

## EEWC 2014 Doctoral Consortium

### A Framework to Evaluate Business Process Modelling Methods

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**Abstract.** The PhD project aims at designing a framework for evaluating Business Process Modelling Methods (BPMMs) according to Design Science criteria. We also plan to instantiate this framework on specific cases – one of them being the use of DEMO – and to conclude about the framework validity. The current document exposes the problem that the framework should partially address and the current work plan.

**Keywords:** information systems design science, method evaluation, artefact evaluation, evaluation criteria, framework design.

# 1 Problem Being Addressed and Problem Relevance

## 1.1 Problem.

Numerous and various Business Process Modelling Methods (BPMMs) exist; difficulties arise when practitioners have to select the most appropriate one to solve a specific problem. We understand “appropriate” as “especially suitable or compatible” [1, 2]. A low appropriateness between problems and BPMMs used to solve them may lead for example to the production of business process models that are not as effective as they could be. Practitioners would benefit from further knowledge about the appropriateness offered by a particular BPMM to solve classes of problems.

Problem:

Whereas organizations use various BPMMs, they do not benefit as much as they could from their use. Amongst various possible causes, we underline the fact that the choice of a BPMM to solve a given problem is usually performed without evaluating thoroughly the appropriateness of the BPMM for the problem. Several causes can be invoked: some people tend to use the BPMM they know; some are not aware of BPMMs differences regarding the way they approach problems or lack knowledge about what BPMMs can offer.

Academics as well as practitioners may raise questions like:

- What can be expected from this BPMM?
  - o What are the benefits of a given BPMM?
  - o In which context does a BPMM apply best?
  - o What goals can we address with a BPMM? What kinds of problems can be solved with a BPMM?
- Why was this BPMM chosen to model our business processes?
- How was this BPMM chosen to model our business processes?
- or
- What BPMM should we use in such a case?

Currently, we do not have any guide for answering these questions. Besides, in their paper about the way organizations deal with the abundance of process modelling methods in their Business Process Management activities, Becker et al. [3] refer to method plurality and state: “No one single modelling method can fulfil all possible Business Process Management requirements of an organization”. They explain that “Business Process Management defines the purpose of business process modelling” and that “Business Process Management activities cover a wide range of application areas, e.g. workflow specification, organizational re-engineering, software development purposes or certification and continuous improvement. Against the background of the multiple contexts of Business Process Management, process modelling methods need to serve multiple purposes as well.” Thus they raise the question of matching BPMMs with business process modelling purposes and

highlight the fact that several BPMMs may be used in conjunction for addressing a given business process modelling purpose.

#### **Why is the Problem Important.**

Using BPMMs provides benefits to organisations; however we argue that organizations could use BPMMs more effectively and benefit more from what they offer by selecting them more appropriately and by not expecting from them what they cannot offer. Albani, Raber and Winter state that “having a clear understanding of the means-end relationship allows for defining appropriate combinations of methodologies in order to construct improved and more complete solutions”[4].

#### **1.2 To Whom Does the Problem Matter?**

Knowledge about BPMMs appropriateness to solve classes of problems is interesting for BPMMs prescribers, who are the people in organizations who choose whether to apply or not a specific BPMM in a given situation, e. g. quality managers, project management office members, project managers, analysts or modellers whether these prescribers are internal or external like consultants. Such knowledge is also valuable for BPMMs promoters to better communicate about their method – namely for trainings and sales. Promoters can be for example tools vendors, consultants or BPMMs authors. It can also be of interest for BPMMs supporting tools developers to develop tools that are in adequacy with BPMMs main users’ expectations.

We call “BPMMs’ final beneficiaries” the people who benefit from the application of BPMMs, whether they are e.g. project sponsors, business analysts or product lines managers. We expect these final beneficiaries to be the ones who may be the most impacted by the consequences of the problem defined above, although they may not be aware of it.

To summarize, we expect the problem to matter to people who select, apply, sell BPMMs or indirectly benefit from them.

