

SOA governance in the Low Countries

The consequences of national culture on SOA governance in the utilities sector

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Master thesis

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I. Abstract

When organizations start adopting service oriented architecture (SOA) as their main enterprise architecture (EA), they often face many obstacles that can be mitigated by performing good SOA governance. A prominent example of a sector in which many organizations choose SOA as their EA is the utilities sector. Furthermore, organizations are influenced by national culture, because employees reflect their national culture in the form of habits, manners, norms and values.

This research explores the relation between SOA governance and national culture in the utilities sector. A literature study on the topic of SOA governance and SOA governance maturity is performed. Based on the literature study, a SOA governance maturity model is developed and evaluated by experts. Using that model, SOA governance maturity is investigated at four electricity suppliers in the Netherlands and Belgium, forming a case study.

Five propositions are formulated based on academic literature about the relation between national culture and elements of SOA governance maturity. The propositions are tested against the results of the case study. For two out of five propositions it was found that they are supported by evidence in practice. Furthermore, the results show that a weak relation between SOA governance maturity and national culture exists. However, other factors also play an important role in a utility company's SOA governance maturity.

Key words: SOA governance, national culture, utilities sector

II. Acknowledgements

This thesis marks the end of my life as a student and the commencement of my professional career. It is a point in time that has been on the horizon for a long time and now finally has become reality. Writing this thesis has been a somewhat stressful, but highly educational and joyful experience for me. Finishing it would not have been possible if not for a number of people, whom I would like to thank in this section.

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VI. List of key abbreviations and definitions

Enterprise architecture (EA) – EA is the high-level set of views and prescriptions that guide the coherent design and implementation of processes, organizational structures, information provision and technology within an organization. EA provides the organization with high-level solution directions, constraints and overall views and therefore focuses on the relatively stable essentials of the enterprise as a whole (Foorhuis & Brinkkemper, 2008)

SOA – Service Oriented Architecture. SOA is a software architecture that is designed around loosely coupled software components called services, which can be orchestrated to improve business agility (Schepers, Iacob, & Van Eck, 2008). Moreover, SOA contributes to the reduction of development and maintenance costs, better quality through service reuse and reduced time to market (Janiesch, Korthaus, & Rosemann, 2009).

Service – A service is a well-defined, autonomous software component that is designed with reusability in mind (Schepers et al., 2008).

SOA governance is a holistic, long-term management model. It guarantees sufficient adaptability and integrity of a SOA system as well as the ability to check services concerning capability, reusability, security, and strategic business alignment. Overall goals are SOA compliance and the guarantee of reusability and standardization throughout the system (Niemann, Janiesch, Repp, & Steinmetz, 2009).

Maturity model – The purpose of maturity models is to assess the maturity of a selected domain based on a more or less comprehensive set of criteria (De Bruin, Rosemann, Freeze, & Kulkarni, 2005).

Maturity – Refers to the extent to which a specific process is explicitly defined, managed, measured, controlled and effective (Pauik, Curtis, Chrissis, & Weber, 1997).

SOAGMM – We define the abbreviation SOAGMM as SOA Governance Maturity Model. It is a maturity model used to determine the maturity level of SOA governance within an organization.

Utilities sector – We define the utilities sector as a sector that contains companies such as electric, gas and water firms and integrated providers (Elkington & Smallman, 2002).

1. Introduction

Governance is a topic that comes and goes in waves. As Löring (2009) posited, one of the last waves where governance became a hot topic again was during the financial crisis and the following period. Prior to that, during the early 2000's after a vast series of scandals within Ahold, Enron and Worldcom, governance also entered the agenda once again (Daniel et al., 2009). Many jobs were lost and vast losses were made. As a result, corporate governance codes were composed and in some cases converted into laws (e.g. the Sarbanes-Oxley Act).

Over the years, the governance framework developed from an originally corporate level issue into more narrowly defined subsets, for instance financial governance, IT governance and SOA governance. SOA governance is the governance of a Service Oriented Architecture (SOA), which in turn is a software architecture that is designed around loosely coupled software components called services. One of the main benefits of deploying SOA in an organization is that it can be orchestrated to improve business agility (Schepers et al., 2008) and efficiency through service reuse (Janiesch, Korthaus, et al., 2009). Furthermore, SOA provides the ability to address challenges such as constantly changing market conditions, new competitive threats and dealing with the increasing number of legal regulations (Niemann et al., 2009).

Of all the sectors that have a great need for SOA governance, the utilities sector is a prominent example (Marvin, Graham, & Guy, 1999). Part of the utilities sector is the specific market our research focuses on; the electricity market. The electricity market was largely liberalized around the world during the past twenty-five years. This introduces many new facets to organizations in the energy market, which have to be dealt with (Abbott & Cohen, 2011). However, governments still play a role in the supply chain; they uphold laws by instituting regulatory agencies. Electricity suppliers have to navigate between the influences of the government on the one hand, and the demands of the liberalized electricity market on the other hand. When further looking at the electricity market we see a complex structure of production, distribution and supply, some firms operate exclusively in one section of the supply chain, while others operate in several segments at once (Smart, 2005). The philosophy of SOA, with its focus on flexibility, is a good fit with the complexity of the electricity market and the electricity suppliers in it.

Hofstede, Hofstede, & Minkov (2011) found that every country has its own national culture and consequently, when growing up every infant is formed in such a way that is socially desirable for his or her own national culture and society. Besides a national culture, every country has its own laws and regulations. National laws and regulations are heavily influenced by national culture and national history (Hofstede et al., 2011) and are interconnected. Therefore, national laws and regulations are also unique to every country, although they are not considered part of national culture (Hofstede et al., 2011).

When taking into account that one of the main goals of SOA governance is to make organizations adhere to national laws, regulations and standards (Niemann, Eckert, & Repp, 2008), which are greatly influenced by national culture (Hofstede et al., 2011), one would expect a relation between SOA governance and national culture. However, it is unclear whether such a relation exists. Furthermore, if

such a relation were to exist, it is unknown what exactly this relation is, what causes it and what is the effect of the relation.

1.1.Problem statement

Multiple scholars (e.g. Janiesch, Korthaus, et al., 2009; Papageorgiou et al., 2009) found that SOA governance lacks a common definition in current literature and can indeed mean many things according to the respective project. Many software companies also introduced their own definitions in white papers, often on behalf of their own commercial market interests (Janiesch, Niemann, & Repp, 2009).

As previously stated, there is a lack of insight in the relation between SOA governance and nationwide laws, regulations and culture with regard to the utilities sector. To cover up this blind spot, this thesis will deliver a comparison in the field of SOA governance between Dutch and Belgian utility companies. Doing so, a structured insight on SOA governance in the utilities sector in the two countries is provided. Afterwards, possible explanations from a point of view of national culture are suggested to interpret the differences.

The formal problem statement of this thesis project is therefore stated as follows.

There is a lack of understanding of the relation(s) between SOA governance and national culture, specifically in the utilities sector.

SOA governance as such is not always easy to measure and compare (Mohindroo, 2009). One particular way of benchmarking similar organizations is by using a maturity model (De Bruin et al., 2005; Maier & Moultrie, 2009). Maturity models are artifacts that show an organization's status quo of its capabilities and deriving measure for possible improvements by showing an evolution path between distinct stages (Becker, Knackstedt, & Pöppelbuß, 2009). Based on this, we will focus on SOA governance maturity as a unit of measurement to compare Dutch and Belgian utility companies.

This formal problem statement is rather broad, but it provides direction and guidance to narrow the scope. The following section will describe the research questions that are formulated to address the problem statement.

1.2.Research questions

To address the main problem statement, a main research question is formulated along with sub questions to provide guidance, direction and demarcation. The main research question is stated as follows.

What are the differences of SOA governance maturity between Dutch and Belgian utility companies and what explains these differences from the perspective of national culture?

As previously stated, one of the main goals of SOA governance is to ensure that an organization adheres to national laws, regulations and standards (Niemann et al., 2008). In this light, the main reasoning behind the research question is that if two countries have a different national history and culture, and hence, different laws and regulations, the two countries could also have different levels of SOA governance maturity. Other studies, such as the work of Silviu, de Haes, & van Grembergen (2009), have already shown many influences of national culture on the way IT is perceived or used in a country.

1.2.1. Research questions overview

For referencing purposes, the main research questions and all sub questions are stated below.

RQ. What are the differences between SOA governance maturity of the Dutch and Belgian utility companies and what explains these differences?

SQ1. How to define SOA governance?

SQ2. How can we develop a maturity model that can be used to evaluate the SOA governance of utility companies in different countries?

SQ3. What is the relation between national culture and SOA governance maturity, and how can this relation be explained?

SQ4. To what extent can differences in SOA governance maturity between countries be explained by national culture?

1.2.2. Sub questions

Three sub-questions are formulated to support the main research question. When the sub questions are answered, enough information has become available to provide an answer to the main research question. The sub questions are stated as follows:

SQ1. *How to define SOA governance?*

There is a lack of consensus amongst scholars about the exact definition of SOA governance. Many different definitions of the term SOA governance exist, such as the definitions provided by Janiesch, Korthaus, et al. (2009), Ott, Korthaus, & Rosemann (2010) and Papageorgiou et al. (2009) Because it is one of the main topics of this research, it deserves a thorough theoretical foundation and definition. The other topics – national culture and the utilities sector – are much more mature from an academic point of view and therefore do not require corresponding sub questions. Recent literature on the topic of SOA governance from varying sources will be presented and discussed to provide the leading definition that will be used as a basis throughout the rest of the thesis project.

SQ2. *How can we develop a maturity model that can be used to evaluate the SOA governance of utility companies in different countries?*

To evaluate the maturity of SOA governance within a country and between countries, we must first develop a way to determine the SOA governance maturity of utility companies. Therefore, a SOA

governance maturity model (SOAGMM) that is used throughout this research will be developed. With SOAGMM, the SOA governance maturity of selected utility companies in the Netherlands and Belgium will be determined. Based on that, the SOA governance of utility companies in the two countries can be compared with each other and further evaluated.

SQ3. *What is the relation between national culture and SOA governance maturity, and how can this relation be explained?*

One of the goals of SOA governance is to ensure that organizations adhere to laws and regulations (Niemann et al., 2009), which are largely determined by national culture (Hofstede et al., 2011). This is especially true in the case of the utilities sector, where many laws and regulations exist to assure that the basic needs of civilians, such as the need for electricity and clean drinking water, are satisfied at an affordable price level and in a safe way.

SQ4. To what extent can differences in SOA governance maturity between countries be explained by national culture?

Following SQ3, when more information is available about the relation between national culture and SOA governance maturity, the next step is to investigate the extent to which differences in SOA governance maturity between countries can be explained by differences in terms of national culture. Differences in national culture always exist, because no two countries share an exactly identical national culture (Hofstede et al., 2011). Hence, the key issue is to discover the extent to which such differences result in differences in SOA governance maturity.

1.3. Research method outline

The main research method for this thesis project is design science devised by Hevner, March, Park, & Ram (2004). Design science is an excellent approach for developing a solution to a practical problem and it is very well suited for the design of artifacts, such as SOAGMM. Design science describes seven research guidelines that should be followed throughout a research project to ensure high quality results. These guidelines are described in section 2.2. Hevner et al. (2004) elaborate that “design science creates and evaluates IT artifacts intended to solve identified organizational problems. Such artifacts are represented in a structured form that may vary from software, formal logic, and rigorous mathematics to informal natural language descriptions.”

This research project is divided into four consecutive phases. In the first phase, a literature study on the three topics of interest (i.e. national culture, SOA governance and the utilities sector) is performed. For this purpose, the scoping review method devised by Hidalgo, Szabo, Brun, Owen, & Fletcher (2011) is used. Based on the literature study, a first version of the SOA Governance Maturity Model (SOAGMM 1.0) is developed in phase 2. SOAGMM is developed using the design science method by Hevner et al. (2004). The development of SOAGMM 1.0 is followed by an evaluation by experts in the area of SOA governance. In phase 3, based on the expert evaluation, version 1.0 of SOAGMM is revised and refined to become SOAGMM 1.1. This new version of the model serves as a basis for determining the SOA governance maturity of utility companies in the Netherlands and Belgium. Furthermore, in this phase propositions are formulated about the relation between national culture and SOA governance. In phase

4, a comparison in SOA governance maturity of Dutch and Belgian utility companies is produced and the propositions developed in phase 3 are evaluated based on the interviews.

1.4. Contributions

In this subsection, the two types of research contributions are discussed. The first type is the scientific contribution of this research to the academic community. The second type is the contribution of this research to society in general.

1.4.1. Scientific contribution

The topic of SOA governance is still young and immature. Consequently, the body of knowledge on the topic of SOA governance has not yet matured (Janiesch, Korthaus, et al., 2009; Papageorgiou et al., 2009). This leaves much room for further research.

Another factor is how differences between the SOA governance of two countries, or two organizations even, can be measured. Comparing two countries in terms of SOA governance in a particular sector has not taken place before.

Given the fact that national laws and regulations are influenced by national culture and national history (Hofstede et al., 2011), combined with the important role of governance when dealing with such laws and regulations, an unknown area of governance and national culture emerges. A large portion of the scientific relevance applies to addressing this unknown area in literature.

In short, this thesis project is scientifically relevant for two reasons. Firstly, it provides a clear vision on SOA governance and how to measure SOA governance maturity in companies. By addressing this blind spot in literature, it provides a solid basis for further research on the topic of SOA governance and SOA governance maturity. Secondly, the combination of SOA governance and nationwide laws, regulations and culture has not been examined before. It may be that this new viewpoint leads to new, important knowledge for academics.

1.4.2. Social contribution

The social contribution of this research mainly lies in the area of two kinds of organizations. First, the organizations that creates laws and regulations, such as governments and other authorities. Second, organizations obliged to live up to such laws and regulations, such as companies in the utilities sector. Additionally, regulatory organizations and consulting firms could also benefit from the outcomes of this thesis project.

Furthermore, large organizations that operate across multiple countries in general may also benefit from this research, because of the cultural aspect that is reflected in the boundaries that have to be crossed when managing people from across different cultures.

Although this thesis project focuses on the utilities sector, lessons from it may still be learned by other sectors that have a need for SOA governance, because certain factors of the utilities sector may also appear in other sectors.

1.5.Outline

The remainder of this document is organized as follows. Section 2 describes the research method used in this research. Section 3 consists of literature on the three main topics: SOA governance, the utilities sector and national culture. Section 4 provides a description of the SOAGMM and how it is developed. Section 5 contains the propositions that are evaluated. In section 6, the participating utility companies are described. Section 7 contains the results and an analysis of those results. In section 8, the results are further discussed and a conclusion is presented.

2. Research design

In this section, the research method and design are further elaborated. The first subsection covers the six phases of this research, followed by an explanation of the main research method that was adopted - design science by Hevner et al. (2004) - in the second subsection. The third subsection describes the research method in place for the literature study. The fourth subsection discusses the use of propositions and why and how they are evaluated. Subsection 5 explains how the semi-structured interviews are conducted. Lastly, subsection six provides an explanation of the purpose of maturity models and how they should be developed according to scientific literature.

2.1. Research phases

This research project is divided into four consecutive steps or “phases”. Each phase is individually described below. Figure 1 visually depicts the overall research model that is used throughout this research project as well as the phases.

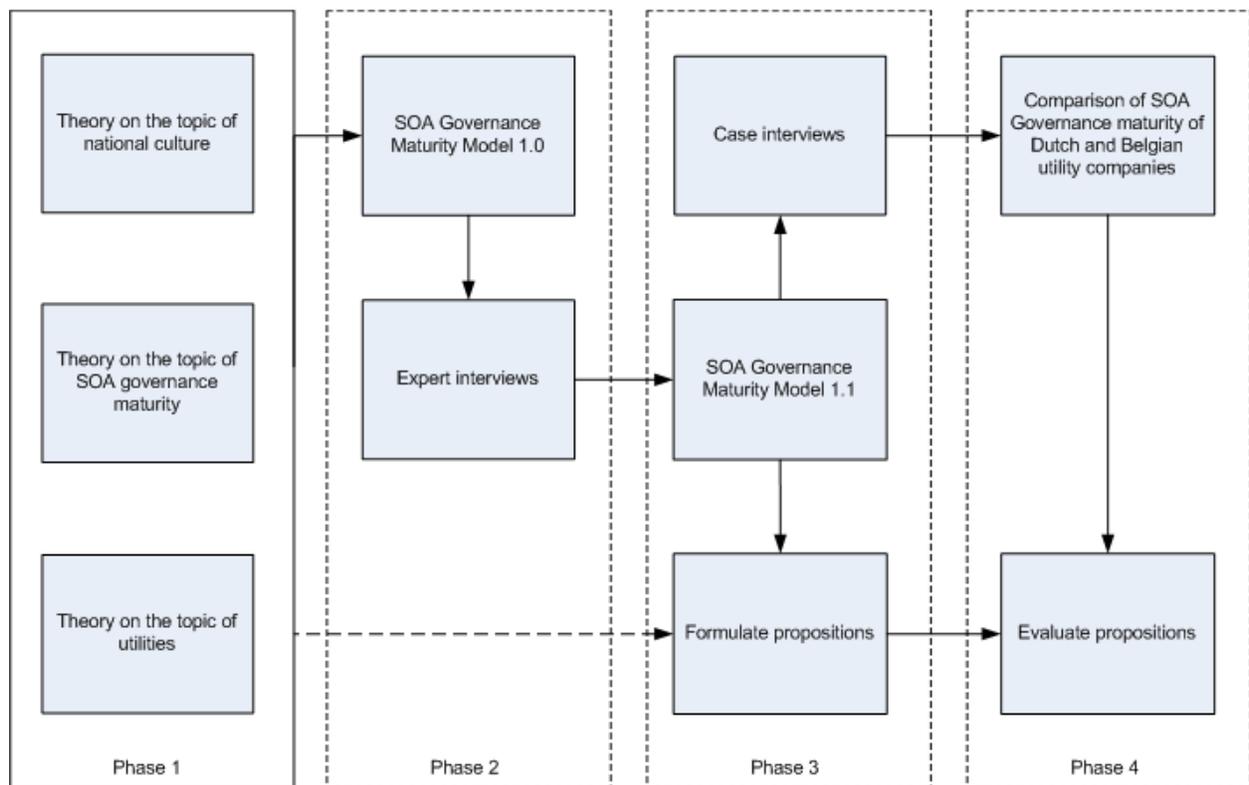


Figure 1 – Research model and research phases

1. In the first phase, a literature study on the three topics of interest (i.e. national culture, SOA governance and the utilities sector) is performed. For this purpose, the scoping review method devised by (Hidalgo et al., 2011) is used. Ultimately, this phase provides a solid knowledge base for the remainder of this research project.
2. Based on the literature study, a first version of the SOA Governance Maturity Model (SOAGMM 1.0) is developed in phase 2. SOAGMM is developed using the design science method by Hevner

et al. (2004). The development of SOAGMM 1.0 is followed by an evaluation by experts in the area of SOA governance (expert interviews).

3. In phase 3, based on the expert evaluation, version 1.0 of SOAGMM is revised and refined to become SOAGMM 1.1. This new version of the model serves as a basis for determining the SOA governance maturity of utility companies in the Netherlands and Belgium (case interviews). Furthermore, in this phase propositions are formulated about the relation between national culture and SOA governance, based on the literature gathered in phase 1.
4. Based on the case interviews, a comparison in SOA governance maturity of Dutch and Belgian utility companies is produced and the propositions described in phase 3 are evaluated.

Table 1 shows an overview of the applied research method applied in each research phase.

Table 1 – Main applied research method for each research phase

Phase	Main research method applied
Phase 1	Scoping review
Phase 2	Design science
Phase 3	Design science
Phase 4	Design science

2.2.Literature

Rather than applying a highly structured research method for conducting the literature study, a more flexible semi-structured approach has been adopted. This is appropriate because the literature review was used as a supporting technique for the design science phases, the main research method applied in this work. Furthermore, a certain degree of flexibility is needed because this research project connects three fields of study: SOA governance, national culture and the utilities sector, which results in increased complexity. The literature review focuses on the SOA governance field of study, but it is also used to gather literature on the topic of the utilities sector.

