**Subquestions:**

- a. **(Q6 repeated):** "Can you briefly summarize one successfully finalized project in which you used model-driven development?"
- b. What was your role and interests in the project?
- c. What were the project characteristics?
  - i. Size (pm):
  - ii. Duration (years):
  - iii. Application domain:
  - iv. Application type (embedded system vs. information system):
- d. Why was MDD used in this project?
  - i. Did this project fit well with MDD because of the same reasons you provided in the previous question (Q5)?
  - ii. Was there any particular reason in this project that forced or pushed towards



the use of MDD? (E.g., it was a project inside a bigger project that was already using MDD)

- e. Which were the relevant NFRs of the project?
- f. Which MDD techniques and tools were used in the project?
  - i. Which techniques (e.g., modelling, meta-modelling, custom transformations, etc.)?
  - ii. Which technologies (e.g., ATL, VIATRA2, etc.)?
  - iii. Which framework (e.g., Eclipse, AndroMDA, etc.)?
- g. In your opinion, why was the project a success?
  - i. Was the project a success thanks to MDD?
- h. In your opinion, to what extent were the relevant NFRs satisfied?
  - i. Were the relevant NFRs satisfied thanks to MDD?

### Short break

#### Instructions for the interviewer:

1. Clarify that the following questions should be answered in general, and that they are not specific to the project mentioned in question 6.
2. Explain that the four remaining questions correspond to four different scenarios in the way that NFRs are handled when using MDD.
  - **Question 7 (NFRs handled in MDD as it is):** This is the scenario where the MDD provides some NFR support (without making any adaptation). In other words, the tools and techniques selected by the company already have some support for NFRs (for some of them, at least) and the company did not require any adaptation to these tools and techniques (for the supported NFRs).
  - **Question 8 (NFRs are tailored into MDD by the company):** This is the scenario where the MDD tools and techniques were adapted to include some NFRs support. This includes, the design of new transformations, notation extensions, etc.
  - **Question 9 (NFRs are manually handled outside the MDD):** This is the scenario where the MDD tools and techniques did not support some of the NFRs but they were handled afterwards by including manual modifications. This typically means that the generated code has been modified to improve some quality, or to satisfy a concrete NFR.
  - **Question 10 (NFRs are discarded, omitted, postponed, etc.):** This is the scenario where the MDD tools and techniques did not provide NFR support, and therefore the company decided to discard the unsupported NFRs and use the outcome of the MDD process as it is. This is not a good practice, but in some cases it may have sense (e.g., creating prototypes).
3. Explain that the four scenarios are not exclusive: it could be the case that some NFRs are already supported by MDD (**Q7**), other NFRs are tailored by the company into MDD (**Q8**), other NFRs are handled manually (**Q9**) and other NFRs were discarded (**Q10**).



7. Does model-driven development (as it is) allow handling the non-functional requirements of the software produced?

**Relation with RQs:**

This question is related to RQ2, and its sub-RQs: RQ2.1 (subquestion 'a'), RQ2.2 (subquestion 'f'), RQ2.3 (subquestion 'd'), RQ2.4 (subquestion 'e'). Subquestion 'c' is for context.

- **RQ2 "To what extent do MDD approaches adopted by companies support NFRs?"**
- RQ2.1 "Which types of NFRs are supported by the adopted MDD approaches?"
- RQ2.2 "Which characteristics do these NFRs exhibit?"
- RQ2.3 "Which notations and tools are used for the supported types of NFRs?"
- RQ2.4 "At which stages of the adopted MDD approach are these NFRs handled?"

**Instructions for the interviewer:**

- Note for subquestion 'd':
    - Do not provide the options listed, unless the participant cannot provide a valid answer.
    - If the answer provided is similar to one of the listed options, confirm that they meant that.
    - They can provide more than one answer.
1. Emphasise that when asking about "MDD as it is", we mean that the MDD was not adapted/tailored in any way (no new transformations, no new modelling extensions, etc.). If they answer "yes" to the **subquestion 'a'** proceed with the rest of subquestions, otherwise jump to the next question (**Q8**).
  2. If the NFRs are handled, which NFRs can be handled (all, some types of NFRs such security or performance requirements, or only particular NFRs). A supported NFR should be stated by the participant in order to make our interpretations (**subquestion 'b'**).
  3. In **subquestion 'c'** we are interested in MDD techniques and tools, but only those that provided the "native" NFR support. In this sense the objective is different from the same subquestion in Q6.
  4. In **subquestion 'd'**, we want to know how are the NFRs specified in the MDD, in other words: how are they provided as an input to the MDD process?
  5. Following the previous subquestion, in **subquestion 'e'** we want to understand how the supported NFRs are used. This is: what is the NFRs role in the process and models (this answers RQ2.4). We also want to know if this native support for NFRs provides more flexibility to the MDD process, in other words: Is the MDD suitable for more kinds of projects thanks to this NFR support?
  6. In the case, that the explanations provided were not accompanied by concrete examples, ask **subquestion 'f'**. It is important to have a complete and concrete example in order to make the content analysis.