#### **1.3 Preliminary Study to Check the Interest for the Research Effort**

In 2012, Céline Décosse and Niek Pluijmer conducted a set of exploratory semi-structured interviews about DEMO (Design and Engineering Methodology for Organisations [5]) from May to July 2012. In this exploratory study, we considered DEMO as being a BPMM. Several reasons led us to choose DEMO:

- DEMO modellers and beneficiaries admitted that DEMO had a strong added-value regarding concepts clarification for enterprise analysis purposes, DEMO’s usefulness for alignment purposes was argued for [6]. However no shared agreement seemed to emerge from the DEMO community about how DEMO should be further developed, sold, better supported by tools or even about what DEMO was: a method, a language?
- We considered that DEMO was a method to model enterprises. DEMO allows, amongst other, to model processes [5, 7].

- We knew practitioners who accepted to have their projects investigated, on which they worked with DEMO.

Our goal was to discover what people in contact with DEMO have to tell about DEMO usefulness, DEMO ease of use and DEMO added-value. Interview guideline questions were based on a Design Science (DS) literature review. Interviews took place in three different project contexts: Air France KLM, Rijkswaterstaat and VISI.

Preliminary results of these interviews suggested that:

- Both DEMO modellers and beneficiaries were interested in DEMO and are confident DEMO.
- There was no shared agreement about what constitutes DEMO added-value, which may impair the evolution of DEMO.

During the interviews, DEMO practitioners, authors, beneficiaries and researchers showed a deep interest for the study, that would provide them a clearer and hopefully more shared view about DEMO usage and added-value, which might help them orient and steer the evolution of DEMO.

#### 1.4 (we think that) the Problem is Unsolved, So Far.

We could find in the literature:

- a theoretical model for validating IS design methods (called a method evaluation model) [8],
- reflections about modelling *languages* evaluation [9],
- a quality framework for evaluating the quality of process models [10],
- a comparative analysis of business modelling techniques [11],
- and a conceptual framework for classifying methodologies for designing and engineering organizations. Two methodologies<sup>1</sup> have been analysed by the authors with this framework. This analysis permitted “to better understand to which ends the methodologies provide which means” [4].

However, we could find no framework that is readily usable by practitioners to gain knowledge about what can be expected from BPMMs for defined types of problems. The framework proposed in [4] partially addresses this problem but may not be readily usable as such by practitioners. Method engineering literature relies on the concept of classes of problems [12], however, studies about method evaluation are often limited to a specific problem and not to a class of problems or to a specific method as in [13]. In [14], the authors identify “the problems facing SME<sup>2</sup>s in innovation processes and the possible support offered by business modelling techniques” but do not allow the selection of specific techniques. In [15], the authors reflect upon design science artefacts within the sustainable ICT capability maturity

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<sup>1</sup> DEMO and PICTURE

<sup>2</sup> Small and Medium Enterprises

framework, but their reflection is not method evaluation oriented. A framework to design the Design Science Research evaluation activity is proposed in [16].

A more thorough literature review is required at this stage. To the best of our current knowledge, there is no existing BPMMs evaluation framework that is readily usable by practitioners and combines the selection of an evaluation strategy and the selection of evaluation criteria according to an evaluation goal.

## **2 Research Effort Goal, Research Questions and Testable Objectives**

### **2.1 Proposed Goal of Research Effort**

We would like to improve organisations benefits from using BPMMs. To do so, we aim at developing a framework to evaluate BPMMs.

The goal of our research effort is to design a framework to help practitioners perform a naturalistic ex-post evaluation [16, 17] of the appropriateness of BPMMs towards classes of problems.

This framework would:

- Be readily usable by practitioners,
- Help practitioners to select an evaluation strategy and evaluation criteria according to their goal when evaluating BPMMs,
- Provide a way of actually performing the evaluation,
- Take into account stakeholder's points of views about the method to be evaluated.

Two scenarios are considered: in the first one, the practitioner wants to select one or several BPMMs to model business processes accordingly to business processes modelling goals. In this case the framework should allow the practitioner to elaborate a list of desired features that candidate BPMMs should have and to match these features to actual BPMMs. In the second scenario, the practitioner wants to evaluate a given BPMMs. The framework should allow him or her to select a list of evaluation criteria accordingly to the evaluation goals and provide a set of steps to actually perform the evaluation.