2.2.1. Scoping review

To facilitate this need for flexibility the lightweight, versatile literature research method scoping review is adopted. Good scoping reviews are systematic literature reviews that provide specialists with relevant, quantified results about the knowledge available on a particular topic, within and without particular a research discipline and community (Hidalgo et al., 2011). Their aim is “to map rapidly the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone projects in their own right, especially where an area is complex or has not been reviewed comprehensively before” (Mays, Roberts, & Popay, 2001). The scoping review method prescribes four steps (Hidalgo et al., 2011):

1. **Define & refine research search terms.** Search terms are in this case lists of words, but concepts behind search words are equally important. Certain ‘jargon’ terms are commonly used in particular research communities, but work on similar concepts outside those communities may use other terms for the same concepts. In order to capture the work of possibly unknown communities, the search query is broadened to include other terms that may refer to the same

concepts. Expanding research terms is not trivial, two mechanisms to perform this task are suggested (Hidalgo et al., 2011): thesauri-based and reports-based. Thesauri-based expansion uses synonyms as defined in a thesaurus to expand the search terms. This is best performed manually so that the meaning of the terms remains consistent. Report-based expansion uses the terms in the literature found by the original search terms to look for further reports. Report-based expansion is chosen in this thesis project SOA governance is an unambiguous term, and no other terms have been found that relate to the same concept. The search terms resulting from this expansion method are shown in table 2.

Table 2 – Search terms used in the literature review

Search terms	
Initial terms	SOA Governance
	SOA Governance maturity
	SOA Governance maturity model
	Electricity Netherlands
	Electricity Belgium
Iteration 1	service oriented architecture governance
	service oriented architecture governance maturity
	service oriented architecture governance maturity model

As is visible in Table 1, the topic of national culture is not part of the scoping review. The work of Hofstede (e.g. Hofstede, 1980, 1991; Hofstede et al., 2011) on national culture provides an adequate knowledge base on the topic. His work – and criticism on his work – on the topic of national culture is further described in section 3.3.

2. **Identify databases and search engines and query using the search terms.** Most academic literature is available on the Internet, where full-text databases can be queried using the defined search strings to obtain candidate studies for review. In this thesis project, the search engines used for the literature review were Google Scholar (<http://scholar.google.com>) and ISI Web of Knowledge (<http://apps.isiknowledge.com>). The former is known to have a wide scope of literature available that has not necessarily been published in academic journals or in the form of conference proceedings. In some cases, this could result in a lack of scientific quality. However, filters are in place to rules such literature out (see also step 3). For the latter, most of the literature has been published in academic journals or conference proceedings. Therefore, the scientific quality of the literature that has been found using this search engine is generally of a very high level.
3. **Create and apply the inclusion & exclusion criteria filters.** The lists of papers returned from the queries in the previous step are passed through a set of filters in order to reduce prior study bias, provide a number that can be feasibly reviewed, remove some irrelevant documents and eliminate other literature of insufficient quality. Three different kinds of filters are proposed: global filters, semantic filters and evidence grade filters. Global filters exclude results based on

metadata of the document, such as author and year of publication. Semantic filters leave out results that have been returned due to the same terms or abbreviations having different meanings. For example, in this thesis project SOA stands for “Service Oriented Architectures”, whereas in a different context and in a different field of study SOA could also mean “Semiconductor Optical Amplifiers”. Evidence grade filters exclude work of insufficient quality; such as if, for example, a study does not have enough supporting evidence or the study is not repeatable. The set of filters that apply to the set of documents are shown in table 3.

Table 3 – Filters applied to the set of papers to be found

Type	Filter
Global	Include only one document by the same author in the same year
	On the topic of SOA governance: Exclude documents previous to the year 2000
Semantic	Exclude documents that use a different abbreviation for SOA than “service oriented architecture”
Evidence grade	Exclude scientific papers that do not show supporting evidence

- 4. Verify if the sub-selection is representative.** In this step, the abstracts of the remaining papers are compared with the abstracts of the original set of papers. If no significantly new material is found, it can be confidently stated that the original set is representative and suitable to use.

After comparing the abstracts of the original set of papers to the set of remaining papers, no significantly new material is found. Therefore, the set of papers is representative and suitable for use.

2.3.Design science

The main research method chosen for this research project is design science, which is a research method that has been devised by Hevner et al. (2004). Design science is seen as a good fit for this research project because it is in the first place a suitable approach for the development of a new scientific artifact, such as the SOA governance maturity model in this research. In their work, Hevner et al. (2004) describe seven guidelines to achieve high quality results for design science research. These seven guidelines are followed throughout the research process and are explained below.

- 1. Design as an artifact.** The artifact that is developed through design research can be a construct, a model or meta-model, a method or an instantiation (Hevner et al., 2004). In this study, the artifact under development is a SOA governance maturity model (SOAGMM).
- 2. Problem relevance.** As previously discussed in section 1.4, the problem addressed in this research is both of high scientific and social relevance. Theoretically speaking, there is a gap in literature on the topic of SOA governance maturity related to national culture. On a practical level, the outcome of this research may greatly benefit organizations that utilize SOA and SOA governance.

3. **Design evaluation.** A form of rigorous evaluation is in order to verify the scientific and practical value of the artifact. To achieve the verification of the SOAGMM, an evaluation takes place in the form of expert interviews with SOA governance professionals, who evaluate SOAGMM 1.0 to ensure its validity in practice. Based on this evaluation, an updated version of SOAGMM is developed. The expert interviews take place in phase 2, as is described in section 2.1.
4. **Research contributions.** The fourth guideline proposes that design science research must provide clear and verifiable contributions (Hevner et al., 2004). These contributions have been more thoroughly discussed in section 1.4.
5. **Research rigor.** Design science research relies heavily upon the application of rigorous methods in both the construction and evaluation of the design artifact (Hevner et al., 2004). This is further explained in the upcoming subsections.
6. **Design as a search process.** The sixth guideline postulates that the research has to be organized as a search for a solution to a problem. In the case of this research project, the problem is the lack of understanding of the relation between SOA governance maturity and national culture. The proposed solution to that problem is developing a SOA governance maturity model and using that model to determine the SOA governance maturity in two separate nations in particular sector, thus gaining more insight in the relation between SOA governance maturity and national culture.
7. **Communication of research.** According to Hevner et al. (2004), design science research must be presented in an effective way to both technology-oriented as well as management-oriented audience. To facilitate the former, attention has been paid to the level of detail in the literature study and the SOA governance maturity model. To facilitate the latter, the results of this thesis project will become available in the form of a scientific article, which is shorter, more comprehensible and much more “to the point” than a full-sized thesis.

2.4.Maturity model development

This section provides a description of what exactly is a maturity model (of which SOAGMM is an example). Furthermore, literature is discussed on how maturity models should be developed.

The purpose of maturity models is to assess the maturity of a selected domain based on a more or less comprehensive set of criteria (De Bruin et al., 2005). A maturity model consists of a sequence of maturity levels for a class of objects, it represents an anticipated, desired or typical evolution path of these objects shaped as distinct stages (Becker et al., 2009). The bottom stage stands for an initial state, in which the organization has little or no capabilities in the domain under consideration. The highest stage represents a conception of total maturity of the same domain. In between these extremes, there typically are a small number of stages, through which organizations can advance, ultimately reaching the highest stage. The maturity model serves as the scale for the appraisal of the position on the path of evolution.

An important observation is that while commercial companies often have the desire to let organizations reach the highest maturity level possible, in reality it is not always beneficial to do so. Often, it is more important - but perhaps less attractive from a commercial point of view - for an organization to reach

the most appropriate maturity level for that organization. The most appropriate maturity level for an organization is not always simply the highest level possible (Rathfelder & Groenda, 2008).

Maturity models may be understood as artifacts that serve to solve the problems of determining an organization's status quo of its capabilities and deriving measures for possible improvements. Based on this, Becker et al. (2009) deduce that the development of maturity models falls within the area of the guidelines developed by Hevner et al. (2004).

Pöppelbuß & Röglinger (2011) devised a number of design principles (DPs) that should be followed during the development to ensure sufficient quality of any maturity model. These DPs serve as a checklist during the design of new maturity models. For that purpose, three application-specific purposes of use are distinguished (Becker et al., 2009; De Bruin et al., 2005; Maier & Moultrie, 2009):

- *Descriptive*: Maturity models serve a descriptive purpose when they are applied for as-is assessments where the current capabilities of the organization under investigation are assessed with given criteria (Becker et al., 2009). The use of the maturity model lies mostly in that of a diagnostic tool (Maier & Moultrie, 2009).
- *Prescriptive*: Maturity models serve a prescriptive purpose when their use indicates how to identify desirable maturity levels and provides guidelines on improvement measures (Becker et al., 2009).
- *Comparative*: Maturity models serve comparative purpose when they allow for internal or external benchmarking. Given sufficient historical data, the maturity levels of similar business units and organizations can be compared (De Bruin et al., 2005; Maier & Moultrie, 2009).

In this research, one of the goals is to compare the SOA governance maturity of two countries in the utilities sector. Therefore, the comparative purpose as described above best fits that objective. Pöppelbuß & Röglinger (2011) describe DPs for all three kinds of purposes. However, only the comparative DPs are listed and explained below, because only comparative DPs are of use in this research project.

- 1) **Basic information**: Maturity models should provide a set of basic information, of which the application domain is an essential part (Becker et al., 2009). The following items are considered to belong to the basic information, along with typical questions that go with the items.
 - a. *Application domain and prerequisites for applicability*: Where and when does the maturity model apply?
 - b. *Purpose of use*: What is the purpose of the maturity model?
 - c. *Target group*: Who can use the maturity model?
 - d. *Class of entities under investigation*: What exactly is examined?
 - e. *Differentiation from related maturity models*: What makes this maturity models different compared to other maturity models covering a comparable domain?

SOAGMM 1.0 and evaluate its validity in practice. Four experts were consulted, divided over three interviews. Two interviews took place with one expert at a time, whereas one interview is conducted with two professionals in one session. Two interviews were setup in a face-to-face manner. One interview took place in a session over telephone, because of practical reasons of a geographical nature. See table 4 for an overview of the interviews.

All four professionals that participated in this round of interviews are currently employed at IBM. They have the following official function titles:

Table 4 – Function titles of participating experts and means of communication

Interview number	Function title	Communication
1	Senior consultant service management and governance	In person
2	Websphere Client Technical Professional	In person
	Software Architect	In person
3	Websphere Client Technical Professional	By telephone

Participants are selected mainly based on their knowledge of SOA governance in practice. Although their titles and exact roles at IBM differ, every participant has had its personal experiences with SOA governance in one role or another.

2.6.2. Case interviews

Based on the expert interviews described in the previous subsection, SOAGMM 1.0 is revised and refined to form SOAGMM 1.1. Version 1.1 of SOAGMM is used to determine the maturity of utility companies in the Netherlands and Belgium. In phase 3, one or two employees per utility company are interviewed in a semi-structured fashion, depending on the size of the company. Apart from earlier arguments stated in this subsection, the interviews are also semi-structured because certain participants may have different levels of expertise and/or knowledge about a particular topic within SOA governance than about other topics within SOA governance. Therefore, there is room during the interviews to treat some topics on a more superficial level than others and pursue other topics with a more in-depth attitude.

Participants are selected based on their role in organizations. The exact roles differ per organization. For a relatively small company like BelgComp2 this person can have the role of Chief Information Officer (CIO), who is a member of the board. In a relatively large company, this person usually has a role on a level just below the CIO, such as 'Lead CIO Office' or 'CIO Office Manager'. Such roles were chosen because such people usually have enough oversight to fully grasp the way the organization copes with SOA, but also have enough contact with the day-to-day implications of SOA in the organization. Furthermore, architects are also a welcome addition to the group of interviewees. They are expected to provide a slightly more practical view on the matter, which adds to the diversity and trustworthiness of the data that will be gathered. An overview of the function titles of the participants is included in table 5.

Table 5 – Function titles of participating experts and their companies

Country	Company	Function Title
The Netherlands	DutchComp1	Lead CIO Office
		Principal Architect
	DutchComp2	CIO Office Manager
Belgium	BelgComp1	Service Center Manager
		Software Architect
	BelgComp2	Chief Information Officer

The preferred number of interviews per company is two. However, at DutchComp2 and BelgComp2 it was only possible to perform one interview due to reasons of a practical nature. It turned out to be impossible to schedule a second interview with DutchComp2 within the available timeframe of the author. Furthermore, BelgComp2 is, as will be discussed later, a rather small company. During the interview with BelgComp2, it became clear for the interviewee that no other person in the organization would be able to conduct such an interview.

3. Literature study and theoretical background

In this section, the three main topics are explained by presenting scientific theory on each individual topic. In section 3.1, SOA governance is discussed, followed by the theoretical concepts underlying the utilities sector in section 3.2. Lastly, section 3.3 presents a selection of available academic literature on national culture.

3.1. SOA governance

Many enterprises currently face the challenge of developing adequate governance mechanisms for SOAs, which introduce new complexities due to the amount of services to be managed (Bernhardt & Seese, 2009). However, for a clear understanding of the term SOA governance the concept of SOA itself must first be further examined.

3.1.1. SOA

There are two fundamental ways of viewing SOA: either as a business architecture or as a software architecture. There are also schools of thought who claim that SOA is both, and then there are those who do not explicitly mention anything about this matter and focus more on what the impact and potential of SOA is rather than what SOA itself exactly is.

Marks & Bell (2006), for example, view SOA as a business architecture and provide the following definition for SOA:

“SOA is a conceptual business architecture where business functionality, or application logic, is made available to SOA users, or consumers, as shared, reusable services on an IT network. “Services” in a SOA are modules of business or application functionality with exposed interfaces, and are invoked by messages.”

By using the words “business architecture” and “business functionality”, this definition clearly lays focus on the business aspect of SOA. Janiesch, Niemann et al. (2009) add to that notion that the SOA paradigm is a holistic approach towards the execution of business processes consisting of services within or across one or more enterprise architecture. They also stress that a structured adaptation is crucial to the success of a company’s SOA and that as an architectural paradigm; SOA defines a number of mechanisms, principles and conditions. Because of that viewpoint, all functions (e.g. business functions) are defined as services.

Supporters of the notion that SOA is a software architecture are numerous. For example, according to Rathfelder & Groenda (2008) and TGI Schepers et al. (2008), SOA is a software architecture in the broader EA field that is designed around loosely coupled software components called services, which can be orchestrated to improve business agility. The first part of this view on SOA clearly provides focus on the software architecture-part of SOA. However, the term business agility already identifies the importance of business as well.

When taking a broader view, most scholars seem to agree that SOA is either a business architecture with many influences in the software architecture area, or vice versa, that SOA is a software architecture with

many influences in the business architecture area. Either point of view marks the essence of SOA; in most cases it is a bit of both (Borges, Holley, & Arsanjani, 2004).

Now that the business/software architecture dilemma is out of the way, the effects and implications of SOA can be further discussed. SOA promises to improve integration of information systems and the alignment of business and IT through such services. Eckert, Bachhuber, Repp, & Steinmetz (2009) add to that notion that SOA fulfills the demand for process orientation, rather than a project orientation. SOA therefore includes both organizational and technological aspects. According to Janiesch, Korthaus, et al. (2009) and Derler & Weinreich (2006), SOA contributes to the reduction of development and maintenance costs, better quality through service reuse and reduced time to market. Furthermore, Schepers et al., (2008) found that SOA promises the ability to improve integration of information systems and improve the alignment of business and IT through loose coupling and design around services.

As Menascé, Casalicchio, & Dubey (2010) noted, SOA enables a multitude of service providers to provide loosely coupled services at different Quality of Service (QoS) and cost levels in a number of service domains. This provides a unique opportunity for businesses to dynamically select services that better meet their business and QoS needs in a cost-effective manner.

By embracing SOA, governance needs to be taken more seriously into account because of the distributed nature of services across lines-of-business. Governance is a key factor of SOA projects success. Without governance, an organization cannot fully understand and benefit of SOA value (Liu, Raahemi, & Benyoucef, 2011). Ultimately, the organizational dynamics and behavioral aspects of SOA will require far more effort than the technology itself (Marks & Bell, 2006).

In short, in our research we view SOA as both a business and a software architecture. Furthermore, SOA promises to increase business agility, improve business/IT alignment and quality, reduce costs, and to reduce time to market. When SOA becomes more prominent in an organization, governance of SOA becomes more important in parallel (Schepers et al., 2008).

3.1.2. Defining SOA governance

So far, scholars have not been able to settle on a definition for SOA governance (Janiesch, Korthaus, et al., 2009; Papageorgiou et al., 2009). While most definitions use roughly similar terms, a lot of variation still exists. They focus for example on different areas within the domain of SOA governance. First, the definition chosen for this thesis project is given. Afterwards it will be further explained and compared with other candidate definitions.

The definition used in our research is as follows (Niemann et al., 2009).

“SOA governance is a holistic, long-term management model. It guarantees sufficient adaptability and integrity of a SOA system as well as the ability to check services concerning capability, reusability, security, and strategic business alignment. Overall goals are SOA compliance and the guarantee of reusability and standardization throughout the system.”

Niemann et al. (2009) and Papageorgiou et al. (2009) agree that SOA governance is a management model that facilitates SOA and creates the best possible environment to make SOA work well in an organization. Furthermore, the definition used by Papageorgiou et al. (2009) is almost identical to the definition used in our research, apart from a few different choices of words.

Bernhardt & Seese (2009) on the other hand do not label SOA governance a management model. Instead, they describe only what SOA governance consists of: the organizational structures, processes and policies that an organization puts in place to ensure SOA success. Apart from the absence of the term management model, this definition is very similar to the definitions that are provided by Niemann et al. (2009) and Papageorgiou et al. (2009).

Ott, Korthaus, & Rosemann (2010) provide the most deviating definition, but still not by much. Although they also agree with Bernhardt & Seese (2009), Niemann et al. (2009) and Papageorgiou et al. (2009) that SOA governance is a way of maximizing SOA usefulness, more focus is put on exercising control and mitigating risk. Like Bernhardt & Seese (2009), they do not label SOA governance a management model.

Most authors agree on the basic elements of SOA governance: organizational structure, processes, policies and metrics (Bell, 2008; Schelp & Stutz, 2007; Shah et al., 2006). These elements are also included in the discussed definitions. However, the definitions are quite long and complex and may be hard to fully understand. The definition by Niemann et al. (2009) is the shortest of all four, but still covers all basic elements and it does so in a comprehensive way. Therefore, the definition by Niemann et al. (2009) is chosen to be used for the remainder of this thesis.

Other authors also give their views on SOA governance, although not always in a formal definition. Schepers et al. (2008) posit that SOA governance is a continuous process. As one SOA project is completed and operational, its results should be blended in within an improved strategy, for the next project. Janiesch, Korthaus, et al. (2009) propose that while the exact definition of SOA governance is under debate, it is at least an increasingly important success factor for today's businesses. Bloomberg & Schmelzer (2006) argue that SOA governance is the application of IT governance to a SOA system. It is how IT governance should operate in an organization that has adopted SOA as their primary approach to enterprise architecture. Mohindroo (2009) found that SOA governance extends and is built upon existing governance disciplines and adds additional elements for considerations that are specific to a SOA environment. Hence, if an organization already has good governance practices in place, its SOA governance will follow suit. Hassanzadeh, Namdarian, & Elahi (2011) add that if SOA governance is successful, the organization can provide high quality and reliable services, which causes the efficiency and effectiveness of the organization to rise.

Numerous authors seem to agree that policies, processes, organization structures and metrics are constituents of a typical SOA governance program (Bernhardt & Seese, 2009; Schelp & Stutz, 2007; Shah et al., 2006). According to Brauer & Kline (2005), "SOA governance is a set of solutions, policies and practices which enable companies to implement and manage an enterprise SOA". Also, an important goal of SOA governance is to let the SOA system adhere to various specification and standards, such as

the previously mentioned Sarbanes-Oxley Act, ISO norms and other regulations (Derler & Weinreich, 2006).

Developing a new definition for SOA governance for our research project was considered an option. However, numerous existing definitions already firmly grasp the essence of what is SOA governance. Furthermore, the amount of overlap among existing definitions steers towards using an existing definition that at least covers that overlap in a clear and comprehensible way, which is exactly what Niemann's definition does. Hence, we will follow Niemann's definition of SOA governance. The notion that scholars have so far been unable to settle upon a single definition does not hinder using an existing definition.

3.1.3. Position of SOA governance in relation with IT governance

SOA governance is closely related to IT governance. However, scholars disagree on the exact relationship between the two concepts. First, a definition of IT governance is presented, followed by a discussion of the relationship between the two concepts.

Weill & Ross (2004) propose the following definition for IT governance: "IT governance represents the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT". According to the same authors, a notion should be made that IT governance is rather different when compared to IT management, with which many people tend to confuse it with. Management is concerned about what specific decisions are made. Governance is concerned about systematically determining which person or role makes each type of decision (a decision right), which person or role has input to a decision (an input right) and how these people are held accountable for their role. Good IT governance draws on corporate governance principles to manage and use IT to achieve corporate performance goals. Governance has been seen as one of the most important success factors of IT for many years and enterprises presently invest considerable resources into the implementation of IT governance frameworks such as Cobit (IT Governance Institute, 2007).