**Subquestions:**

- a. (**Q7 repeated**): "Does model-driven development (as it is) allow handling the non-functional requirements of the software produced?"



- b. Which NFRs are supported?
- c. Which are the MDD techniques and tools that support NFRs?
  - i. Which techniques (e.g., modelling, meta-modelling, custom transformations, etc.)?
  - ii. Which technologies (e.g., ATL, VIATRA2, etc.)?
  - iii. Which framework (e.g., Eclipse, AndroMDA, etc.)?
- d. How are the supported NFRs specified?
  - Specified in models.
  - Specified as transformation parameter.
  - Specified during the MDD process execution (user interaction).
  - Other: \_\_\_\_\_
- e. How are the supported NFRs used in MDD?
  - i. In which models are the NFRs represented?
  - ii. How do these NFRs impact on the MDD process (e.g., how are they embedded in the transformations)?
  - iii. In your opinion, does the support of NFRs increased the flexibility of the MDD process?
- f. Please, provide an example of one particular NFR supported by the MDD
  - i. What is the particular NFR?
  - ii. How is the NFR specified in the MDD process?
  - iii. How is the NFR used in the MDD process?

8. Is the model-driven process adapted/tailored to take into account some specific non-functional requirements?

**Relation with RQs:**

This question is about RQ3, and in particular RQ3.1 (subquestion a, b, c) and RQ3.3 (subquestion d):

- **RQ3 "How do companies deal with NFRs when the adopted MDD approach does not support them?"**
- RQ3.1 "How are MDD approaches customized to take into account the previously unsupported types of NFRs?"
- RQ3.3 "To what extent are the drawbacks of dealing with unsupported types of NFRs compensated by the benefits of adopting MDD?"

**Instructions for the interviewer:**

- Note for subquestion 'b':
    - Do not provide the options listed, unless the participant cannot provide a valid answer.
    - If the answer provided is similar to one of the listed options, confirm that they meant that.
    - They can provide more than one answer.
1. Emphasise that when asking about "tailored MDD", we mean that the MDD is adapted/tailored by the company to support some of the NFRs (e.g., new transformations, new modelling extensions, etc. were created). Note that manual



adaptations to the outcome of the MDD process are asked in the next question (Q9), this question is about adaptations to the MDD process itself. If they answer "yes" to the **subquestion 'a'** proceed with the rest of subquestions, otherwise jump to the next question (Q9).

2. If the MDD has been tailored, determine the adaptations that the company have done to the MDD to support NFRs (**subquestion 'b'**).
3. Ask **subquestion 'c'** to obtain a concrete example of the adaptations made to support one particular NFR.
  - Identify the NFR.
  - Identify what new models, extensions, transformations, etc. were made to support this particular NFR.
  - In addition, we want to know if the adaptations were made ad-hoc (only for one project) or to be maintained and reused in following projects.
4. Ask **subquestion 'd'** (related to RQ3.3) to understand the perceptions of the participant about if adapting MDD to support NFRs is a good choice.
  - In particular, if they said in subquestion 'c' that the adaptations were reusable, the effort of making the adaptations should be compared to the effort of performing manual adaptations in all the projects where it can be used.
  - If the adaptations were not reusable, the effort comparison should be limited to the particular project where the MDD was adapted.

#### Subquestions:

- a. **(Q8 repeated):** "Is the model-driven process adapted/tailored to take into account some specific non-functional requirements?"
- b. How are these adaptations performed?
  - New models/metamodels introduced (new kinds of models)
  - Metamodel/language extensions (same models, but extended)
  - New transformations
  - Transformations extended with new parameters (same transformations, but extended)
  - Specific technologies adaptations (e.g., tailoring the code generation -M2T transformation- to improve the performance of the database queries)
  - Other: \_\_\_\_\_
- c. Please, explain the MDD adaptations made for one particular NFR.
  - i. Are the MDD adaptations reusable for other projects?
- d. In your opinion, do the MDD adaptations to support NFRs pay for the extra effort required?