Sub-goals of the proposed PhD project are:

- Design a framework for evaluating BPMMs according to Design Science criteria,
- Instantiate this framework on specific cases,
- Conclude about the validity of this framework.

One of the cases on which we will try this framework is the use of DEMO. Other cases have not yet been determined.

## 2.2 Research Questions

Our main research question is: “How to evaluate the appropriateness of BPMMs to classes of problems in practice?” We refined it into sub-questions:

1. What strategies and criteria can be used to evaluate BPMMs?
2. How to apply them?
3. What are the implications for theory and practice?

## 2.3 Testable Objectives: Expected Outcomes of Research Effort.

Build and evaluate are the two main pillars of design science practice [18, 19]. They constitute the testable objectives of our research effort: build the framework and evaluate it.

### Build the BPMMs Evaluation Framework.

- In order to define the framework, a *requirement engineering* phase about the use of the framework should be performed. This phase would address for example questions such as: “For what context or goals will the framework be used? Who will use the framework? What are the constraints to which the framework should comply, e.g. time or cultural constraints?”
- The actual *design* of the BPMMs evaluation framework is the second phase. It relies on the Design cycle identified by Hevner et al. in [19].
- We then plan to *validate* the framework in order to check to what extent the designed BPMM appraisal framework a priori fulfils the requirements that have been defined during the first phase.
- Then, in the *implementation* phase, we plan to instantiate the framework on case studies (DEMO and at least another one).

### Evaluate the BPMMs Evaluation Framework.

As any design artefact, the framework to be produced should be evaluated [20, 21]. We plan to evaluate the framework against utility, detect adaptations that should be brought to it, its limits and see to what extent it could be applied to evaluate other methods (external validity). In [16] the authors propose a framework to design the Design Science Research evaluation activity.

## 2.4 Identification of Target Audience and Beneficiaries of the Thesis.

In the paragraph “To Whom Does the Problem Matter?” of the section 2 “Problem.”, we explained that people who select, apply, sell BPMMs or benefit from them are impacted by the problem we defined above. However, we expect the framework beneficiaries to be rather people who select, apply or sell BPMMs than the BPMM’s final beneficiaries. Indeed, the former ones might be more aware of the problem. Besides, researchers also constitute a target audience for the thesis.

Here is how we expect the thesis to be valuable for BPMMs stakeholders and researchers. The *theoretical part* of our work mostly targets BPMMs stakeholders: we see the thesis possible contribution to the research knowledge base in the definition of evaluation criteria for BPMMs. Still, it's the *practical application* that we clearly expect to be the main contribution of this thesis. The practical implication of our work consists in a framework that helps people to evaluate the appropriateness of one or several BPMMs for some goals and classes of problems. An example goal is to propose effective evolutions for a BPMM or to select a BPMM to visualize processes for improving the managerial processes of a small enterprise.

The application of principles and recommendations concerning Design Science Research might provide feedback to the DS community, for example we plan to use the framework for evaluation in DS research proposed by Venable, Pries-Heje and Baskerville [16].

## 2.5 Considerations about our Research Effort Scope.

Previous paragraphs aim at scoping the research effort. However, further scoping is required. Although the table below is not complete, it presents our initial reflection and some open questions about our current scope.