Authors disagree whether SOA governance is in fact a *subset* of IT governance (e.g. Holley, Palistrant, & Graham, 2006) or an *extension* of IT governance (e.g. Janiesch, Niemann, et al., 2009; Niemann et al., 2008). If SOA governance is considered a *subset* of IT governance, it would imply that SOA governance only covers an area within the scope of IT governance. Therefore, the exact scope that is covered by SOA governance must be smaller than the scope that is covered by IT governance. In this situation, SOA governance cannot cover areas outside the scope of IT governance. If SOA governance is considered an *extension* of IT governance, it would imply that SOA governance could cover the same scope that IT governance covers, plus an extra area that is not covered by the scope of IT governance.

Based on the above, in this thesis project SOA governance is viewed as an *extension* of IT governance. Although SOA governance has much overlap with IT governance, it also applies to a spectrum of issues that is beyond the scope of IT governance because of the special nature of SOA, such as service lifecycle management (Schepers & Kratz, 2009; Software AG, 2007) and service portfolio management (Afshar et al., 2007; Schepers & Kratz, 2009). Furthermore, Schepers et al. (2008) found that SOA governance is essentially different from IT governance in that it also requires the involvement of business

management and of line-of-business employees. Additionally, this view on the relation between IT governance and SOA governance is gaining more ground in the academic community (Bernhardt & Seese, 2009).

3.1.4. Recap on SOA governance

Summarizing, we view SOA as both a business and a software architecture, because SOA has implications for both the business side of an organization as well as the IT-side of an organization. In this view, when SOA gains a more prominent role in an organization, so does SOA governance.

Although SOA governance is a relatively young topic in the academic world, numerous definitions are available. The youth of the topic at hand is perhaps also one of the reasons that academics have not been able to settle on a standard definition yet. Nevertheless, in our research an existing definition of SOA governance will be used; the one provided by Niemann et al., (2009), because out of all candidate definitions, Niemann's definition was found to be most concise and comprehensive, without leaving out any necessary information.

Lastly, the relation of SOA governance with IT governance is a point of discussion. One school of thought views SOA governance as an extension of IT governance, whereas another school of thought has the opinion that SOA governance is a subset of IT governance. After careful consideration, in our research the decision has been made to view SOA governance as an *extension* of IT governance, because SOA governance shows a large proportion of overlap with IT governance, but also covers another area of phenomena outside IT governance. Additionally, this notion is also gaining more support among academics (Bernhardt & Seese, 2009).

3.2. The utilities sector

The utilities sector, or more specific, the electricity sector will be described in this section. First, an introduction is given about the sector and the regulatory agencies within the sector. Second, an explanation of the model used to describe the Dutch and Belgian electricity markets provided. The third and fourth subsections contain the actual descriptions of the Dutch and Belgian electricity markets.

3.2.1. Independence of regulatory agencies

According to Abbott & Cohen (2011), one of the consequences of the reform of the utilities sector around the world over the past twenty-five years has been the growth in the number of government agencies, which regulate the activities of utility companies, that have been established. In many countries, state-owned entities have been responsible for the delivery of such services as electricity, gas, water and telecommunications. These entities were often responsible for not only the production and delivery of services but also other things such as planning, policy formulation and other regulatory matters. More recently, as utility markets have been opened up to greater levels of competition (liberalization) and in some cases government owned assets privatized, the tendency has been to separate regulatory and policy functions into different entities. This means that regulatory agencies in energy, telecommunications and other industries, which were once only common in countries like Canada and the United States, have now emerged in many parts of the world, and also in the Netherlands and Belgium (Hobbs & Rijkers, 2005). Liberalization of the electricity markets was realized

by law in the Belgium in 2003 (Vinck, 2008), the Netherlands followed a year after (Energiekamer Nederlandse Mededingingsautoriteit, 2011).

An important issue that rises with the establishment of regulatory agencies is the degree to which they should be independent. First, the term “independent regulatory agencies” needs a clear definition. Ocana (2002) defines independent regulatory agencies as:

“Autonomous public bodies empowered to regulate specific aspects of an industry. Regulatory agencies may also have judicial or quasi-judicial powers such as setting fines and penalties for non-compliance or acting as an arbitrator in disputes among industry participants.”

In this context, independency specifically means *political* independency, i.e. the regulatory agency is protected from short-term political interference. When independency is used in the context of *economic* independency, the question of independence is also an important issue (Stern, 1997). In this context, independence generally means that a regulatory agency has an arm’s length relationship with the regulated firms, political authorities and consumers. It also means organizational autonomy in terms of funding and operations as well as some degree of discretion about how they exercise their powers (Smith, 1997).

Today’s industry of electricity is a complex structure of production, distribution and supply, with some firms operating exclusively in one section of the supply chain and others who operate in several segments at once (Smart, 2005). This increases the need for regulatory organizations in the supply chain and the need for good governance across the supply chain (Marvin et al., 1999).

3.2.2. Porter’s five competitive forces

To describe the Dutch and Belgian electricity market, Porter’s model of five competitive forces is used to analyze both markets from the perspective of the electricity suppliers. Porter’s model is a widely accepted model that provides means to thoroughly analyze a particular market or sector. In practice, Porter’s model main purpose is to shape the strategy of an organization. The model consists of five forces that influence an industry’s structure. Strategists must cope with these forces to determine a sensible strategy. Figure 2 provides a graphical overview of Porter’s five forces model (Porter, 2008).

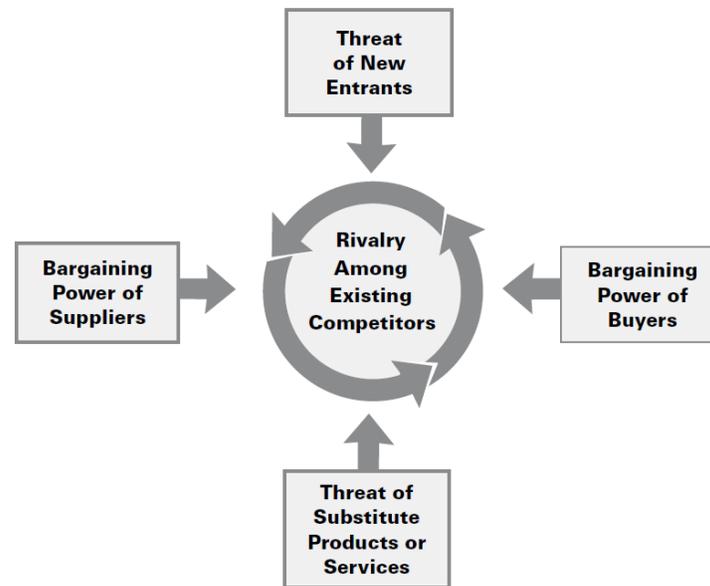


Figure 2 – Porter's five forces model

- *Threat of new entrants*: new entrants to an industry introduce new capacities and desires to gain market share that put pressure on prices, costs, and the rate of investment necessary to compete. The threat of new entrants, therefore, puts a cap on the profit potential of an industry. The threat of entry in an industry mainly depends on the height of entry barriers that are present and on the reaction entrants can expect from incumbents.
- *Bargaining power of suppliers*: powerful suppliers capture more of the value for themselves by charging higher prices, limiting quality or shifting costs to industry participants. Several factors could cause a group of suppliers to be powerful, such as if the group of suppliers is more concentrated than the industry it sells to, or when industry participants face high switching costs, or when there is no substitute for the product that the supplier group provides.
- *Threat of substitute products or services*: a substitute product performs the same or a similar function as an industry's product by a different means. When the threat of substitute products is high, industry profitability suffers by placing a ceiling on prices. Possible ways of avoiding such an event from happening are increasing product performance or increasing marketing.
- *Bargaining power of buyers*: powerful customers can capture more value by forcing down prices, demanding better quality or more service and generally playing industry participants off against one another. Buyers are powerful if they have negotiating advantage relative to industry participants, using their power primarily to pressure price reductions.
- *Rivalry among existing competitors*: the degree to which rivalry drives down an industry's profit potential. It depends on the intensity with which companies compete and on the basis on which

they compete with each other. An example of great intensity is when industry growth is slow. Slow growth results in fights over market shares. The basis on which companies compete may vary. For example, price competition is liable to occur if products of rivals are nearly identical and switching costs for buyers are low.

Because Porter speaks of forces, qualifications such as weak, moderate and strong are used from here on to indicate the impact of the forces on the industry as a whole.

3.2.3. The utilities sector in the Netherlands

Ever since the liberalization of the Dutch electricity market in 2004, the three largest companies have gained a combined market share of 81% in 2010 (Energiekamer Nederlandse Mededingingsautoriteit, 2011). The number of people that switch utility companies was initially low. However, the number has risen slowly but steadily over the past years, indicating that the market is now finally becoming more and more dynamic, as was one of the forecasted benefits when market was liberalized.

Threat of new entrants: since the liberalization of the energy market in the Netherlands in 2004, in theory everyone is allowed to start a utility company. However, the aspiring company must have a supply permit from the Dutch Competition Authority, known as 'Nederlandse Mededingingsautoriteit' (NMa). To obtain such a permit, the aspiring company must undergo a test, recorded by the NMa. If, and only if this test is passed, the company receives a supply permit and will henceforth be an eligible energy company. In 2009, there were 32 electricity companies on the Dutch market in total. One year later, this number increased to 34 (Energiekamer Nederlandse Mededingingsautoriteit, 2011). Once new entrants are allowed in the market, they frequently face obstacles to facilitate a healthy growth and are struggling to increase turnover, mainly because consumers are hesitant to transfer to another utility company (Energiekamer Nederlandse Mededingingsautoriteit, 2011).

Based on this, the force 'threat of new entrants' for existing utility companies is regarded as weak. New entrants emerge occasionally, but they often fail to achieve significant market shares to become a real threat to existing utility companies (Energiekamer Nederlandse Mededingingsautoriteit, 2011).

Bargaining power of suppliers: in the Netherlands, many utility companies do not produce electricity themselves. Instead, they buy electricity on the electricity market and supply it to their own customers. The price for electricity is linked to the oil price, because a large proportion of Dutch electricity is generated using power stations that run on natural gas. Furthermore, the margins of utility companies decrease when the oil price goes up (Energiekamer Nederlandse Mededingingsautoriteit, 2011). Therefore, in a timeframe where the oil price is high, such as the timeframe we are in now, margins are under heavy pressure and the utility companies have no choice but to keep their asking price low. This reduces the force 'bargaining power of suppliers' to a minimum. If the oil price would drop, the margins may slowly increase and the bargaining power of suppliers could grow because of that.

Threat of substitute products or services: there are no practical alternatives to electricity for consumers. Hence, the threat of substitute products is zero.

Bargaining power of buyers: because of the liberalization of the electricity market, consumers now have the option to switch to another utility company. However, although the amount of consumers who switch to another electricity supplier is rising, consumers in general are hesitant to switch utility companies (Energiekamer Nederlandse Mededingingsautoriteit, 2011). Therefore, at this moment, the force 'bargaining power of buyers' is regarded as moderate.

Rivalry among existing competitors: there is a healthy competition going on in the electricity sector. Profit margins are reasonable and sometimes even low due to the competition and the high oil price (Energiekamer Nederlandse Mededingingsautoriteit, 2011). However, as stated, consumers are still hesitant to switch electricity suppliers, slightly limiting the competition. Ultimately, the force 'rivalry among existing competitors' is regarded as moderate.

3.2.4. The utilities sector in Belgium

Supervision on the Belgian electricity market is more complex than supervision on its Dutch counterpart. In Belgium there are four regulatory agencies compared to only one in the Netherlands. These four agencies are: one in Flanders (VREG), one in Wallonia (CWAPE), one in Brussels (BRUGEL) and one for the federal state Belgium as a whole (CREG). Since our data on national culture is about Belgium as a whole (see also chapter 3.3.2), correspondingly, we will use information supplied by the CREG, which also covers Belgium as a whole.

Notable in the Belgian electricity market is the decline of former monopolist Electrabel. Even though the Belgian electricity market was liberalized in 2003 (Vinck, 2008), Electrabel has retained its position as a monopolist for many years. More recently, Electrabel's market share has come to a more serious decline and other utility companies attained significant market shares (CREG, 2011).

Threat of new entrants: similar to the Netherlands, newcomers in Belgium also must have a supply permit to be allowed to supply electricity to consumers. To receive such a permit, the aspiring organization must pass a test performed by the Belgian regulation agency, known as the CREG or 'Commissie voor de Regulering van de Elektriciteit en het Gas'. In 2010, thirteen companies possessed a supply permit (CREG, 2010a). However, twenty companies were in possession of a supply permit in 2011 (CREG, 2011). This is a much larger increase compared to the increase in the Netherlands. Aspiring companies see potential in the electricity market, especially since the decline of former monopolist Electrabel. A notable example of this is the commercial success of newcomer Lampiris. Based on this information, we conclude that the force 'threat of new entrants' is moderate in Belgium.

Bargaining power of suppliers: Contrary to the situation in the Netherlands, in Belgium many utility companies produce their own electricity (CREG, 2011). A notable example is Electrabel, which is responsible for 70% of the total electricity supply in Belgium (CREG, 2011). Therefore, Electrabel is in reality its own supplier. There are also those utility companies that do not generate electricity themselves. However, these companies are small in both number and size, making this group insignificant in the market. Based on this, we consider the force 'bargaining power of buyers' in Belgium as weak

Threat of substitute products or services: there are no practical alternatives to electricity for consumers. Hence, the threat of substitute products is zero.

Bargaining power of buyers: Belgian consumers also have the option to switch utility companies, which they seem more prone to do so than their Dutch counterparts (CREG, 2011). However, electricity prices in Brussels are the highest of many Western European capitals (CREG, 2010b). This leads to the conclusion that even though more consumers switch utility companies, the power of buyers is not up to the level of the Dutch electricity market. According to the CREG, it will take more time for prices to further drop to a level that is comparable to other Western European countries. The former monopoly of Electrabel is identified as the most important cause of the expensiveness of electricity in Belgium (CREG, 2010b). Taking this information into account, the force ‘bargaining power of buyers’ is regarded as weak.

Rivalry among existing competitors: Belgian consumers seem less hesitant to switch utility companies than Dutch consumers. About 10% of the Belgian consumers switched utility companies in 2010 (CREG, 2011). Moreover, the Belgian electricity market has become much more dynamic over the past few years. While improvements are still possible, the market has never been more dynamic than today (CREG, 2011). However, one could also argue that because the market was so static to begin with due to Electrabel’s monopoly that this actually does not say much. Furthermore, Prices are more and more under pressure since the decline of former monopolist Electrabel. As previously stated, in the upcoming years the price of electricity is expected to further drop to a comparable level with other Western European countries (CREG, 2010b). Based on the above we regard the force ‘rivalry among existing competitors’ as moderate.

3.2.5. Wrap-up on the utilities sector

The reform of the utilities sector around the world has led to a growing amount of regulatory agencies in the sector (Abbott & Cohen, 2011). This is also the case for the Netherlands and Belgium. While the Netherlands has one national regulatory agency, Belgium has four. Based on the information of the regulatory agencies, an analysis of the electricity markets in both countries has been produced using Porter’s five forces model. The results of that analysis are summed up in table 6.

Table 6 – Porters five forces model applied to the Dutch and Belgian electricity markets

	The Netherlands	Belgium
Threat of new entrants	Weak	Moderate
Bargaining power of suppliers	Weak	Weak
Threat of substitute products or services	Zero	Zero
Bargaining power of buyers	Moderate	Weak
Rivalry among existing competitors	Moderate	Moderate

Notable differences are the forces ‘threat of new entrants’ and ‘bargaining power of buyers’. Besides these two forces, the two markets are rather comparable from the perspective of Porter’s five forces

model. However, the Belgian market is regarded as slightly more dynamic; a high proportion of Belgian consumers switched utility companies and the number of regulatory agencies is higher.

3.3. National culture

To be able to grasp the concept of national culture, it is first necessary to get a firm understanding of what *culture* is exactly. A common definition with a great deal of anthropological consensus is as follows (Kluckhohn, 1951):

“Culture consists in patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values.”

In line with Hofstede’s work, in this thesis we use his definition of the term culture. Hofstede’s definition is shorter than the previously cited definition, but implies everything that is in Kluckhohn’s definition that is more extensive. The definition provided by Hofstede (1991) is formulated as follows.

“Culture is the collective programming of the mind that distinguishes the members of one group or category of people from another.”

In this definition, the “mind” stands for “the head, heart and hands – that is, for thinking, feeling and acting, with consequences and beliefs, attitudes, and skills. And as Kluckhohn has affirmed, culture in this sense includes values; systems of values are a core element of culture” (Hofstede, 1991). The word *culture* is often reserved for societies in the form of nations or as ethnic or regional groups within or across nations. The word can be applied to any human collective or category: an organization, a profession, an age group, an entire gender or a family. In this thesis, we apply the word culture in a national context; the Netherlands and Belgium are different countries with different histories, and therefore must have different national cultures (Hofstede et al., 2011).

3.3.1. Hofstede’s cultural dimensions

In his work, Hofstede found six dimensions on which a culture can be characterized or “graded” (Hofstede et al., 2011; Hofstede, 1980, 1991). Each dimension is rooted in a basic problem with which societies have to cope; countries can then be positioned between the two poles of each dimension. Using these scores, it becomes possible to make comparisons between countries. The six dimensions that Hofstede et al. (2011) found are shown in table 7. Afterwards the dimensions will be further explained individually.

Table 7 – Overview of Hofstede's cultural dimensions

Dimension name	Acronym
Power Distance Index	PDI
Individualism vs. Collectivism	IND
Masculinity vs. Femininity	MAS
Uncertainty Avoidance Index	UAI
Long-term Orientation vs. Short-term Orientation	LTO
Indulgence vs. Restraint	HED

3.3.1.1. Power Distance Index (PDI)

The power distance index refers to the way cultures deal with *inequality* in society. Every culture has to deal with inequality. Some people receive more respect, become more powerful, become more influential or become wealthier than others become. PDI is defined by Hofstede (1991) as “the extent to which less powerful members of institutions or organizations in a nation expect and accept that power is divided unequally.” Note that PDI is therefore based on values of people that are generally less powerful than others are. A low PDI generally shows limited acceptance of power inequality and less dependence of subordinates on managers. It is also characterized by a preference for consultation and cooperation (Silvius et al., 2009). How PDI typically affects the situation at work is sketched in Table 8.

Note that table 8 and the following tables (up until table 13) are merely a selection of typical characteristics. It is by no means exhaustive. In addition, they provide an image of a national culture that *purely* has either a very small power distance or a very large power distance. In reality, this is rarely the case. For example, a nation may have a national culture that leans towards a small power distance, but that nation can still show a number of characteristics that are associated with a large power distance. The same principle also applies to all the other dimensions by Hofstede.

Table 8 – Typical characteristics of national cultures with small and large power distances

Small power distance	Large power distance
Decentralization is popular	Centralization is popular
Many independent workers	A lot of supervisory staff
Relatively small differences in income between upper management and the rest of the organization	Big differences in income between upper management and the rest of the organization
Bosses utilize their own experience and make use of the opinions of workers below them	Bosses follow instructions from superiors and follow formal rules
Subordinates expect to be consulted	Subordinates expect to be told what to do
Manual labor has the same status as administrative labor (office)	Administrative labor (office) is more popular than manual labor
The ideal boss is a competent democrat	The ideal boss is a good-natured autocrat or a good father

3.3.1.2. Individualism vs. Collectivism (IND)

This index scales national cultures on the extent to which they can be characterized as *individualistic*. In individualistic cultures, people are expected to look out for themselves and their family. Collectivistic cultures prefer that people be integrated in strongly cohesive groups, where group loyalty is considered very important and spans a whole lifetime. Individualistic cultures consider punctuality and schedules highly important. In collectivistic cultures, personal relationships and contacts prevail. Note that the term collectivistic has no political implication in this case. It does not refer to the power a state may have over individuals. Instead, it refers to the loyalty of individuals to a group. Typical examples of how individualistic and collectivistic traits influence the situation at work are shown in table 9.

