# Chapter 14
# Requirements on Dimensions for a Maturity Model for Smart Grids Based on Two Case Studies:
## Disciplined vs. Agile Approach

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## ABSTRACT

*This contribution describes two different types of requirements engineering analysis of the necessary dimensions of a possible maturity model for Smart Grids to be implemented for utilities. For the first case study, the requirements engineering for necessary dimensions for a Smart Grid maturity model was elicited using a systematic literature research. On the contrary a more agile approach is used for the second requirements engineering. For this more agile approach, interviews with energy suppliers were conducted, taking into account the analysis of the literature research. Various energy suppliers from Germany took part in the survey. The results were used to develop the basic framework for a maturity model for Smart Grids, which can still be tailored if necessary. Finally, future research activities for the application and further development of maturity models for Smart Grids in the energy industry are explained as well as the different procedural variants in the requirements analysis.*

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## INTRODUCTION

At present, the issue of energy system transformation and climate targets is of crucial importance for politics and society. In order to be a successful utility in the future, it is important to move from a previously centrally controlled grid infrastructure to a decentralized, dominated structure. Only through a decentralized grid infrastructure is it possible to guarantee increasing feed-in from renewable energy into the grid (Appelrath, Mayer, & Rohjans, 2012).

This decentralization of the grid can be achieved through increased measurement, control and automation of the electricity flow, as well as regional high-resolution monitoring and control of the electricity grid. To achieve this, the electricity grid is to be modernized and made more intelligent through new information and communication technologies (ICT) (Projekt Green Access, 2019).

More and more research and development projects are dealing with the topics of the energy grid of the future, innovative technologies, the addition of storage facilities, etc. This shows that the subject is of great interest for practice and science.

In this contribution, a maturity model will be applied as an evaluation model for utilities. Through the use of evaluation models, the continuous improvement of a company is aimed at, whereby the focus is on comparison, i.e. "learning from the best" (Uebernickel, Stölzle, Lennerts, Lampe, & Hoffman, 2015). This maturity model should be specific to the energy domain in order to analyse the specific dimensions there. This analysis is necessary for a utility to know its status quo. Only when the status quo is known can the goal of making the own grid more modern and intelligent be pursued.

Due to the strong change in the energy domain that demands a high degree of change from utilities – in processes, procedures, methods and technologies – flexibility, adaptability, changeability and willingness to company-wide change processes play an increasingly important role.

A domain-specific maturity model has to be developed for two research projects in Germany, each of which uses different approaches and ideas to research and test new technological solutions for an intelligent power grid. Both case studies involve distribution system operators.

In this chapter we report on how the requirements for the dimensions of the maturity model to be developed were determined in these two research projects - case studies "utility 1" and "utility 2".

Due to the increasing importance of agility in business, the approach of requirements elicitation will be conducted with two different methods: a disciplined and an agile approach.

The following research questions are to be answered:

**RQ1:** Is there already a suitable maturity model in the literature that can be used for this case studies?
**RQ2:** If a new maturity model is necessary, which dimensions of a utility have to be considered?
**RQ3:** Which approach is the better one for collecting the requirements for the dimensions, a disciplined or an agile one?

This contribution is structured as follows: The section "Introduction" briefly presents the motivation for dealing with the topic. Section "Background" represents the basic terminologies and section "Disciplined Maturity Models vs. agile Maturity Models" describes the differences between these kinds of maturity models. The research methodologies of the two case studies are presented in section "Research Methodology" and the results are presented and interpreted in section "Results".