**Table 1.** Scoping of research effort – Some questions to be addressed

| <i>Subject theme</i>                                                          | <i>Subject and questions to be addressed</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluand scope: business process modelling method definition                  | <p><u>What is a method?</u> What method definition will we use?</p> <p>We have to answer questions like: “If the users of an artefact think that this artifact does not include a way of working, can we still evaluate this artefact as a method?”</p> <p>Where do we situate the difference between a method and the context in method definition? In other words, where is the frontier between the method purpose and the method scope?</p> <p>From an evaluation perspective, what are the differences between any IS (DS) artefact and an IS (DS) method?</p> <p>What are the differences between any IS (DS) method and a BPMM?</p> <p>What do we call a business process?</p> |
| Framework validity                                                            | Identify and investigate concerns that relate to any IS Design Science artifact evaluation and concerns that are specific to BPMMs evaluation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Framework scope: evaluation scope in terms of evaluation criteria             | <p>What features of a method do we want to evaluate (e.g. utility, usefulness)? What does a method do? What can be expected from it within the scope in which it is applicable? [16]</p> <p>Evaluation criteria selection depends on evaluation goals. What are the implications for the evaluation framework?</p>                                                                                                                                                                                                                                                                                                                                                                    |
| Framework scope: evaluation scope in terms of generality versus instantiation | <p>Evaluate an instantiation of a method (= a specific performance) for a specific purpose: “How did this method perform in this project?”</p> <p>Evaluate the method “in general” answering questions such as: “What can be expected from this method? Under which conditions?” [16]. This type of evaluation may or not be based on evaluation of instances.</p>                                                                                                                                                                                                                                                                                                                    |
| Framework scope                                                               | Do we address naturalistic or experimental, ex-ante or ex-post evaluation?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Evaluation results bias and validity                                          | <p>What is the influence of the modeller on BPMMs use?</p> <p>What is the influence to the evaluator on BPMM evaluation results?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