Table 9 – Typical characteristics of collectivistic and individualistic national cultures

Collectivistic	Individualistic
Employees pursue the interest of the group as a whole	Employees pursue their own interest
The interest of the group as a whole is not necessarily the same as personal interest	Personal interests and the interest of the organization should correspond
During the application process, having relatives already working at the same organization is considered important and beneficial	During the application process, it is best not to have relatives working at the same organization to avoid nepotism
Employees and employers should protect each other in exchange for loyalty	Employees and employers view their relation purely as a business transaction
Management means leading groups	Management means leading individuals
Internet and e-mail are used less	Internet and e-mail are frequently used to connect individuals

3.3.1.3. Masculinity vs. Femininity (MAS)

This dimension indicates the extent to which national cultures reflect masculine or feminine characteristics. A masculine culture values assertiveness, performance and material success. Furthermore, roles are more strictly divided between men and women and success and careers are valued highly. A feminine culture values quality of life, tenderness and modesty. Moreover, a large portion of overlap exists between the roles of men and women, and it is less likely that individuals desire to stand out or be unique compared to other individuals. Typical examples of feminine and masculine characteristics of national culture are listed in Table 10.

Table 10 – Typical characteristics of feminine and masculine cultures

Feminine	Masculine
“Work to live” is an important motto	“Live to work” is an important motto
Conflicts are resolved using negotiations and compromises	Conflicts are resolved in a direct manner and without compromise: “let the best man win”
Small organizations are preferred	Large organizations are preferred
People would rather have more spare time than more money	People would rather have more money than more spare time
Men and women can choose whether they want to pursue a career	Men are expected to pursue a career, women can choose whether they want to pursue a career
Larger proportion of women are active in jobs with higher status	Larger proportion of women are active in jobs with low status
Strong position in agricultural products and the services sector	Strong position in manufacturing and bulk chemistry

3.3.1.4. Uncertainty Avoidance Index (UAI)

The UAI is defined by Hofstede (1991) as “the extent to which the members of a culture feel threatened by uncertain or unknown situations”. Cultures with a high UAI tend to have a large need for rules and regulations to guide tasks. Cultures with a low UAI are generally less dependent on rules and regulations and people are generally more trusting towards each other (De Mooij, 2000). Table 11 provides a list of typical examples of traits of national cultures with a weak and with strong uncertainty avoidance.

Table 11 – Typical characteristics of national cultures with weak and strong uncertainty avoidance

Weak uncertainty avoidance	Strong uncertainty avoidance
People change jobs frequently, finding balance between work and personal life is not as hard	People change jobs less often, it is generally harder to find balance between work and personal life
There should be no more rules than strictly necessary	There is an emotional demand for rules, even if they are impractical
It is acceptable to only work hard when the situation asks for it	People have an inner drive to always work hard
Time is a frame of reference	Time is money
Tolerance for ambiguity and chaos	Demand for precision and formalization
Belief in generalists and common sense	Belief in specialists and technical solutions
Upper management is concerned with strategy	Upper management is heavily involved in day-to-day operations
Skilled in innovation, less skilled in applying it in practice	Less skilled in innovation, skilled in applying it in practice

3.3.1.5. Long-term Orientation vs. Short-term Orientation (LTO)

This dimension indicates the perception of time in a culture. It is based on the heritage of Confucius, the most influential Chinese philosopher who lived around 500 B.C. Cultures with a high score on LTO value thrift and perseverance as positive traits. Short-term oriented cultures value respect for traditions,

fulfilling social obligations and protecting one's 'face'. In general, many Asian cultures are long-term oriented, western countries are in between both extremes and most of the African countries are short-term oriented. Typical examples of characteristics of national cultures with a short-term orientation and national cultures with a long-term orientation are provided in Table 12.

Table 12 – Typical characteristics of national cultures with short-term and long-term orientation

Short-term orientation	Long-term orientation
Important values at work are for example: freedom, rights, success and thinking for yourself	Important values at work are for example: Learning, honesty, adaptability, responsibility and self-discipline
Spare time is important	Spare time is less important
Aimed at "bottom-line" results	Aimed at position in the market
Interest in this year's profits	Interest in profit over ten years
People are rewarded for their levels of skill	Large social and economic differences are undesirable
Personal loyalties vary with the cause of the business	Investing in life-long personal networks

3.3.1.6. Indulgence vs. Restraint (HED)

Indulgence or 'hedonism' (hence HED) stands for a relatively unlimited satisfaction of fundamental, natural human need to enjoy life and experience pleasure in life. The opposite, restraint, represents the belief that satisfaction of needs should be restricted and regulated by strict social norms. Note that the term indulgence does not imply the satisfaction of human desires in general; it applies to the urge to make life as pleasurable as possible. Eventually this dimension is about the wellbeing and welfare of people. Table 13 provides an overview of typical example of indulgent and restraining national cultures.

Table 13 – Typical characteristics of indulgent and restraining national cultures

Indulgence	Restraint
People smile a lot, for example: when taking a picture, when helping a customer and when speaking in public	People are expected not to smile unless there is a clear reason for it, smiling is suspicious
Freedom of expression is considered very important	Freedom of expression does not matter as much
Law enforcement does not have a high priority	Law enforcement is of the utmost importance
In rich countries: many people are obese	In rich countries: not as many people are obese
Internet and e-mail are frequently used for private communication	Internet and e-mail are used less for private communication
More Internet and e-mail with foreigners	Less Internet and e-mail with foreigners
People are happy with their "family life" more often	People are less often happy with their "family life"

3.3.2. Hofstede's model and Belgium

In this section, Hofstede's methods of dealing with the linguistic situation in Belgium are explained. This subject requires explanation because in his work, Hofstede treats Belgium differently compared to other nations. Hofstede chose this approach because Belgium's linguistic situation is unique, as will be explained in this section. The Netherlands is treated like every other nation in Hofstede's work, so no further explanation is necessary about Hofstede's approach to his work on the Netherlands.

Belgium is divided in three linguistic regions; each with their own national language. There is a Dutch speaking part, a French speaking part and a German speaking part. Flanders is the Dutch speaking part of Belgium and Wallonia is the French speaking part of Belgium. They are of roughly comparable sizes. The German speaking part, close to the German border, is significantly smaller compared to the other two regions. The Belgian capital city Brussels is an exception, it is the only part of Belgium that is officially bilingual; both Dutch and French are official languages in that area. Hofstede does not mention in his work how he copes with this factor. Figure 3 shows a graphical view of the linguistic regions of Belgium.

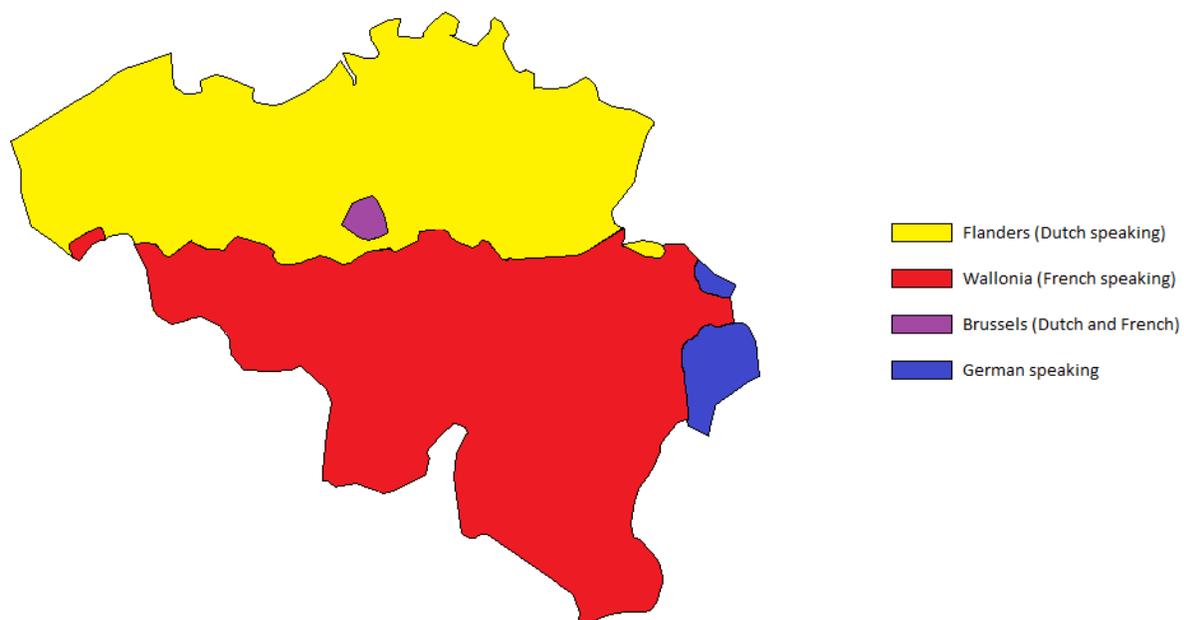


Figure 3 – Linguistic regions of Belgium

In the case of four out of six dimensions, Hofstede et al. (2011) provide separate scores for Flanders and Wallonia. Whenever this is the case, Hofstede refers to Flanders as *Belgium NL* and to Wallonia as *Belgium FR*. This notion will be followed for the remainder of this work. There are no separate scores for the German speaking part of Belgium, possibly because of its small size and low amount of inhabitants. There are also no separate scores for Brussels. Hofstede provides separate scores for Belgium NL and Belgium FR for the following dimensions:

- Power Distance Index (PDI)

- Individualism vs. Collectivism (IND)
- Masculinity vs. Femininity (MAS)
- Uncertainty Avoidance (UAI)

On the remaining two dimensions, Belgium is considered as a whole by Hofstede and there are no separate scores for Flanders and Wallonia, possible due to these dimensions being later additions to his work. This is the case for the following dimensions:

- Long-term orientation vs. Short-term orientation (LTO)
- Indulgence vs. Restraint (HED)

To cope with the issue of two separate scores for Belgium, the average of the scores of Belgium NL and Belgium FR will be used as a basis for comparison with the Netherlands. The reverse is impossible: since there are no separate scores for LTO and HED provided by Hofstede, it is impossible to generate scores for these two dimensions for Belgium NL and Belgium FR separately. Therefore, the only way to compare the scores of the Netherlands with the scores of Belgium is to use the combined score of Belgium NL and Belgium FR into a single number. Since both parts of Belgium are of roughly equal size and have a roughly equal amount of inhabitants, it is deemed appropriate to compute the average of the two scores and use the outcome to compare with the scores of the Netherlands. Although there are a few minor differences in the scores of Belgium NL and Belgium FR, they do not differ too much. On top of that, the study of national culture is considered to be a study of averages; nations may show varieties in their culture in different regions, but national culture is always based on the average across the nation as a whole (Hofstede et al., 2011). One could very well find similar differences between certain provinces or regions in the Netherlands as Hofstede found in Belgium between Belgium NL and Belgium FR. In this light, using the average of two areas of roughly the same size with a comparable amount of inhabitants is an acceptable solution.

3.3.3. Critical work on Hofstede

Hofstede's original publication in 1980 contained the following four cultural dimensions: *power distance*, *Individualism vs. collectivism*, *masculinity vs. femininity* and *uncertainty avoidance*. His work was received with much acclaim, but has also been widely criticized for not including Eastern European countries (Miller, Batenburg, & Van de Wijngaert, 2006; Schwartz, 1994), Hofstede has addressed this issue in later editions of his work, which include the results of many Eastern European countries.

Others have argued that Hofstede performed his research in an ad hoc fashion (P. Smith & Bond, 1998). While this is debatable for the earlier editions of his work, Hofstede has addressed this critique by analyzing and including multiple independent follow-up studies on his work (De Mooij, 2004; Hoppe, 1990; Merritt, 2000; Mouritzen & Svava, 2002; Shane, 1995; van Nimwegen, 2002). These studies achieved a refinement of Hofstede's previously found results, rather than a contradiction. This further ensures the validity of Hofstede's current work.

In the following years, Hofstede has further updated and extended his work on national culture, resulting in the six dimensions that have previously been described, up from the original four. The two most recent added dimensions *long-term orientation vs. short-term orientation* and *indulgence vs.*

restraint have addressed a great deal of critique on his work. Therefore, Hofstede's six dimensions are regarded to form a trustworthy basis for evaluating national cultures. Furthermore, alternative frameworks such as Schwartz's also achieved an evolution of Hofstede's framework, instead of a contradiction or revolution (Miller, Batenburg & Van de Wijngaert, 2006).

3.3.4. Wrap-up on national culture

For analyzing the national cultures of the Netherlands and Belgium, we rely on Hofstede's framework of six cultural dimensions: Power Distance Index (PDI), Individualism vs. collectivism (IND), Masculinity vs. Femininity (MAS), Uncertainty Avoidance Index (UAI), Long-term Orientation vs. Short-term Orientation (LTO) and Indulgence vs. Restraint (HED). Although his work was received with much acclaim by scholars and practitioners, his work has also been widely criticized. By updating and extending his work for over twenty years, Hofstede has managed to further increase the validity of his framework.

The results of Hofstede's work on the national cultures of the Netherlands and Belgium are shown in figure 4. The most significant differences between the Netherlands and Belgium are found in the dimensions PDI, MAS and UAI. However, the other differences are not to be neglected. It would be difficult, let alone arbitrary, to judge whether or not a difference in these scores is large enough to impose a noticeable difference on other things, such as SOA governance.

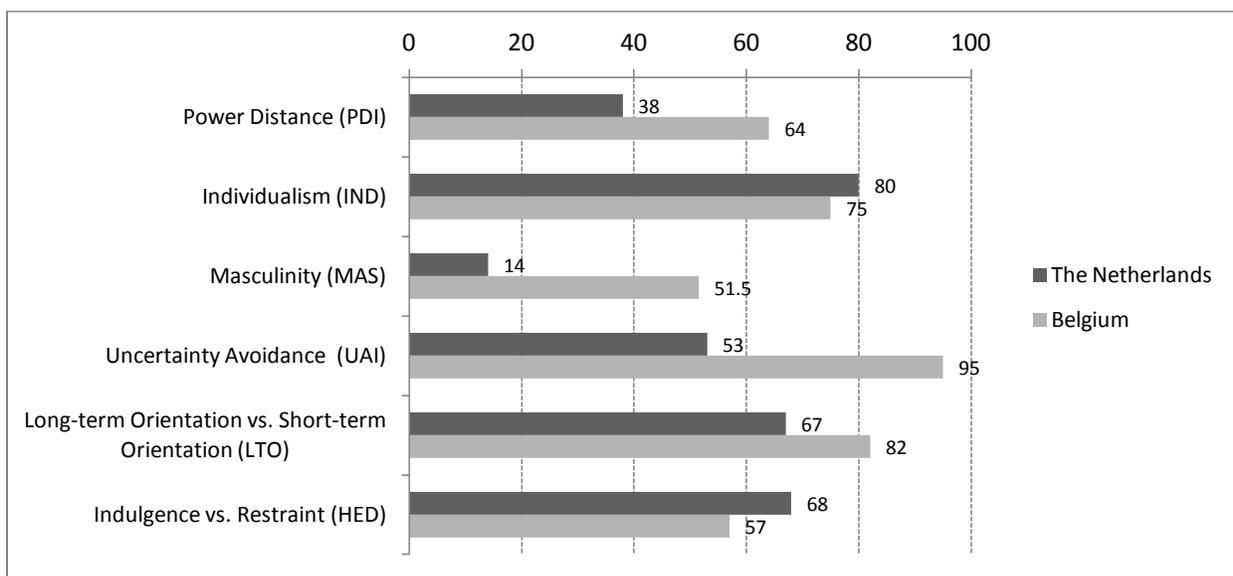


Figure 4 – Cultural scores of the Netherlands and Belgium

4. Developing the SOA Governance Maturity Model

In this section, the first (1.0) and second (1.1) version of SOAGMM are explained. As stated before, version 1.0 is based on existing literature and artifacts. That version is evaluated with four experts in the area of SOA governance. Based on the evaluation, version 1.1 of the model is created. The 1.1 version is an updated version of the maturity model that can be used to determine the maturity of utility companies in the Netherlands and Belgium.

4.1. SOAGMM 1.0

Version 1.0 of the SOAGMM contains the following seven elements.

1. SOA Vision
2. Service Portfolio Management
3. Service Lifecycle Management
4. Policy Catalog
5. Organizational Changes
6. Metrics
7. Communication & Incentives

Each element of SOAGMM is described by at least two of the authors in the literature study. However, many elements are described by more than two authors. Table 14 shows an overview of which author exactly describes which elements of SOA governance maturity.

Table 14 – Overview of SOA governance maturity elements

Legend: • - included in author's work x - excluded in author's work	SOA Vision	Service Portfolio Management	Service Lifecycle Management	Policy Catalog	Organizational Changes	Metrics	Communications and Incentives
Afshar et al. (2007)	•	•	x	•	x	•	•
Bieberstein et al. (2005)	•	x	x	x	•	x	x
Schepers & Kratz (2009)	x	•	•	•	•	x	x
Mohindroo (2009)	x	x	x	x	•	•	•
Software AG (2007)	•	x	•	•	•	x	x
Marks & Bell (2006)	x	x	x	•	•	•	•

Furthermore, for visual clarity, the elements of SOAGMM 1.0 are depicted in figure 5 in the form of a temple. This figure was also shown to the participants during the expert interviews to enable them to quickly grasp the essence of the model.

To keep an open perspective during this stage of the development of the maturity model, SOAGMM 1.0 does not yet feature a standard scoring matrix with the appropriate scales and necessary questions for

determining the maturity. Instead, a list of example questions based on the literature in table 14 is discussed with each of participants, as well as the potential scale that the outcome of the questions should be categorized in. Based on this, a scoring matrix with standard questions and a corresponding scale will be developed, as part of SOAGMM 1.1. The list of example questions of SOAGMM 1.0 is included in Appendix A.

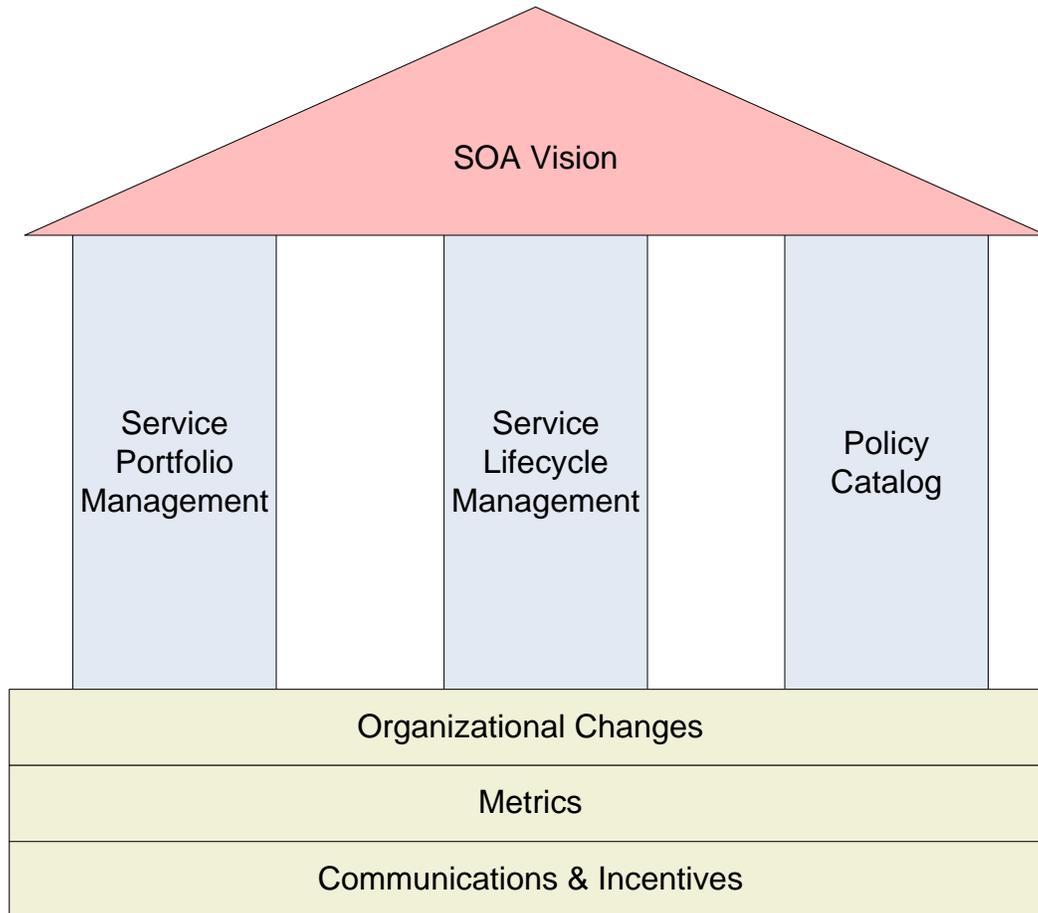


Figure 5 – Visual perspective on SOAGMM 1.0

Roof

In line with the metaphor of the temple, on top is the roof; the *SOA Vision*. SOA vision is a broad, high-level view of the perspective on SOA in the organization to make sure that the organization as a whole sees the benefit that comes with SOA. The exact contents of the SOA vision can differ greatly amongst different organizations, so there is no single “correct” SOA Vision that must be attained (Afshar et al., 2007). That is also not the point of the SOA vision, the exact contents could (or should, even) differ per organization, because every organization is different and faces different obstacles in their SOA journey (Bieberstein, Bose, Walker, & Lynch, 2005). If an organization has such a SOA vision in place, it means that the organization has at least thought about it on some level.