9. Is it necessary to manually modify the resulting code and/or models to support specific non-functional requirements?

#### Relation with RQs:

This question is about RQ3, and in particular RQ3.2 (subquestion a, b, c) and RQ3.3 (subquestion d):

- **RQ3 "How do companies deal with NFRs when the adopted MDD approach does not support them?"**



- RQ3.2 "How do companies deal with an NFR which is not supported by MDD?"
- RQ3.3 "To what extent are the drawbacks of dealing with unsupported types of NFRs compensated by the benefits of adopting MDD?"

**Instructions for the interviewer:**

- Note for subquestion 'b':
    - Do not provide the options listed, unless the participant cannot provide a valid answer.
    - If the answer provided is similar to one of the listed options, confirm with the participants that they meant that.
    - They can provide more than one answer.
1. Emphasise that when asking about "manual modifications", we mean that the outcome of the MDD process was manually modified to satisfy some of the NFRs (e.g., the code generated was manually modified to increase the performance). If they answer "yes" to the **subquestion 'a'** proceed with the rest of subquestions, otherwise jump to the next question (**Q10**).
  2. If the outcome was modified, determine the modifications that the company have done to support NFRs (**subquestion 'b'**).
  3. Ask **subquestion 'c'** to obtain a concrete example of the modifications made to support one particular NFR.
    - Identify the NFR.
    - Identify the modifications made to support this particular NFR.
    - In addition, we want to know if the modifications were persistent among MDD iterations (i.e., the company does not need to apply the modifications every time the outcome is generated by the MDD process)
  4. Ask **subquestion 'd'** (related to RQ3.3) to understand the perceptions of the participant about if using MDD (even when it requires manual modifications).
    - Take into account if they said in subquestion 'c' that the modifications were persistent.

**Subquestions:**

- a. **(Q9 repeated):** "Is it necessary to manually modify the resulting code and/or models to support specific non-functional requirements?"
- b. How are these modifications performed?
  - Modification of an intermediate model
  - Partial modification of the code produced
  - Complete rewriting of some parts of the software
  - Other: \_\_\_\_\_
- c. Please, explain the manual modifications for one particular NFR.
  - i. Are the manual modifications persistent between MDD iterations?
- d. In your opinion, do the manual modifications to support NFRs pay for the extra effort required?





10. Are there any NFRs not taken into account because of the MDD approach?

**Relation with RQs:**

This question is about RQ3, and in particular RQ3.2 (subquestion a, b, c) and RQ3.3 (subquestion d):

- **RQ3 "How do companies deal with NFRs when the adopted MDD approach does not support them?"**
- RQ3.2 "How do companies deal with an NFR which is not supported by MDD?"
- RQ3.3 "To what extent are the drawbacks of dealing with unsupported types of NFRs compensated by the benefits of adopting MDD?"

**Instructions for the interviewer:**

- Note for subquestion 'b':
    - Do not provide the options listed, unless the participant cannot provide a valid answer.
    - If the answer provided is similar to one of the listed options, certify that they meant that.
    - They can provide more than one answer.
1. Emphasise that when asking about "NFRs not taken into account", we mean that the company accepted the limitations of the MDD (at least for some NFRs) and they used the outcome produced by the MDD process as it is. If they answer "yes" to the **subquestion 'a'** proceed with the rest of subquestions.
  2. If the some NFRs were omitted, determine what happens to these NFRs (**subquestion 'b'**).
  3. Ask **subquestion 'c'** to obtain a concrete example of the actions made discard one particular NFR.
    - Identify the NFR.
    - Identify the modifications made to support this particular NFR.
    - In addition, we want to know if the discarded NFRs are common in the company projects (if yes, why they did not use one of the other approaches?), and what was the impact of discarding the NFRs (did the project succeed?).
  4. Ask **subquestion 'd'** (related to RQ3.3) to understand the perceptions of the participant about if using MDD (even when it requires omitting some NFRs).
    - Take into account what they said in subquestion 'c' about the impact of discarding NFRs.

**Subquestions:**

- a. **(Q10 repeated):** "Are there any NFRs not taken into account because of the MDD approach?"
- b. What happens with the NFRs that are not taken into account?
  - NFRs are postponed for future releases
  - NFRs are removed from the project
  - NFRs are adapted to the possibilities offered by MDD
  - Other: \_\_\_\_\_
- c. Please, provide an example of one particular NFR that was not taken into account.
  - i. How common or uncommon was the excluded NFR?





- ii. What was the impact of excluding this NFR for the project?
- d. In your opinion, does the use of MDD excluding NFRs still pays?

*Thanks for your participation*

**Instructions for the interviewer:**

1. Let the participants provide any additional comment as they like to close the interview.
2. Let the participants know that once the recorded interview is transcribed they will have the chance to review and change their statements.