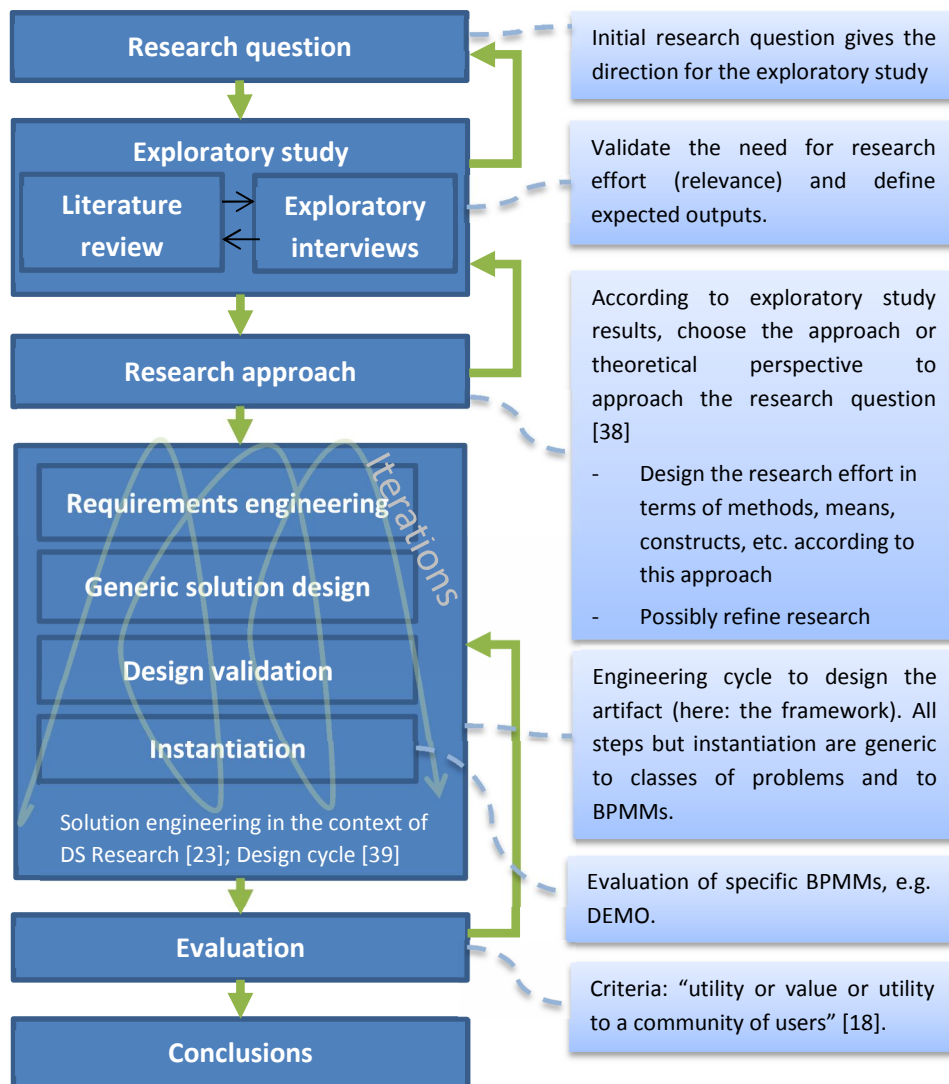
### 3 Research Design

#### 3.1 Underlying Principles of the Approach: A Design Science Perspective.

We base our research effort on an Information Systems (IS) Design Science (DS) perspective because IS DS addresses the problems of building and evaluating artefacts and we want to design and evaluate a framework to evaluate BPMMs.

#### 3.2 Work Plan.

Our work plan is inspired by a research process for social sciences presented in [22] and the engineering cycle according to [23].



### 3.3 Research Methods.

The choice of the research methods we will use depends on the research philosophy we adopt [24]. We still have to define this one accurately. Mixed methods research is possible provided that chosen methods are consistent with adopted research philosophy [25].

For the *preliminary exploratory study* (see **Error! Reference source not found.**), we adopt a qualitative research approach, because it is aimed at understanding phenomena and provides modes and methods for analysing text [26, 27]. Qualitative research can be positivist, interpretive, or critical [26]. We chose an interpretive approach because it allows to produce “an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context” [28]. In [29], Walsham exposes the following: “Interpretive methods of research adopt the position that our knowledge of reality is a social construction by human actors. In this view, value-free data cannot be obtained, since the enquirer uses his or her preconceptions in order to guide the process of enquiry, and furthermore the researcher interacts with the human subjects of the enquiry, changing the perceptions of both parties. Interpretivism contrasts with positivism, where it is assumed that the “objective” data collected by the researcher can be used to test prior hypotheses or theories.” We use an interpretive approach to explore the current use of BPMs, because methods are artefacts that are designed, performed and evaluated by human people and whose performance strongly relies on people’s views, culture and knowledge. We already collected and analysed data about case studies through semi-structured interviews [27, 30].

For the *preliminary exploratory study* (see **Fig. 2**) aiming at understanding and refining the research questions, we adopted a qualitative research approach, because it is aimed at understanding phenomena and provides modes and methods for analysing text [26, 27].

The *research approach definition* relies on DS literature and social science literature [22].

The requirements engineering step of the *solution engineering phase* relies on a literature review about method evaluation and on interviews to elicit stakeholders’ expectations about the framework.

As for the instantiation and validation of the framework, a strong reliance on case studies is expected to ensure that research results are empirically grounded, tested and relevant for the intended audience [31]. Case studies may be used in various research approaches [24]; it is the way they are conducted and analysed that partly depends on the philosophical research assumption.

Besides, *for evaluating the framework*, direct observation, interviews and possibly large-scale surveys – which are usually used for positivist research projects but leave some room for interpretation [24] – may be performed.

We still have to reflect upon the methods we will include within the framework.

## **4 Why Believe That the Framework will Contribute to Solve the Problem**

### **4.1 Expected Contributions of the Proposed Framework to Problem Solution.**

We expect the framework to be developed to be usable as a tool in organizations or by external consultants in order to:

- better benefit from BPMMs already in use in an organization,
- or select BPMMs for a given problem in an organization.

In paragraph “Identification of Target Audience and Beneficiaries of the Thesis” we explained that we expected the thesis to be valuable for BPMMs stakeholders. Still, as not all organizations can afford spending time in applying such a framework, the main benefits of the framework for the organisations might be a comparison table between a set of BPMMs which would be the result of the evaluation of these BPMMs by a researcher or a consultant with the aid of our framework. Consultancy firms involved in BPM modelling may also be interested by such a table, if not the framework itself.

### **4.2 Aspects in which We Think That the Suggested Solution is Different, New or Better as Compared to Existing Approaches to the Problem.**

We expect the approach supported by the framework to be new in the way that evaluation criteria for BPMMs appropriateness are defined – as we explained in [27], we plan to rely on criteria of progress for IS DS theories proposed by Aier and Fischer [32] to define them – and in the way we propose to combine already existing evaluation frameworks, reflections and rules. We expect the future framework to provide a view of what a method can propose that takes various stakeholders’ points of view into account.