Body

Then there is a main body of the temple, consisting of three vertical pillars. These elements are visualized in a vertical fashion because they represent the core of SOA governance. They greatly influence the day-to-day operations of the organization.

The first pillar is *Service Portfolio Management (SPM)*. Schepers & Kratz, (2009) posit about SPM that consensus is needed about the services that need to be developed. Furthermore, the architect should weigh IT arguments against business arguments for developing specific services to establish and maintain a well-balanced portfolio of services that are at the organization's disposal. A services roadmap listing current and planned services and their purposes is an often seen counterpart of SPM.

The second pillar is named *Service Lifecycle Management (SLM)*. Schepers & Kratz (2009) describe SLM as "the processes that addresses the implementation, updates and retirement of enterprise services". Lifecycle management should never be managed in projects alone, but should take place by a central entity called the SOA governance board, where changes to the SOA in an organization are managed. Such changes relate to conceptual, enterprise-wide services, which can be reused to perform another business function. In addition, SLM defines what each service does, when it does it and, most importantly, when it stops doing it and another service takes over (Software AG, 2007). This shows a portion of overlap with the services roadmap mentioned in the previous paragraph.

The third pillar is *Policy Catalog*, which concerns the design and enforcement of policies (Schepers & Kratz, 2009). Employees must post their services in a central repository, so that these services can be governed and reused. However, attention also needs to be spent on policies applied at design level. Design level policies are standards on the development of services and usually take the form of principles or best practices. Developers need to be convinced that they should adhere to such design level principles. Policies in the Policy Catalog are usually, but not necessarily, built around the following concepts (Afshar et al., 2007):

- Standards compliance
- Use of architectural assessments, including reviews and change processes
- Utilization of architecture documents and guidelines covering use cases, views, service interface design, and/or design patterns
- Use of service-based application blueprints
- Adherence to reference architectures

Another aspect of the policy catalog is who gets to define policies. According to (Marks & Bell, 2006), a small SOA core team (possibly a Center of Excellence) should define the initial body of policies. Hereafter, IT managers, chief technology officers, chief architects, architects, development managers, team and/or project leaders could all play a role in defining the policies that are part of an organization's SOA governance.

Foundation

On the bottom of the model, there is the foundation, consisting of horizontal layers. These elements are shown in a horizontal fashion because they reflect processes that do not necessarily have a large immediate impact, but may still greatly influence the organization in certain situations. Additionally, they may appear on a more underlying level than their vertical counterparts may.

The first layer consists of a description of *Organizational Changes*. Organizations that adopt the SOA paradigm, must make changes to their organizations to be able to implement it in a successful manner (Bieberstein et al., 2005). Incorporating organizational redesign is a complex task; it involves executing a well-planned transition strategy that harmonizes existing elements in the new structure. Applying the SOA metaphor to an organizational structure intuitively leads to viewing core tasks and activities as units of service. Each team provides a service and is specialized in delivering a particular activity or task. A chain of services from various teams can be orchestrated to execute higher-level tasks or business objectives. Often, organizations create an entity called the SOA Governance board, or SOA Center of Excellence. This entity represents the stakeholders of SOA governance; from business and IT, and decides on how SOA governance is implemented (Schepers & Kratz, 2009). In addition, Mohindroo (2009) states that priorities and efforts will shift as SOA becomes more mature in the organizations, and as such, the governance program will need to shift its emphasis on what needs to be governed and where.

The following layer is named *Metrics*. Identifying and defining key metrics in an organization is a key element of successful SOA governance (Marks & Bell, 2006). Overarching success factors must be broken down into measurable milestones (Mohindroo, 2009). Furthermore, once it is known what kinds of policies (see Policy Catalog) need to be focused on, it is necessary to define success factors and key performance indicators. If such metrics are not in place, it is impossible to measure the success of a project with adherence to SOA (Afshar et al., 2007).

The final layer is *Communication & Incentives*. This means that organizations should create a communications plan that keeps the entire community of the organizations informed of the goals of the SOA program (Mohindroo, 2009). It helps keeping everyone throughout the organization educated about the purpose of SOA Governance and its goal of maintaining alignment with the business. Besides education, another aspect is the ability to encourage and reward. Employees, including architects, should be encouraged to reuse existing services and build shareable services themselves (Afshar et al., 2007; Marks & Bell, 2006). For example, an organization could follow a “profit” sharing approach, in which a proportion of costs saved from SOA reuse and other hard-dollar and soft-dollar business benefits of SOA are returned to employees (Marks & Bell, 2006).

Along with the above explanation, a list of example questions is created that serves as a basis during the semi-structured interviews with utility companies. These example questions are reviewed during the interviews and can be found in Appendix A. Remember from section 2.1 that in phase 2, the interviews are held with experts on the topic of SOA governance. Before this round of interviews, SOAGMM 1.0 is devised based on academic literature. To keep the mindsets of the experts clear and open, the set of

example questions that accompanies SOAGMM 1.0, to serve as subject to refinement and get the evaluation started. In phase 3, during the refinement of SOAGMM, this set of example questions is converted to a scoring matrix (see Appendix B), accompanying SOAGMM 1.1. This scoring matrix will ultimately be used during the second round of interviews, which takes place at utility companies, to measure SOA governance maturity of an organization.

4.2. Expert interviews on SOAGMM 1.0

In this section, the three expert interviews are discussed individually.

4.2.1. Interview 1

According to participant 1, the overall impression of SOAGMM 1.0 is good and it should definitely be possible to gather the required information to make a sound assessment of an organization's SOA governance maturity using this model. However, there was some criticism on a number of topics, such as the way SOAGMM 1.0 is visually depicted and the nature of the questions. During the interview, the following changes are proposed:

- 1) The figure that represents SOAGMM 1.0 is logical and straightforward. However, participant 1 would rather draw the following picture, using the same elements. (Note that SPM stands for Service Portfolio Management and SLM stands for Service Lifecycle Management) Although participant 1 states that the original model does not necessarily have to undergo this many changes, it could still merge in some of the changes that the variation shown in figure 6 proposes.

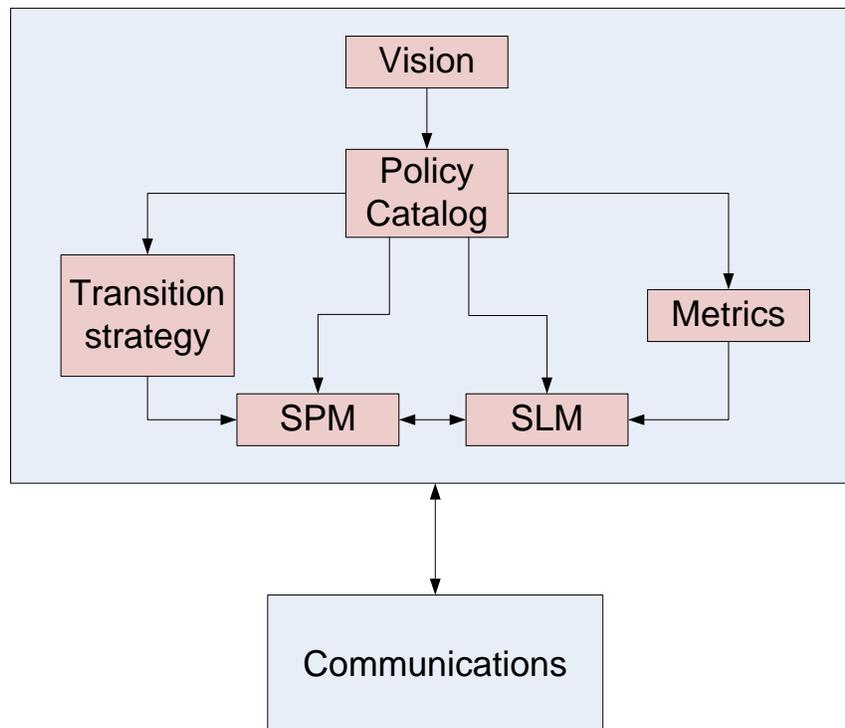


Figure 6 – Alternative model drawn by participant 1

This figure has a number of implications to the model. They are as follows.

- Organizational Changes is renamed to Transition Strategy, which according to participant 1 is a name that better suits the contents of the element
 - Policy Catalog is the only element that has a direct relation with SOA Vision. The other elements inherit from Policy Catalog, not from SOA Vision.
 - The relations between the elements are changed. There is no distinction between vertical elements (pillars) and horizontal elements (layers).
 - Policy Catalog, SPM and SLM get a more prominent position in the model.
- 2) A number of questions are typically based on literature of a commercial organization. For example, question 'e' in Organizational Changes (about using SOA maturity model) is typical for a commercial organization with a commercial goal, but it does not necessarily apply to SOAGMM. Therefore, such questions could be removed from the list of example questions or they should at least be reconsidered.
 - 3) The questions about SLM should be modified. According to Participant 1, SLM cannot be done per project, because it applies to every single service that an organization has and should be regarded as a process. Instead, new questions about how SLM is performed throughout the organization as a whole should be added.
 - 4) Add a question under SOA Vision to ask who identifies new services (IT or Business). According to participant 1, this is a key question.

4.2.2. Interview 2

The second interview was conducted with two participants. They shared the opinion with the previous participant that with this model it should be possible to gather the required information from an organization to make a valid measure of an organization's SOA governance maturity. The two participants stated that the layout of the model should be refined, rather than completely overhauled as is suggested by participant 1. The following changes were proposed during interview 2:

- 1) A general remark about the example questions: they should be open-ended and more directly aimed towards getting to know the answer. For example, instead of asking the following question: "Are there long-term goals in place for your SOA strategy?" The question should be rephrased to "What are the long-term goals that are in place for your SOA strategy?"
- 2) SOA Vision should incorporate more questions about EA principles. According to the participants, having an architecture that reflects the characteristics of SOA is crucial for good SOA governance.
- 3) Organizational Changes should be renamed, possibly to "People, Process and Technology". The question about HR should be removed and there should be more focus on a SOA Center of Excellence. A question should be added to determine an organization's willingness to change; their reasoning is that if an organization does not want to change there is no point in adopting SOA governance (or SOA, even). The question whether all core tasks and activities are viewed as units of services should be left out.

- 4) Policy Catalog should be renamed to something else, although a specific name is not mentioned. Furthermore, it should include a question to determine that the organization does not have a “paper tiger” as a central SOA entity. A paper tiger is an entity that has a large amount of power on paper, but not in reality.
- 5) Communications & Incentives should be renamed to just Communication. It should also include a question about how the message of SOA is spread throughout the organization. Furthermore, reward mechanisms make a good tool, but ensure that an organization does not focus too much on the rewards rather than the work itself.
- 6) A question should be added to determine how new services are created, who identifies them and who determines whether they should be further developed.

4.2.3. Interview 3

This participant does not feel inclined to modify the layout of the model at all. All elements serve a good purpose and although the exact names can be under debate, at least they provide a fitting description.

- 1) SPM should include a question about whether a service repository is in place and how it is used if that is the case.
- 2) Policy Catalog should focus more on how the policies are enforced throughout the organization. It should also determine what happens when policies are not met. Furthermore, a question about policies for naming conventions should be added.
- 3) Communications & Incentives already includes a question about how SOA is educated to employees throughout the organization, but it should be given more attention. The title could be changed to “Education”.
- 4) More emphasis should be put on whether a central entity, a SOA Center of Excellence or SOA Governance Board is in place. According to the participant, this single question could provide a lot of information, because in the participant’s opinion it is necessary that an organization that embraces SOA has such an entity in place. In addition, it is important to know who are in this central entity (what roles).
- 5) SLM should include a question that determines what benefits the organization has by deploying SOA; whether it helps to increase the reuse rate for example. Additionally, SLM should include a question that determines who has the authority to stop a service. Likewise, a question should be included to determine what department comes up with new services and what these new services do exactly.

4.3.SOAGMM 1.1

Based on the feedback of the three expert interviews SOAGMM 1.1 is constructed. In this section, SOAGMM 1.1 is explained along with the changes that have been made in comparison to SOAGMM 1.0 and why these changes have been made.

All participants pointed out that a question to determine which departments are entitled to come up with new services. According to the participants, this should generally be the “business departments”, because they are best able to make business case for a new service. A business case should contain an overview of all projected costs and benefits that a new service will introduce. IT-centered departments

may contribute to this process, but they are not expected to individually start the development of a new service. As this was pointed out by all participants, such a question is included in SOAGMM 1.1.

In general, changes to the visual view on the model are rather limited. Not all feedback could be incorporated because of several reasons; such when the feedback of two participants contradicted with each other, or when the feedback was unfeasible to implement. However, the using the feedback, it became possible to transform the set of example questions to the scoring matrix.

Changes visible in figure 7:

- *Organizational changes* is renamed to *Organization*. Participants generally dislike the term *changes* in this element and thought it did not fit the description. The contents of this element stay the same, albeit with a more focus on the organization “as-is” and the SOA aspects thereof. Hence, less focus is put on the aspect of change within the organization and more focus is put on the end-result; the organization itself.
- *Policy Catalog* is renamed to *Policies*. Participants were generally averse against the term *catalog*. The contents and topics it covers remain largely unchanged.
- *Communications & Incentives* is renamed to *Communication*. The double term was received as rather confusing. In a sense, incentivizing is a means of communication too. Therefore, the new title better fits the contents it stands for.

Besides these changes, many changes are made in the area of the set of example questions that accompanies SOAGMM 1.0. This set of example questions has been converted to a scoring matrix. In the next chapter, the scoring matrix accompanying SOAGMM 1.1 is further discussed.

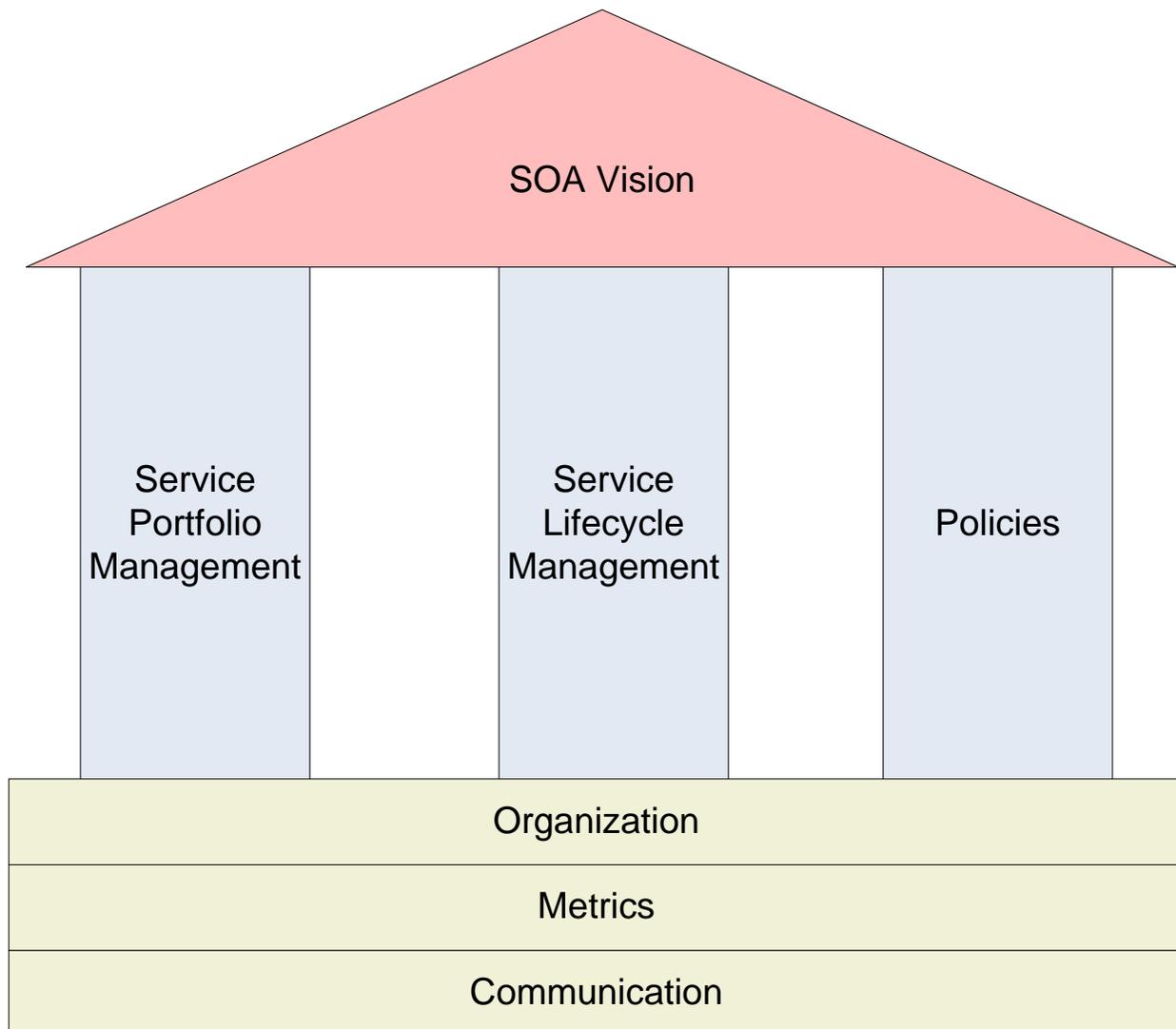


Figure 7 – Visual perspective on SOAGMM 1.1

4.3.1. SOAGMM 1.1 scoring matrix

The example questions of SOAGMM 1.0 (see Appendix A) are converted to a scoring matrix, which purpose is to be filled out during the case interviews with the utility companies. The example questions of SOAGMM 1.0 served as a wide basis that is meant to be narrowed down by the participants during the expert interviews discussed in chapter 4.2. This results in the division of each element of SOAGMM into four qualifications on which a score can be obtained on a 0-4 scale, 4 being the highest. The average of the four qualifications represents the overall score for the element. After evaluating the set of example questions with experts, the key issues for each element that remain are as follows.

- *SOA Vision*
 - The presence long-term vision and / or a description of long-term goals concerning SOA.
 - The presence of a “SOA roadmap”, containing milestones

- The degree to which current corporate and/or IT governance is complementary to SOA governance at the organization
- The degree to which an organization's EA reflects SOA characteristics
- *Service Portfolio Management*
 - The decision who or which department has the power to identify new services
 - The timeframe in which there is consensus about new services
 - The presence of a central service repository
 - The conception that new services should contribute to the existing portfolio
- *Service Lifecycle Management*
 - The decision whether SLM takes place in projects or centralized
 - Whether services are in scope of SLM at the organization
 - Whether there are tools in place at the organization to support SLM
 - The decision who or which department has the power start and stop a service
- *Organization*
 - The presence of a transition strategy
 - The degree to which an organization is willing to change
 - The degree to which roles and responsibilities are explicitly defined
 - The presence of a "SOA Center of Excellence" or likewise entity
- *Policies*
 - The presence of policies that are in line with the corporate strategy
 - The presence of a central policy repository
 - The decision whether new services are thoroughly reviewed
 - The decision about what action is undertaken when services do not comply with policies
- *Metrics*
 - The presence of KPI's / other metrics
 - The degree to which existing metrics provide visibility in progress
 - The degree to which metrics are aligned with "the business"
 - The presence of measurable milestones
- *Communication*
 - The presence of a communications plan
 - The presence of reward mechanisms
 - The degree to which developers are convinced of SOA
 - The degree to which the "SOA message" is spread throughout the organization

Now, all that remains is a scale on which the issues can be graded during case interviews. In some cases, the possible answers had been provided by the experts, in a number of other cases possible answers were provided by literature, and in the remaining cases, we developed possible answers from scratch, based on our interpretation of the concepts at hand.

All participants shared the opinion that for our research, a standard scale is sufficient and they do not see any reason to deviate from a standard scale. Furthermore, Maier & Moultrie (2009) indicate that the consistency with which the scale is applied is more important than the scale itself. Hence, as the participants advised, a standard scale of 0-4 is used for the scoring matrix.

A snippet of the scoring matrix, showing the qualifications for SOA Vision, is included in table 15. The complete contents of the scoring matrix, containing qualifications for every element of SOAGMM, can be found in Appendix B.

Table 15 – Snippet of SOAGMM 1.1 scoring matrix

	0	1	2	3	4
SOA Vision					
Long-term goals / broad vision	Not present	Only superficial	Some	Managed and monitored	In line with corporate strategy
SOA roadmap	Not present	x	Present, but not monitored	x	Present and monitored
Complementary corporate / IT Governance	Not present	Only superficial	Some	Much “overlap”	Complete alignment between SOA gov. and corporate / IT gov.
Does the EA reflect SOA characteristics?	No	Only superficial	Yes, some	Yes, many	EA is fully SOA-based

Note that from this point on, whenever SOAGMM is mentioned, version 1.1 is implicated.

5. Propositions

In this section for each cultural dimension the scores of the Netherlands and Belgium as they are found by Hofstede et al. (2011) are provided, analyzed and possible implications are discussed.

Now that national culture and Hofstede's six dimensions are explained, along with SOAGMM and its elements, it is possible to formulate propositions about the relation between SOA governance and national culture.

Figure 8 again provides the scores of the Netherlands and Belgium on the six dimensions, followed by an analysis and discussion of the indexes of the national cultures of the two countries at hand. The numbers in figure 8 do not actually represent absolute values or scores. Instead, the numbers represent the position the countries are ranked compared to all other countries that were investigated by Hofstede et al. (2011). Thus, the numbers we see represent the *position* of a country compared to the other countries on a certain dimension.

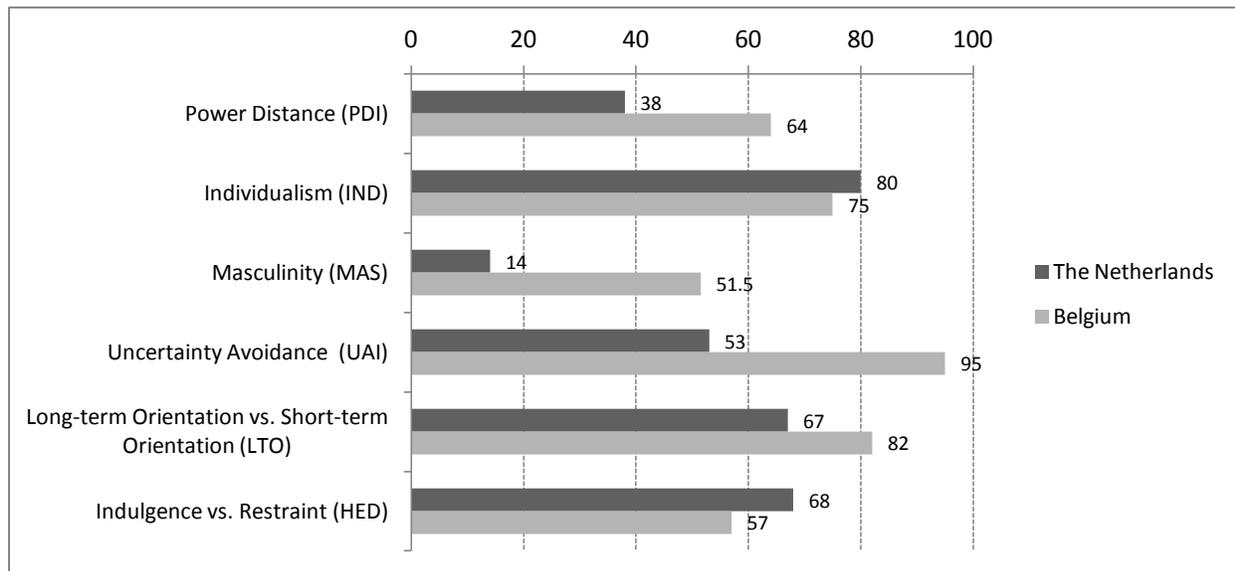


Figure 8 – Cultural scores of the Netherlands and Belgium

The propositions are categorized by the elements of SOAGMM 1.1.

5.1. Power Distance Index (PDI)

The Netherlands has a culture with a below average power distance (38), whereas Belgium's national culture shows an above average power distance (64).

A low score on PDI indicates close working relationships between hierarchical levels and assertive behavior by subordinates (Sørnes, Stephens, Sætre, & Browning, 2004). Moreover, a low PDI indicates a lack of elements of control, procedures and formalization in general. Metrics and Policies are typical examples of control elements and therefore are expected to result in having lower maturities in low PDI cultures. The element Organization entails the transition of an organization towards a typical EA that is

suitable for SOA. This future EA must include a certain degree of formalization to enable the successful implementation of SOA in an organization, because ultimately, that is what SOA governance is about. Therefore, a low PDI is expected to indicate a lower maturity on Organization. Lastly, Communication is expected to favor a low PDI, because of the more intensive, more interactive and less formalized communication that is associated with a low PDI culture. Thus, low PDI cultures are expected to have a higher maturity on Communication.

Cultures with a higher PDI are better suited for centralized structures (Hofstede et al., 2011). The introduction of a SOA Center of Excellence implies more centralization, which is therefore a good fit with cultures with a higher PDI. SOA is arguably difficult to implement without a form of central authority. This indicates that high PDI cultures are expected to have a higher maturity on Organization. However, this does not imply that it is impossible for countries with a relatively low PDI, such as the Netherlands, to successfully implement SOA. Furthermore, cultures with a high PDI prefer top-down management and are prone to enforcing elements of control, procedures and formalization (Hofstede et al., 2011). This results in the conception that Metrics and Policies, being typical elements of control, are also expected to have higher maturities in high PDI cultures.

When considering the Dutch and Belgian utility sectors, communicating with consumers and regulatory agencies becomes an increasingly important factor. As previously established, a low PDI indicates more intensive, more interactive and less formalized communication. However, it is unclear whether this is beneficial or detrimental for a utility company. On the one hand, this is expected to benefit the relationship with the customer, whilst on the other hand this is expected to negatively influence the communication with the regulatory agency, which perhaps better suits a formal approach.

Following the given argumentation, Belgium, with its higher PDI, is expected to have higher maturities for the following elements: SLM, Policies, Organization and Metrics. The Netherlands, with its lower PDI, is expected to have a higher maturity on Communication.

5.2. Individualism (IND)

The small difference between the scores of the Netherlands (80) and Belgium (75) makes it difficult to formulate effective, clear propositions about the two countries separately. However, still some expectations can be formulated about the effect of individualism in general on SOA governance maturity. Overall, High IND cultures are expected to score high on governance maturity in general as a reaction to fraudulent actions of individuals (Silvius et al., 2009). This is possibly reflected in a high maturity of SOA Vision and Organization. Furthermore, in individualistic societies, the task normally prevails over personal relationships (Silvius et al., 2009). Therefore, a high IND score could indicate more task-oriented communication that results in a high maturity on Communication. Birgelen, Ruyter, Jong, & Wetzels (2002) found that people in individualistic cultures show a greater emphasis on organizational structure and architecture because of their openness to exchange relationships with external parties. This is expected to have a positive effect on the maturity of Organization.

Looking at the utilities sector, it is difficult to predict a how IND affects companies in the sector. One could argue that in a sense, utility companies serve well in a typical collectivistic environment, because

in practice nobody can do without the power and/or fresh water delivered by utility companies. Therefore, one could say they serve a typical collectivistic goal. However, this claim is hard to sustain, because the examples of individualistic countries where utility companies are stable and healthy are numerous, such as many western countries (Smart, 2005).

5.3. Masculinity (MAS)

The Netherlands has an index of 14, while Belgium scores 51.5. This implies that the Netherlands has a very *feminine* culture. The higher score of Belgium means that Belgium shows more masculine traits in its national culture than the Netherlands. However, the score of 51.5 indicates that it is in the middle when compared to all the other countries. Therefore, Belgium's national culture is certainly much more *masculine* than the national culture of the Netherlands, but still not very masculine considered overall.

Cultures with a high MAS are more oriented towards material success, measurements and performance (Silvius et al., 2009). Policies and Metrics, being typical examples of that, are expected to show high scores in high MAS cultures. Furthermore, because of this orientation, cultures with a high MAS can be expected to score high on governance maturity in general (Silvius et al., 2009). Moreover, in high MAS cultures one-way communication is more prominent (Hofstede et al., 2011), which is expected to negatively affect Communication because Communication covers the spectrum of communicating the philosophy of SOA throughout the organization. Contrastingly, low MAS cultures favor two-way communication (Hofstede et al., 2011). Hence, the maturity of Communication is expected to be higher in low MAS cultures.

Typical traits of a high MAS culture, such as the previously mentioned orientation towards material success, measurements and performance could be beneficial for the utilities sector, where measurable factors are abundant. However, the typical one-way communication of high MAS cultures could hinder communication with customers and regulatory agencies. Perhaps two-way communication, which is typical for a low MAS culture, is better suited for these communication purposes.

The following propositions are based on the argumentation provided above. The Netherlands, with its feminine culture, is expected to score high on Communication. Belgium on the other hand, with its less distinct culture concerning masculinity, is expected to score higher on the elements Policies and Metrics.

5.4. Uncertainty Avoidance (UAI)

The index of Netherlands on uncertainty avoidance is 53, whereas the Belgian index is 95. The difference between the countries is considerable. In this case, the Netherlands can be viewed as a country with mediocre UAI, whereas Belgium has a high UAI.

As Sørnes et al. 2004 found, cultures with a high UAI are usually expected to score higher on governance maturity, because of its tendency to require certainty. Governance in general reduces uncertainty in an organization. This is expected to have a positive effect on SOA Vision. The vision on SOA on the long term can provide important guidelines and context for the future, reducing uncertainty. Cultures with a high PDI are more likely to have such guidelines in place and are therefore expected to score higher on SOA vision. Furthermore, Policies and Metrics are expected to show higher maturities in high UAI

cultures, because of their focus on tangible results, which are also meant to reduce uncertainty. Moreover, Organization is also expected to show a higher maturity in cultures with a high UAI, because of its orientation towards formalization of organizational structure, reducing uncertainty. Livonen, Sonnenwald, Parma, & Poole-Kober (1998) found that cultures with a high UAI are expected to have a slower pace of individual learning. Thus, high UAI cultures are expected to score lower on Communication.

Eliminating uncertainty, in the form of procedures and formalization, is one of many solutions to deal with the low error-tolerant circumstances of the utilities sector. Therefore, we expect that many utility companies will have an organizational culture geared towards a high UAI.

Following this argumentation, the Netherlands, with its mediocre UAI, is expected to score higher on Communication. Belgium, with its high UAI, is expected to score higher on SOA Vision, Policies, Organization and Metrics.

5.5. Long-term Orientation vs. Short-term Orientation (LTO)

The Netherlands has an index of 67. Belgium's index is 82; both countries (especially Belgium) are more long-term oriented than short-term oriented. The small difference between the two countries requires a careful approach to formulating the propositions. First, expectations are given about the effect of LTO on SOA governance in general.

In cultures with high LTO, managers receive more trust and more time to contribute their efforts to the organization (Hofstede et al., 2011). This is expected to positively affect SOA Vision, because long-term visions are important in a high LTO culture, and the manager has enough time to realize that vision. Furthermore, it is expected to have a negative effect on Policies and Metrics, because such elements of control are emphasized less in high LTO cultures. Instead, Policies and Metrics are typical examples of short-term thinking. Hence, high LTO cultures are expected to show lower maturities on Policies and Metrics.

In contrast, cultures with low LTO are more geared towards bottom-line results. Hence, managers are quickly replaced in the case of disappointing results (Hofstede et al., 2011). The results of this are expected to be the opposite of the expectations described in the previous paragraph. So, cultures with low LTO are expected to score lower on SOA Vision, because long-term vision are less prominent in cultures oriented towards short-term results. Furthermore, in most low LTO cultures, Policies and Metrics are expected to show high maturities because of their orientation towards short-term control. Such tools of control play an important role in assessing one's performance, and if necessary, undertake appropriate action.

Whether utility companies are benefit of a high LTO culture or a low LTO culture is difficult to predict. It is possible that short-term goals are less important in the utilities sector and that long-term goals, such as becoming friendlier to the environment, are emphasized more. However, one could also argue that short-term oriented cultures have no problem running their utilities sector, as there are numerous examples of countries with such a culture that do.

Based on these considerations, Belgium with its higher LTO is expected to score higher on SOA Vision. In contrast, the Netherlands, with its lower LTO, is expected to score higher on Policies and Metrics.

5.6. Indulgence vs. Restraint (HED)

For this dimension, the index of the Netherlands is 68, whereas Belgium's score is 57. Both countries therefore have cultures more geared towards indulgence (or hedonism) than towards restraint. Again, the difference is small, which impedes the formulation of propositions.

This dimension is also the youngest of Hofstede's dimensions, which further increases the difficulty of formulating expectations based on existing evidence. Furthermore, given the characteristics of HED, no sound expectations can be formulated at all about the relationship between HED and SOA governance. For example, in indulgent cultures it is acceptable to smile frequently and have a positive attitude towards life in general (Hofstede et al., 2011). Contrastingly, in restraint cultures people show more negative and cynical behavior (Hofstede et al., 2011). However, it is unknown what consequences result from this difference concerning SOA governance at this point. Likewise, the relation of HED and the utilities sector is also difficult to indicate at this point.

5.7. Wrap up

In table 16 the relation between the elements of SOAGMM 1.1 and Hofstede's six cultural dimensions are listed. A '+' symbol indicates a positive relation. For example, the positive relation between PDI and SOA Vision indicates that if the PDI in a country is high, the maturity on SOA Vision is expected to also be high. Likewise, '-' indicates a negative relation. For example, the negative relation between PDI and Communication indicates that if the PDI in a country is low, the maturity on Communication is expected to be high. Furthermore, the country that is expected to be favored most by the given relationship is put between parentheses '(' and ')'. In some occasions, no clear choice can be made, in which case there are no parentheses visible. An empty cell indicates that no clear relation can be predicted based on literature or the author's own findings and insights. The bottom-row indicates the country that, according the propositions, is expected to score highest on the corresponding element of SOAGMM. For two elements of SOAGMM 1.1, there is insufficient information available to propose sound expectations about their relation with cultural dimensions.

Table 16 – The relations between elements of SOAGMM 1.1 and Hofstede's six cultural dimensions

<i>Legend:</i> BE = Belgium NL = the Netherlands	SOA Vision	SPM	SLM	Policies	Organi- zation	Metrics	Commu- nication
PDI				+ (BE)	+ (BE)	+ (BE)	- (NL)
IND	+				+		+
MAS				+ (BE)		+ (BE)	- (NL)
UAI	+ (BE)			+ (BE)	+ (BE)	+ (BE)	- (NL)
LTO	+ (BE)			- (NL)		- (NL)	
HED							
Expected country	BE (P1)			BE (P2)	BE (P3)	BE (P4)	NL (P5)

Belgian utility companies are expected to score higher on SOA Vision, Organization, Policies and Metrics. Communication is the only element where utility companies in the Netherlands are consistently expected to have a higher maturity than their Belgian counterparts have. We are unable to provide propositions about the relations between SPM and SLM and national culture. The following is an overview of the propositions:

P1. Belgian utility companies are expected to score higher on SOA Vision than Dutch utility companies.

P2. Belgian utility companies are expected to score higher on Policies than Dutch utility companies.

P3. Belgian utility companies are expected to score higher on Organization than Dutch utility companies.

P4. Belgian utility companies are expected to score higher on Metrics than Dutch utility companies.

P5. Dutch utility companies are expected to score higher on Communication than Belgian utility companies.

To understand the value of the propositions we should take into account two factors.

- The propositions only take into account the possible influence of national culture. There may be other factors that influence SOA governance maturity in a country's utility sector. For example, it is possible that the laws and regulations in a country require less SOA governance maturity than the laws and regulations in another country. Furthermore, companies may be under influence of several different circumstances outside the scope of the energy sector as a whole. For example, a relatively young and small company (such as BelgComp2) may have very different SOA governance needs based on its size and age alone compared to larger, longer existing companies.
- On three out of six dimensions, the Netherlands and Belgium have rather comparable indices. This makes it difficult to predict the direct implications of these dimensions, because the indices are so similar. Moreover, it is difficult and possibly arbitrary to determine whether a difference in the scores of the countries is big enough to directly influence SOA governance, so we are inclined to be careful with such qualifications.

6. Participating utility companies

In this section, the participating companies are introduced. A part of their history is explained accompanied by a description of the organizational culture at the utility companies and some of their strategic IT-choices.

An overview of the participating organizations is shown in table 17. The numbers in table 16 are based on the official annual reports of the organizations and/or their official website(s). Anonymity was guaranteed to the participating organizations. Therefore, the direct sources of the numbers in table 17 are not provided here. DutchComp1, DutchComp2 and BelgComp1 are quite similar in terms of size, whereas BelgComp2 is much smaller.

Table 17 – Market shares of participating companies

Country	Company	Amount of customers	Amount of employees
The Netherlands	<i>DutchComp1</i>	2.300.000	4100
	<i>DutchComp2</i>	3.300.000	6650
Belgium	<i>BelgComp1</i>	3.300.000	7100
	<i>BelgComp2</i>	400.000	170

Each company is briefly described and the organizational culture is discussed. Note that organizational cultures may differ from the national culture. Qualifications of organizational culture should be put into context of the national culture at hand because they are *always* subjective to the national culture (Hofstede et al., 2011). For example, when an organization within a country with high MAS indicates that they have low MAS as part of their organizational culture, an objective observer should always take into account that the context of the organization is high *national* MAS. In fact, we must also take into account that the authors of this thesis are also subject to a national culture; the Dutch. Lastly, the information on the organizational cultures is merely meant to add to the context of the organization. The information is in no way further verified, so we will be reserved with drawing conclusions in the area of organizational culture.

- **DutchComp1**

Originally founded in 1999, DutchComp1 has been in the hands of a German owner since 2009. It is a rather large company, with 4100 employees, which results in an above average PDI, MAS and UAI. This is not uncommon for larger organizations, even when the Dutch national culture is more geared towards low PDI, MAS and UAI. The IND and HED are estimated to be average for Dutch standards. Lastly, the organization focuses more on short-term interests over long-term interests, which is rather unique for Dutch standards.

DutchComp1 has started with a pilot of SOA in 2009. Ever since, they have started to more and more embrace SOA as their main EA. The organization is subject to many changes over time. Not only from inside (such as the introduction of SOA), but also from the outside (such as the change of ownership and introduction of new laws and regulations from the governments). These

frequent changes add to the complexity of the SOA governance-question, but also make DutchComp1 an interesting case to examine.

- **DutchComp2**

DutchComp2 emerged in its current form when it split off another Dutch utility company in 2009. With 6650 employees, DutchComp2 is also a large company. However, DutchComp2 is different from the other participating companies in the sense that, in the past, a conscious choice has been made for standard 'off-the-shelve' software over other approaches, such as SOA. Nevertheless, in a number of areas, services are still used as building blocks at DutchComp2.

DutchComp2 is indicated to have average PDI, IND, MAS and LTO for Dutch standards. The organizational culture is a bit more restraining than many others are, eloquently characterized by the interviewee as "typical Dutch Calvinism". Lastly, DutchComp2 has a higher than average UAI; a lot of consultation takes place before final decisions are made.

- **BelgComp1**

BelgComp1 is one of the few original players of the Belgian electricity market before its liberalization. Since 2005, it is owned by a French company. It is large company with about 7100 employees. Like DutchComp1, BelgComp1 has been working on incorporating SOA in the EA for some years now.

According to the interviewees, BelgComp1 has high PDI, MAS and UAI, which is typical for Belgian organizations, especially when they are rather large. More focus is put on collectivism over individualism, unlike the usual individualism in Belgium. Lastly, BelgComp1 is mostly long-term oriented, which is common in Belgium.

- **BelgComp2**

Founded in 2003, BelgComp2 is the youngest company of all participating companies. Additionally, by serving 400.000 customers and employing 170 people BelgComp2 is also the smallest company of all participants. This has its effect on the organizational culture, which is judged to be roughly as follows. Due to the small size and young age, there is low PDI, MAS, UAI and LTO for a Belgian company. In addition, BelgComp2 is more geared towards collectivism than usual for Belgium. Lastly, the HED is deemed average at BelgComp2. In short, BelgComp2 is rather unlike the average Belgium organization.

BelgComp2 resembles DutchComp2 in the sense that on the one hand BelgComp2 is an interesting case, because it brings a degree of diversity to the field of participating companies. On the other hand, this is also a risk; BelgComp2 could prove to be an outlier by providing extreme results, hindering reliable analysis. Furthermore, one could argue that its youth hinders BelgComp2 from being very mature in terms of SOA itself, and hence, SOA governance.

However, at this point in time this statement's validity is uncertain, because one could also argue that while the company is certainly young compared to the other participating organizations, it is not that young in absolute terms and is rather old when compared to a number of other competitors in the market.