### **4.3 How does the Proposed Solution Relate to Existing Work?**

The framework will strongly rely on:

- Existing IS DS artefacts evaluation frameworks, e.g. [16], to reflect upon the evaluation of BPMMs and of the proposed framework,
- Additional existing literature about evaluation in DS
  - o whether it relates to artefacts [13, 33]
  - o or to theories [32, 34]: indeed, we adopted Aier and Fischer’s position that “evaluation criteria for IS DSR artefacts should be strongly related to those for IS design theories” [32].

Besides, we will also investigate DS literature to help us reflect upon and justify the way we design the proposed framework (and then, again, the way we evaluate it; which might also be an input for BPMMs evaluation). For example, Fischer and

Gregor’s paper “Forms of Reasoning in the Design Science Research Process” [35] and Fischer, Gregor and Aier’s paper “Forms of Discovery for Design Knowledge” [36] could help us reflecting upon the framework design and evaluation.

As a method is a design artefact [18], literature about design artefacts quality, artefact evaluation and method quality may be useful. Sources from the situational method engineering community may also be valuable for our purpose, both because the future framework aims at evaluating methods and because the framework itself may include a method.

This list is not exhaustive.

## 5 State of the Thesis and Future Plans

### 5.1 Current State of the Thesis.

The preliminary exploratory study (**Error! Reference source not found.**) has been performed and partially analysed. Two papers have been written about it, the first one presents the research approach for qualitative interviews [27] and the second one, “What does DEMO do? A qualitative analysis about DEMO in practice: founders, modellers and beneficiaries” [30], which is accepted at EEWC 2014, presents some results of this exploratory study. The literature review is in progress. The main part of the work has to be performed.

### 5.2 What Has Been Done so Far.

| <i>Activity</i>             | <i>Details</i>                                                                                                                                                                                                                                        |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <b>2012</b>                                                                                                                                                                                                                                           |
| Reading and trainings       | Attended trainings: TOGAF (trainers: haled Gaaloul, Erik Proper), DEMO (trainer: Niek Pluijmer), Mentoring (trainer: LuxDoc association), SIKS doctoral school. Interviewed researchers at Tudor Research Center about how to do a literature review. |
| Exploratory study           | May-July: 13 qualitative interviews about the use of DEMO in practice.                                                                                                                                                                                |
| PhD official start          | December 1st Theoretical (administrative) beginning of PhD.                                                                                                                                                                                           |
|                             | <b>2013</b>                                                                                                                                                                                                                                           |
| Industry track at EEWC 2013 | Presentation of preliminary results of interviews in the industry track session, Céline Décosse and Niek Pluijmer                                                                                                                                     |

|                                              |                                                                                                                                                                                                                                               |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accepted paper at PoEM 2013 conference       | PoEM 2013 conference - Riga (Practice of Enterprise Modelling) - <i>A Qualitative Research Approach to Obtain Insight in Business Process Modelling Methods in Practice</i> , Céline Décosse, Wolfgang A. Molnar, and Henderik A. Proper [27] |
| Observing DEMO in practice                   | 3-day observation of DEMO in practice run by a consultant (Niek Pluijmert) at Caritas Coopération Internationale Luxembourg. Interview of workshop participants.                                                                              |
|                                              | <b>2014</b>                                                                                                                                                                                                                                   |
| Accepted paper at EEWc 2014                  | <i>What does DEMO do? A qualitative analysis about DEMO in practice: founders, modellers and beneficiaries</i> , Céline Décosse, Wolfgang A. Molnar, and Henderik A. Proper [30]                                                              |
| <b>PhD effort current state (March 2014)</b> | 1.3 years of PhD effort (minus some 2-day trainings given about how to write requirement documents, plus some research effort performed before December, 1 <sup>st</sup> 2012).                                                               |

### 5.3 Next Steps.

- Refine research questions.
- Scope the research effort.
- Perform requirements engineering activity and identify classes of problems to be addressed.

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I thank Daniel Berry for his slides about how to do a PhD (and to present it) [37].

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