One could argue that DutchComp1 and BelgComp1 represent a sort of straightforward organizations. They are both rather comparable organizations in terms of size, centralization and organizational culture. On top of that, they both pursue IT-related goals by using many practices that lie in the area of SOA. DutchComp2 and BelgComp2 have the role of adding diversity to our research. DutchComp2 is similar to DutchComp1 and BelgComp1 in terms of size, but differs greatly in the chosen IT strategy. BelgComp2 is a new participant in the Belgian market; a growing organization that is 'up and coming', a young organization with, literally, young employees. This ultimately results in a different IT strategy and organizational culture. To get a firm understanding of SOA governance in both countries, it is therefore not only interesting to compare DutchComp1 with BelgComp1, but also to compare both Dutch companies with each other and both Belgian companies with each other.

The interviews take place in a semi-structured fashion. This technique has been chosen because of the explorative nature of this research. Participants should be enabled to freely discuss the topic and they should be able to ask clarifying questions when necessary. Furthermore, certain participants may have different levels of expertise and/or knowledge about a particular subtopic within the spectrum of SOA governance than about another. Therefore, there is room during the interviews to treat some topics on a more superficial level than others and more thoroughly explore other topics.

Participants are selected based on their role in organizations. The exact roles differ per organization. For a relatively small company like BelgComp2 this person can have the role of Chief Information Officer (CIO), who is a member of the board. In a relatively large company, this person usually has a role on a level just below the CIO, such as 'Lead CIO Office' or 'CIO Office Manager'. Such roles were chosen because such people usually have enough oversight to fully grasp the way the organization copes with SOA, but also have enough contact with the day-to-day implications of SOA in the organization. Furthermore, architects are also a welcome addition to the group of interviewees. They are expected to provide a slightly more practical view on the matter, which adds to the diversity and trustworthiness of the data that will be gathered. Table 5 contains an overview of the function titles of the participants.

Preferably, two interviews are held per utility company. In the case of DutchComp1 and BelgComp1, two participants are interviewed for each organization, whereas DutchComp2 and BelgComp2 each provide one participant for the case interview. DutchComp2 was unable to schedule a second interview within the available timeframe. BelgComp2, being a small company, had no other employee available that would have enough expertise and/or knowledge on the topic of SOA governance to participate in the interview.

7. Results

This section covers the results of the case study. For every element of SOAGMM, the results of the four cases are discussed and possible explanations are given to clarify the results. Furthermore, the five propositions are tested against the results to verify whether they are supported, and, if that is the case, to which degree they are supported. Participating utility companies can score on a scale of 0-4 on each of the elements of SOAGMM. The scores will be presented on bar charts on a fixed scale of 0-4.

In section 7.1, the results of SOA Vision are discussed. Section 7.2 covers the results of SPM. In section 7.3 the results of SLM are given. Section 7.4 contains a discussion of Policies. Section 7.5 entails the results of Organization. Section 7.6 argues about the results of Metrics. Lastly, Section 7.7 discusses the results of Communication. In section 7.8, an overview of the results is presented and discussed.

7.1. SOA Vision

Recall that the proposition concerning SOA Vision is as follows.

P1. Belgian utility companies are expected to score higher on SOA Vision than Dutch utility companies.

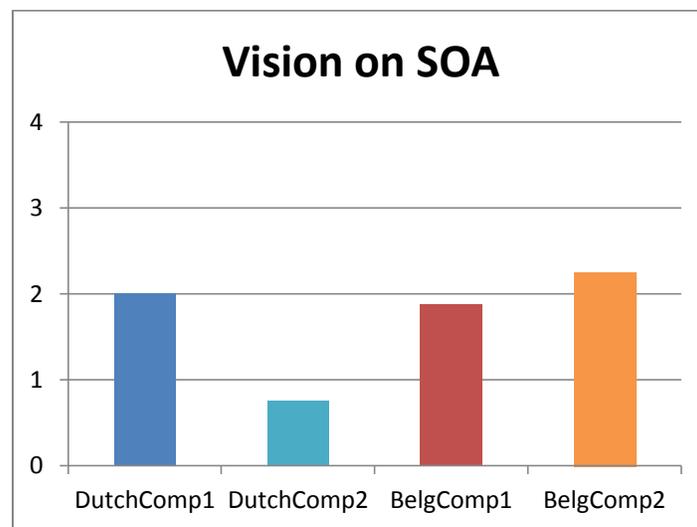


Figure 9 – Scores on SOA Vision

DutchComp1 (2.0), BelgComp1 (1.88) and BelgComp2 (2.25) show rather comparable scores. From an organizational point of view, a possible explanation is the relatively high PDI and UAI at DutchComp1, which could cause a higher score on SOA Vision. Still, following the propositions, BelgComp1 scores lower than expected, as their circumstances (high PDI, UAI and LTO in both the organizational and national cultures) were expected to provide the best conditions for a high maturity on SOA Vision.

A noticeable phenomenon concerning BelgComp2 is that their focus on short-term, the low PDI and low UAI do not seem to hinder BelgComp2 from getting the highest score, unlike what was expected. This directs us to the consideration that the relation between organizational culture and SOA Vision is unclear.

In terms of national culture, the expected relation between cultural dimensions and SOA Vision has not been observed. DutchComp1's score is almost identical to the scores of both Belgian companies.

The score of DutchComp2 is noticeably lower (0.75) than the other three companies. The cause of this is explained by the already mentioned lack of SOA-related efforts at DutchComp2. As the interviewee eloquently put it him/herself in the form of a rhetorical question: *"Why would a company that does not adopt SOA have a long-term SOA Vision or have an EA that reflects many SOA characteristics?"*

The unexpected high scores of DutchComp1 and BelgComp2 and low score of BelgComp1 lead us to rejecting P1 and the underlying argumentations.

7.2. Service Portfolio Management

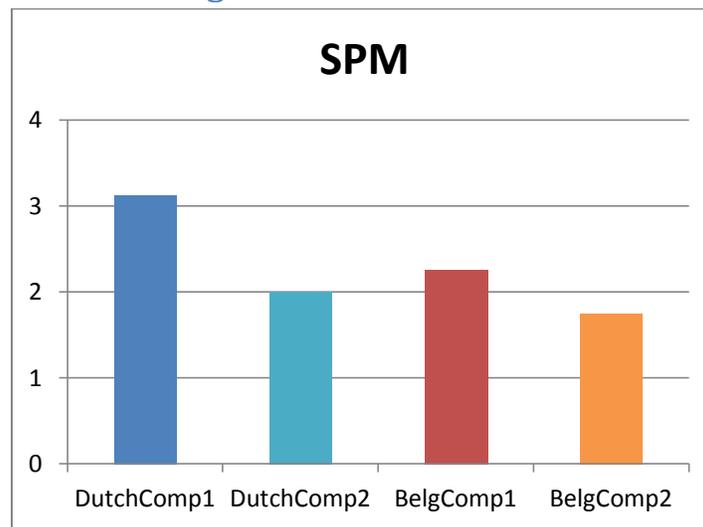


Figure 10 – Scores on Service Portfolio Management

Although no proposition was formulated concerning SPM, we can still analyze the results. DutchComp2 (2.0), BelgComp1 (2.25) and BelgComp2 (1.75) have comparable scores. DutchComp1 however, scores higher (3.13).

Perhaps the feminine Dutch culture positively influences the high score of DutchComp1. However, the MAS at DutchComp1 is also judged as high for Dutch standards, so this could negate (part of) the feminine aspects of their culture. Furthermore, the lower score of DutchComp2 should also be taken into account, as its score is almost equal to the two Belgian companies. DutchComp2 has been indicated to have average MAS for Dutch standards, which would make their culture more feminine than the culture at DutchComp1. Moreover, it should be noted that DutchComp2 has made smaller SOA efforts than the other organizations, which could also partially make up for the lower score compared to DutchComp1. Additionally, BelgComp2 has rather low MAS for Belgian standards, but scores lower than BelgComp1, with higher MAS.

The most logical explanation for the higher score of DutchComp1 is given by the one of the interviewees. It was stated that they started valuing service reuse about three to four years ago, which

is longer than most other companies, making the processes surrounding service catalogs and service portfolios rather mature. This most likely explains best why DutchComp1 scores higher than other companies, but unfortunately provides no new insight in the relation between national culture and SOA governance maturity.

Therefore, we posit that there is not enough evidence to support the existence of a relation between SPM and any of the cultural dimensions.

7.3. Service Lifecycle Management

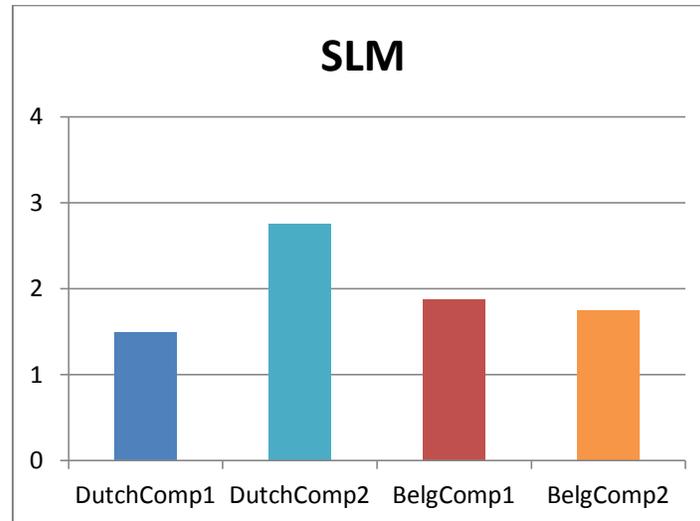


Figure 11 – Scores on Service Lifecycle Management

Like in the case for SPM, for SLM there is also no proposition formulated. The results show that DutchComp1 scores lower (1.5) than both BelgComp1 (1.88) and BelgComp2 (1.75). DutchComp2 scores the highest with 2.75.

The high score of DutchComp2 is immediately noticeable. During the interview, it became evident that for the small number of services that are running at DutchComp2, processes in the area of lifecycle management are more mature than at other companies. The interviewee explained that several other factors led them to achieving this maturity level, such as the need to manage the lifecycle of tailor-made customizations to off-the-shelf software that has been purchased and their own tailor-made solutions. Although this explanation seems plausible, it does not provide further insight in the relation of SLM and national culture. Note that if DutchComp2 had no services or features of SOA at all, the score would have been set to zero. However, because DutchComp2 does have some services and it does have some features of SOA, although not many, we decided not to adjust the score of DutchComp2.

The remaining companies score relatively close to each other, although both Belgian companies score somewhat higher than DutchComp1. The higher PDI in Belgium could be factor in this phenomenon, but the difference in scores is rather small, which makes it hard to sustain the direct relation between PDI and SLM.

Based on the argumentation above, we decide that there is no evidence to support the existence of a relation between SLM and any of the cultural dimensions.

7.4.Policies

Recall the following proposition that accompanies Policies.

P2. Belgian utility companies are expected to score higher on Policies than Dutch utility companies.

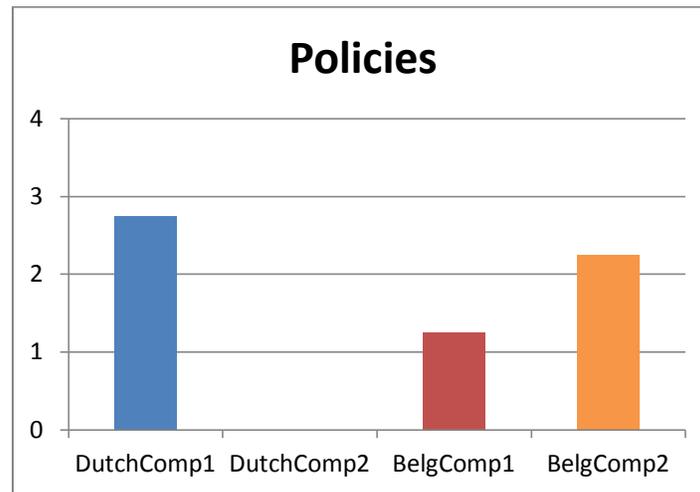


Figure 12 – Scores on Policies

The outcomes are difficult to analyze because of the extreme results. DutchComp1 scored highest with 2.75. BelgComp2 scored 2.25 and BelgComp1 scored 1.25. DutchComp2 scores zero, which can be explained by the same argumentation as earlier; no policies are needed to run a tiny amount of services. Furthermore, it was stated that DutchComp2 does not have many policies in their organization to begin with, which also explains why no other factors could have led DutchComp2 to develop policies (which was the case with SLM).

An obvious possible explanation for the differing scores of DutchComp1, BelgComp1 and BelgComp2 would be that Policies is strongly related to organizational culture, rather than national culture. However, if organizational culture is a better predictor for maturity on Policies than national culture, then the low score of BelgComp1 and the high score of BelgComp2 already firmly contradict it. Remember that BelgComp2 has a very different organizational culture than BelgComp1 and DutchComp1, being a young and growing company. DutchComp1 and BelgComp1 are more similar in terms of organizational culture. In the case that this explanation is true, we would have expected BelgComp1 to score higher and BelgComp2 to score lower.

If we take DutchComp2 out of the equation, the proposed relation between low LTO and Policies is a point of discussion. Although the difference in terms of LTO between the two countries is rather small (67 for the Netherlands and 82 for Belgium), DutchComp1 achieves the highest score of all participants. On top of that, BelgComp2 also shows a high score. From an organizational perspective, the factor that DutchComp1 and BelgComp2 have in common is that they are both relatively short-term oriented.

However, we cannot put too much weight on that resemble, because the information on organizational cultures is trustworthy enough and not verifiable. Ultimately, it is not unlikely that other factors play a prominent role here. For example, DutchComp1 was the first company to adopt SOA and therefore could be furthest down the road of the “SOA journey”.

From the perspective of national culture, another possible explanation is that the low PDI, MAS or UAI in the Netherlands compared to Belgium, or a combination of two or more of those dimensions, actually work in favor of DutchComp1. However, there is no evidence to support this and existing studies, such as studies by Sørnes et al., (2004) and Gilbert Silvius et al., (2009), have already steered towards the other direction. Hence, there is no evidence to substantiate this claim either. Ultimately, the expected positive effects of the high Belgian PDI, MAS and UAI are not visible in the results.

Based on the above, we reject P2, as there is no evidence to back the proposition or the underlying arguments up.

7.5. Organization

The proposition covering Organization is as follows:

P3. Belgian utility companies are expected to score higher on Organization than Dutch utility companies.

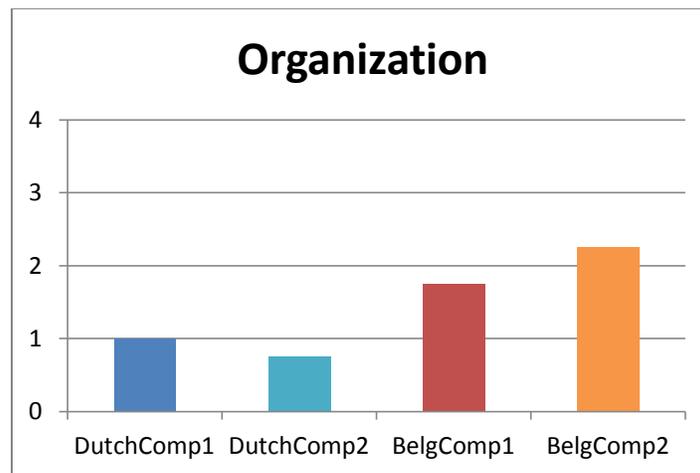


Figure 13 – Scores on Organization

Both Dutch organizations score lower (1.0 for DutchComp1 and 0.75 for DutchComp2) than the two Belgian companies (1.75 for BelgComp1 and 2.25 for BelgComp2). The high score of BelgComp1 is no surprise in light of the propositions. However, the high score of BelgComp2 is surprising, because its organizational culture is very different compared to the organizational culture at BelgComp1. Perhaps, even though it may sound contradicting, organizational culture is rather unimportant when it comes to the relation between Organization and national culture. In that light, national culture could be of much greater influence on Organization than organizational culture. Note however that Organization is just a chosen term by the authors and is arguably arbitrary in the sense that other candidate terms could apply just as well. Hence, the mentioned contradiction should not be taken too seriously.

Furthermore, it is notable that BelgComp1 is the only participating company that has instituted a SOA Center of Excellence, which is viewed as viewed by practitioners as crucial for good SOA governance (see also section 4.1 and 4.2). This greatly adds to the maturity level of BelgComp1 on Organization.

Again, the low score of DutchComp2 is largely explained by the lack of SOA-related goals and lack of SOA in the IT strategy. The low score of DutchComp1 was more or less expected given the propositions. Judging from these outcomes, mostly the high PDI and UAI of the Belgian national culture seem to favor SOA governance maturity. The influence of IND on Organization is harder to judge because of the small difference in IND between the two countries.

Based on these results and the following argumentation, we regard that P3 and the underlying expected relations between elements of SOAGMM and cultural dimensions are strongly supported.

7.6.Metrics

Recall the following proposition for Metrics:

P4. Belgian utility companies are expected to score higher on Metrics than Dutch utility companies.

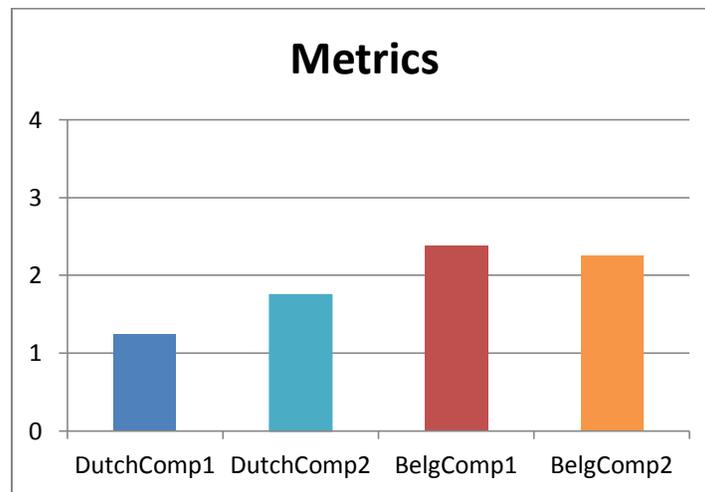


Figure 14 – Scores on Metrics

Both Dutch companies (DutchComp1 with 1.25 and DutchComp2 with 1.75) score lower than their Belgian counterparts (2.38 for BelgComp1 and 2.25 for BelgComp2).

DutchComp2 explained during the interview that they sign service level agreements (SLAs) with their software providers. These SLAs partly cover the services that they have running. In that sense, the SLA's also count as metrics, this accounts for the scores of DutchComp2. However, not all services fall under the umbrella of SLAs.

When taking DutchComp2 out of the equation, the difference between DutchComp1 on one side and BelgComp1 and BelgComp2 on the other side becomes obvious. The high Belgian PDI, MAS, UAI and LTO seem to have a consistent, positive effect on the maturity level of Metrics.

On an organizational level, it is harder to say what causes the similar results of BelgComp1 and BelgComp2. It could be that organizational culture plays a less prominent role as a predictor for Metrics.

Based on the results and the above argumentation, we argue that P4 and the underlying argumentations are strongly supported.

7.7. Communication

Recall the following proposition concerning Communication:

P5. Dutch utility companies are expected to score higher on Communication than Belgian utility companies.

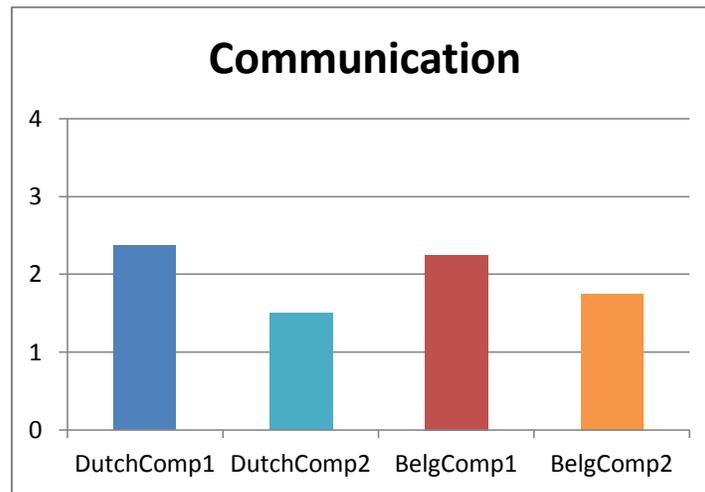


Figure 15 – Scores on Communication

The results on Communication may be divided into two groups. First, DutchComp1 (2.38) and BelgComp1 (2.25) show comparable maturities. Second, DutchComp2 (1.5) and BelgComp2 (1.75) also have roughly comparable scores.

From the point of view of national culture, these results are difficult to explain. The low PDI, MAS and UAI of the Dutch culture were expected to positively affect Communication, but no such effect is visible in the results.

However, from an organizational point of view, the results make more sense, since DutchComp1 and BelgComp1 are comparable in terms of organizational culture, size and IT strategy. Perhaps Communication is more directly influenced by organizational culture than national culture.

Based on the above argumentation, we find no support for P5 and its underlying trains of thought.

7.8. Overview

Now that all elements of SOAGMM have been discussed, an overview of the propositions and their degree of support is presented in table 18.

Table 18 – Overview of degree of support for the propositions

#	Contents of proposition	Support
P1	Belgian utility companies are expected to score higher on SOA Vision than Dutch utility companies	None
P2	Belgian utility companies are expected to score higher on Policies than Dutch utility companies	None
P3	Belgian utility companies are expected to score higher on Organization than Dutch utility companies	Strongly supported
P4	Belgian utility companies are expected to score higher on Metrics than Dutch utility companies	Strongly supported
P5	Dutch utility companies are expected to score higher on Communication than Belgian utility companies	None

Judging the results, the question rises whether the propositions were principally correct to begin with. Although the propositions are based on academic literature, as always with science, there is the risk of a discrepancy between theory and practice. However, we should take into account that the propositions were solely based on the consequences of national culture on SOA governance maturity. Other factors could also have played an important role in determining the scores, therefore clouding the gathered information about the direct relation between national culture and SOA governance maturity. For example, the time and effort that an organization has put into adopting SOA could also influence SOA governance maturity. Several possible explanations are further discussed in section 8.

8. Conclusion & Discussion

This section is dedicated to discussion and conclusion concerning our research. In section 8.1, the results are further discussed and confronted with academic literature. In section 8.2, the limitations of our research are described. Section 8.3 presents recommendations for future work.

8.1. Concluding discussion

Here the implications of the results are further discussed. Section 8.1.1 discusses the expected relations between Hofstede's cultural dimensions and SOA governance maturity. Section 8.1.2 presents a discussion of internal factors - from the perspective of the utility companies - that play a role in SOA governance maturity, followed by a consideration of the external factors. Lastly, section 8.1.4 contains an overall conclusion. When discussing the SOA governance maturity model, remember that the philosophy of a maturity model is not to get the highest maturity overall, but to get to the appropriate maturity level for the situation of the company at hand, which is not necessarily the highest maturity level.

8.1.1. Cultural dimensions

Sørnes et al., (2004) argued that a low PDI indicates close working relationships between hierarchical levels and assertive behavior, resulting in averseness of formalization and procedures. Cultures with a high PDI are better suited for centralized structures. Based on that, a high PDI (such as in Belgium) was expected to positively influence SOA Vision, SLM, Policies, Organization and 'Metrics because of the good fit with centralization, which also a good fit with SOA governance maturity. Contrastingly, a low PDI (such as in the Netherlands) was expected to positively influence Communication. The results show that only for the elements 'Organizations' and Metrics this proposition is true. There are several possible explanations for this. First, perhaps SOA Vision, SLM, Policies and Communication revolve less around PDI itself. We should take into account that even though SOAGMM 1.1 is evaluated by experts, it may not be as mature as it should be. Second, it is possible that other factors besides PDI, such as the organizational structure or the pursued IT strategy play a much bigger role, negating the effect of PDI.

Concerning IND, it was expected beforehand that SOA Vision, Organization, and Communication would be positively affected by a high IND. This expectation is difficult to test, because the two countries have such a similar IND (remember that the Dutch IND is 80 and the Belgian IND is 75). Organizational culture could also play a role in this case. However, this lacks evidence in the results or in theory.

A low MAS was indicated to have a positive effect on SPM and Communication, whereas a high MAS was expected to positively influence Policies and Metrics. Recall that the Belgian MAS is 51.5 and the Dutch MAS is 14. Gilbert Silvius et al., (2009) argued that cultures with high MAS could be expected to score high on overall governance maturity and typical governance elements. Another consideration about MAS and its relation with SOA governance is that in high MAS cultures one-way communication is preferred over two-way communication (Hofstede et al., 2011), resulting in the positive expectation for the elements Policies and Metrics, where communication is mostly one-way. Of those two, Metrics was the only element where the relation indeed was observed. Concerning Policies, it is possible that Policies does not entail as much one-way communication as was expected and organizations implement an

approach with two-way communication, nullifying the effect of MAS. Furthermore, more factors could weigh in as well and negate the effect of national culture. As discussed in sections 7.2 and 7.7, no relation between MAS and SPM or Communication was visible in the results. Apparently, either both SPM and Communication do not entail as much two-way communication as expected or other factors play a more important role and the effect of MAS is negated.

High UAI was expected to have a positive effect on SOA Vision, Policies, Organization and Metrics. On the other hand, low UAI was expected to positively affect Communication. Sørnes et al., (2004) found that cultures with high UAI have a higher governance maturity level, because of their tendency to reduce uncertainty. This was expected to positively influence SOA Vision, Policies, Organization and Metrics. The relations between UAI and Organization and Metrics were visible in the results, as discussed in section 7.5 and 7.6. The other expected relations were however not found in the results. A possible explanation is that SOA Vision and Policies do not revolve enough around reducing uncertainty to enable the results to show it off. However, this is rather unlikely, because SOA Vision and Policies are arguably two of the most uncertainty reducing elements of SOAGMM. Therefore, it is more likely that other factors play a more prominent role in predicting maturity of SOA Vision and Policies, negating the expected relation. Furthermore, Communication was expected to be positively influenced by a low UAI, because high UAI cultures have a slow pace of learning (Livonen et al., 1998). The absence of this expected relation in the results can perhaps be explained by the suggestion that the pace of learning is not as important as was expected beforehand.

High LTO cultures were beforehand expected to have a positive effect on SOA Vision, because long-term visions and plans are valued as important in high LTO cultures. Furthermore, high LTO cultures were expected to have a lower score on Policies and Metrics, because such elements of control are expected to play a lesser role in high LTO cultures. The opposites of those expectations were also proposed for low LTO cultures. Hence, low LTO cultures are associated with a lower score on SOA Vision and higher scores on Policies and Metrics. However, Metrics was already positively associated with PDI, MAS and UAI, which are all dimensions where the differences between the Dutch and Belgian cultures are much higher. Based on these conditions, there is not enough evidence to sustain the expectation that a high LTO positively influences Metrics. In contrast, the expected relation between LTO and Policies was visible, as is described in chapter 7.4. It remains however a question whether it was only the lower LTO in the Netherlands that caused the relation or other factors played a more significant role, such as how much time and effort the company has already spent on adopting SOA in general.

As stated before in section 5.6, for HED, there were no expectations formulated beforehand. HED is the latest addition to Hofstede's dimensions. Hence, much less is known about the relation of HED with other topics than is the case for the other dimensions.

8.1.2. Internal factors

Besides national culture, other factors also affect the SOA governance maturity of a utility company. Primarily, as we have seen with DutchComp2, the IT strategy pursued by the utility company at hand plays a big role. DutchComp2 deliberately made a choice to go in a different direction than SOA and to

only utilize a small spectrum of the capabilities of SOA. Hence, DutchComp2 had an overall low SOA governance maturity because there was no need for a high level of SOA governance maturity.

Second, if national culture plays a role in SOA governance maturity, organizational culture should not be ignored, as one is never without the other (Hofstede et al., 2011). However, the exact division between the two types is difficult to grasp. Furthermore, acquiring data for the organizational culture within an organization can quickly become time-intensive. Nevertheless, when we compare the results of BelgComp1 and BelgComp2, there are notable differences. Remember that BelgComp2 is a young and small company, which results in a different organizational culture than at BelgComp1, which is a large, mature and established company.

Third, the amount of time and effort a company has put into the adoption of SOA is possibly an important factor. When SOA is more deeply integrated into an organization's EA, SOA governance becomes more important. Hence, higher maturities can be expected if an organization is well down the road of SOA. This is occasionally visible in the results of DutchComp1, where high maturity scores are reached for a number of elements of SOAGMM. However, it is not that case that DutchComp1 consistently scores the highest, so the relationship is not strong enough that other factors can be ignored in predicting an organization's SOA governance maturity.

8.1.3. External factors

A possible external factor lies within the market. The dynamics of the electricity markets and the laws and regulations that rule in the markets are not identical for the two countries. This is also in line with the notion that no two countries share an identical national culture, so no two countries share identical laws and regulations that partly arise from their national cultures (Hofstede et al., 2011). Although Porter's five forces model showed that the markets themselves are rather comparable, the Belgian market is still arguably more dynamic than its Dutch counterpart is. In Belgium, a higher proportion of consumers switched utility companies and the Belgian market has four regulatory agencies. This means Belgian utility companies have to put more focus on marketing and dealing with the regulatory agencies. Although it was expected beforehand that the latter would positively influence SOA governance maturity, this was not directly visible in the results.

Although the following external factor may not always apply, it did appear in this study. Namely, DutchComp1 is owned by a German company and BelgComp1 is owned by a French company. Germany and France, like the Netherlands and Belgium, have rather different national cultures (Hofstede et al., 2011). It is possible that some cultural aspects of the parent company slipped down to DutchComp1 and/or BelgComp1, influencing their organizational cultures. This could have a serious impact on the results. Moreover, this complex factor will require intensive research to investigate further, because assessing a company's organizational culture can quickly become time consuming.

8.1.4. Overall conclusion

At this point in time, this research pioneered the particular combination of topics; SOA governance maturity and national culture. SOA governance itself has become more mature over time as an academic topic, whereas national culture already is and has been a much more mature field. However,

the combination of the two topics has not occurred before in science. We therefore view this study as a starting point that has paved the way for future research.

If we recall the problem statement from section 1, the main goal of this study was to gain more insight in the relation between SOA governance maturity and national culture in the utilities sector. To perform this study, a SOA governance maturity model has been developed based on scientific theory. After an evaluation by experts on the topic of SOA governance, this model was used to assess the maturity of SOA governance at utility companies. Afterwards, the results were related to the appropriate national culture, based on the six dimensions of Hofstede. Five propositions were formulated to investigate the relation between SOA governance maturity and national culture. After careful consideration, two out of those five propositions turned out show strong support in practice. This brings us back to the question whether there truly is a relation between SOA governance maturity and national cultures.

Perhaps the most significant conclusion is that both topics are complex and they are hard to measure, let alone hard to relate to each other. On some occasions, different combinations of factors, such as national culture and the pursued IT strategy, led to identical results, whereas on other occasions identical factors led to different results. We conclude that a weak relationship is visible between national culture and SOA governance maturity, but also that more research is required to enable scholars to draw conclusions with more confidence in the future.

8.2. Limitations

No research is performed without limitations, and our research is no exception. Perhaps the most obvious limitation is that participating utility companies are not as high in number as ideal. It should however be taken into account that the number of companies within the electricity market is not high to begin with; smaller than ten for both the Netherlands and Belgium. Still, the diversity of the participating companies is rather limited.

As our research had a limited timeframe, only one or two people were interviewed per participating organization. This limits the validity of the results. As always with qualitative studies, the number of participants can be quite low without impeding validity. Nevertheless, more participants would certainly have been a welcome addition to this study.

Another limitation is associated with the two countries. Although the Netherlands and Belgium are arguably very different on three out of six dimensions of Hofstede, the cultural differences are not so obvious for the other three dimensions. Additionally, our research covered only two countries. Perhaps if utility companies from more countries had participated, more unambiguous conclusions could have been drawn from the data. However, this would have also increased complexity and hence, could have further clouded the results.

The low maturity, or in other words, the youth of SOA governance as a topic is also limits our research. SOA itself has emerged around 2005 in academic literature and even later for SOA governance. This not only has its implications on the available theory in academic literature, but also in practice. Looking back, the amount of scientific literature was sufficient and numerous. However, the gap between the academic world and the practical side of SOA governance is still significant.

Lastly, the relation between SOA governance and national culture is complex. As previously discussed, there are indications that other factors also play a role in the relation between the two topics. At this point however, not all factors are clear or perhaps even known.

8.3.Future research

One suggestion is to increase the sample size. Although the utility market is not large in terms of contenders, it would certainly increase the legitimacy of the sample and, depending on the gathered data, could possibly aid greatly in acquiring valid results. Additionally, increasing the amount of employees that are interviewed per organization is also suggested. Ideally, it would be a quantitative study. Nevertheless, it is questionable whether this is feasible, because usually only a small group of people within a utility company has sufficient knowledge to participate.

Furthermore, adding participants from different countries is also suggested. However, there is a possible downside to this suggestion, because depending on the country this might greatly increase the complexity.

This study focused on the utility sector. Another particular suggestion is to explore other sectors that might show a relationship with SOA governance maturity. The financial sector comes to mind for example, because of its history with governance, although this is more in the area of corporate governance. Nevertheless, other sectors may show direct relationships between national culture and SOA governance maturity.

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Appendix A: SOAGMM 1.0 example questions

1) SOA Vision

- a) Are there long-term goals in place for your SOA strategy?
 - i) What are these goals?
 - ii) Are these goals in line with your business goals and strategies?
 - iii) Is progress towards these goals measured? How often?
- b) Does the company have a broad vision and perspective of SOA
- c) Does the company have a SOA roadmap? (to manage the transformation of SOA by building on each successive step)
- d) Are there SOA Maturity Models in use to keep the SOA Enterprise vision in mind?
- e) Is there a form of complementary Corporate Governance and IT Governance in place?
- f) Has there been an effort before starting with SOA to make sure the organization as a whole sees the added value of SOA?
- g) Did your organization already make a choice between a *Service-based approach* and a *Process-based approach*?
 - o Service-based: a company identifies the most shareable business services, develops and deploys them, acquires tools to manage and support them, and then starts to use them. The return on investments (ROI) tends to increase as the company improves the scale of SOA and better leverages its investments. (middle-out)
 - o Process-based: top-down approach, initiated through business architecture and business processes.
Process-based approach usually has the highest ROI, but it usually also requires the most significant buy-in across lines of business.

2) Service Portfolio Management

- a) Is there consensus about what services need to be developed?
- b) Is there a services roadmap or likewise artifact?
- c) Are there policies to ensure projects use SOA principles and that new services contribute to the business service portfolio, from which other projects can then benefit?

3) Organizational changes

- a) Has a well-planned transition strategy been executed to incorporate any organization redesign because of SOA? Which of the following have taken place?
 - i) Modify existing traditions
 - ii) Institute new HR practices and management principles
 - iii) Developing novel incentive arrangements
- b) Are all core tasks and activities viewed as units of service?
- c) Are the roles and responsibilities for SOA Governance explicitly defined?
- d) Is there a form of SOA Governance board (or SOA Center of Excellence) in place?
- e) Are SOA maturity models used to assess the situation of the organizational change that is required on a regular basis?

4) Policy Catalog

- a) Are there policies in place in the organization?
- b) Is there a repository of all policies that are enforced in the organization?
- c) Are developers convinced they need to adhere to these policies?
- d) Are new enterprise services reviewed, based on these policies?

5) Service Lifecycle Management

- a) Is Service Lifecycle Management performed in any way?
 - i) Is it performed in projects?
 - ii) Is it performed by (some sort of) SOA Governance board?
- b) Is it ensured in some way that all services are in scope of the lifecycle management?
- c) Are there tools in place that support Service Lifecycle Management? Manual management of even a small number of services can become tedious very quickly) (Software AG)

6) Metrics

- a) Are key metrics, success factors or KPI's defined to measure the success of SOA Governance?
- b) Same, but success factors?
- c) Same, but KPI's?
 - For all 3:
 - i) Do they provide visibility into the progress and evolution of SOA and do they ensure continuous alignment with the business side?
 - ii) Do they support the business case for continued investment?
 - iii) Are they S.M.A.R.T.?

7) Communications / Incentives

- a) Is there a communications plan in place that keeps the entire community informed to educate employees? Examples:
 - i) Explain the goals of the SOA program?
 - ii) Answer why SOA Governance is important?
 - iii) Explain how it is to be applied?
 - iv) Inform people what impact they can expect in their work?
- b) Are there mechanisms in place that enable the organization to reward people?
- c) Are there incentives in place to encourage the building of shareable services and the reuse of existing services?
- d) Has a choice been made as to how much "carrot" and how much "stick" is applied to incentivize / reward people?

Appendix B: SOAGMM 1.1 scoring matrix

Legend:

- *Italic*: element
- **Bold**: qualification

	0	1	2	3	4
<i>SOA Vision</i>					
Long-term goals / broad vision	Not present	Only superficial	Some	Managed and monitored	In line with corporate strategy
SOA roadmap	Not present	x	Present, but not monitored	x	Present and monitored
Complementary corporate / IT Governance	Not present	Only superficial	Some	Much "overlap"	Completely alignment between SOA gov and corporate / IT Gov
Does the EA reflect SOA characteristics?	No	Only superficial	Yes, some	Yes, many	EA is fully SOA-based
<i>Service Portfolio Management</i>					
Who identifies new services	No policies in place	x	IT is leading, business provides support	x	Business side is leading, IT provides support
Consensus about new services	No	x	Yes, for a short time	x	Yes, for a long time
Central service repository	Not present	Ad-hoc solution, rarely fully up to date	Present, but it is not always up to date	Present, almost always up to date	Present, regularly updated
New services contribute to portfolio	New services are not monitored at all	New services are sometimes briefly checked	New services are briefly reviewed	Services are always reviewed, but actions are inconsistent	Only services that contribute to the portfolio are accepted
<i>Service Lifecycle Management</i>					
SLM in projects / centralized SLM	Sometimes in projects, sometimes centralized	SLM in Projects	x	x	SLM is done centralized (process)

Services are in scope of SLM	Not checked at all	Checked in an ad-hoc fashion	x	x	All services are in scope of the SLM
Tools in place for SLM	SLM is done manually	x	Some tools, manual work still required	x	Tools in use to support SLM
Who can stop and start a service	Virtually anyone	Almost everyone in business and IT	Everyone in the business-side	Small number of designated people in either business or IT	Small number of designated people in the business
Organization					
Transition strategy	Not present	Only superficial	Present, but not executed	Present and (mostly) executed	Present, monitored and continuously adjusted
Organization's willingness to change	Completely unwilling	Not willing in general, change has to be forced	Indifference: Persuasion is possible	Minor aversion against change. Little persuasion needed	No obstacles; the organization has no aversion against change
Roles and responsibilities explicitly defined	No	x	Some are defined and/or formalized	x	All are defined and formalized
SOA Center of Excellence	Not present	x	Present, but "paper tiger"	x	Present and empowered by the board
Policies					
Policies in the organization	No policies	Some policies, not monitored	Many policies, no alignment with corporate strategy	Policies are in line with corporate strategy, but never adjusted	Policies that are in line with the corporate strategy, all monitored and reacted upon
Central policy repository	No central repository in place	A central repository exists, but it is hardly used	x	x	Fully functional central policy repository, part of the process
Review new services	No	x	Yes, for a short time	x	Yes, for a long time
Policies that are not complied	No action	x	Action in some cases	x	Consequent action
Metrics					

Metrics / KPI's defined	No metrics / KPI's in place	Only a handful of ad-hoc metrics are in place	Metrics are abundant, but still ad-hoc and random	Metrics are formalized and structured	Metrics / KPI's are formalized, monitored and reacted upon when necessary
Metrics provide visibility in progress	No	x	Yes, some	x	Yes, a lot
Ensure alignment with business side	Metrics are random	x	Some metrics support the corporate strategy	x	All metrics fully support the corporate strategy
Measurable milestones	No	x	Yes, but not actively used / monitored	x	Yes, and actively used / monitored
<i>Communication</i>					
Communications plan	No communications plan	Superficial communications plan exists, hardly executed	Communications plan exists, blindly executed	Plan exists and is executed, monitored and adjusted	Plan executed, monitored and in line with the corporate strategy
Reward mechanisms	No reward mechanisms in place	A handful of reward systems in place, but not for the right jobs	Many reward systems in place, but not all for the right jobs	Many reward systems in place, but not formalized	Reward systems in place for things that support the corporate strategy
Developers convinced of SOA	Developers are not aware of SOA	x	Developers have some knowledge of SOA benefits	x	Developers are well-informed of SOA benefits
SOA message is spread through organization	Only a handful of people know what SOA is	SOA has been explained once, but is quickly forgotten	The ICT department has some knowledge	ICT and business departments have some knowledge	All necessary stakeholders know the SOA paradigm