How can Lowlands-SocioTechnical Systems Design contribute to redesigning healthy organizations when deploying Enterprise Architecture

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Due to the growing number of unsuccessful transformations of organizations, enterprise architects were forced to think of better designs that might increase the success factor of these transformations. However, most enterprise architects are coming from IT-background and use Enterprise Architecture approach (EA) which is also an ICT-based model. Therefore, we see that most solutions provided by those architects are also IT-based aimed at automating organizations.

On the other hand, many approaches and theories have been presented in the domain of organizational development and design to support the mission of designing organizations. The lowlands-sociotechnical systems design approach (L-STSD) suggests to redesign the organizational structure first, and then design ICT systems that match the new organizational structure.

This research has analyzed both approaches and compared them based on a broad literature review and also by interviewing EA practitioners and consultants from different organizations in an exploratory qualitative research. It has also investigated whether architects do exploit the opportunity to simplify the organizational structure first and then automate like L-STSD suggests.

The data analysis showed that there are few similarities in both approaches with a big variation when looking at redesigning the organizational structure. Enterprise architects tend only to change the organizational structure, if there is only a strategic need, in parallel with designing the ICT and information systems.

The significance of my findings is stemmed from the importance of the recommendations that have been provided by this research and led to developing the current Enterprise Architecture framework by integrating additional processes based on L-STSD in a trial to help architects and consultants to design healthier organizations.
## Contents

Acknowledgements ........................................................................................................................................................ iii

Abstract ......................................................................................................................................................................... iv

Contents ..................................................................................................................................................................... v

List of Figures .......................................................................................................................................................... viii

List of Tables .......................................................................................................................................................... ix

1 Introduction .......................................................................................................................................................... 1

1.1 Problem description ................................................................................................................................... 1

1.2 Personal motivation ..................................................................................................................................... 2

1.3 Research questions ...................................................................................................................................... 2

1.3.1 Main research question ...................................................................................................................... 3

1.3.2 Sub-questions ..................................................................................................................................... 3

1.4 Practical and theoretical relevance ............................................................................................................. 3

1.5 Thesis outline .............................................................................................................................................. 3

2 Theoretical Background ................................................................................................................................... 4

2.1 Lowlands Socio-Technical System Design L-STSD approach ................................................................. 4

2.1.1 Introduction ......................................................................................................................................... 4

2.1.2 Designing an adequate structure (Tasks and Design Parameters) .................................................... 6

2.1.3 L-STSD framework of designing the organizational structure ......................................................... 8

2.2 Enterprise Architecture Approach ......................................................................................................... 13

2.2.1 Introduction ....................................................................................................................................... 13

2.2.2 TOGAF Approach’s main parts ....................................................................................................... 14

2.2.3 Architecture Development Method (ADM) ...................................................................................... 15

3 Research Methodology ................................................................................................................................... 22

3.1 Research design .......................................................................................................................................... 22

3.2 Data collection methods ............................................................................................................................. 24

3.3 Interview sample ........................................................................................................................................ 24

3.4 Data analysis procedure .............................................................................................................................. 25
Appendix 3: Respondents and interviews information .................................................................55
Appendix 4: interview questions ..............................................................................................56
Appendix 5: The coding book ..................................................................................................60
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1</td>
<td>Structure design (Achterbergh &amp; Vriens, 2009)</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>The Enterprise Continuum layers and phases (moving from generic to specific)</td>
<td>15</td>
</tr>
<tr>
<td>Figure 2.3</td>
<td>ADM phases and iterations (resource: <a href="http://www.opengroup.org">www.opengroup.org</a>)</td>
<td>16</td>
</tr>
<tr>
<td>Figure 2.4</td>
<td>Strategic thinking model in TOGAF-ADM</td>
<td>17</td>
</tr>
<tr>
<td>Figure 2.5</td>
<td>The three-top-level model, Governance phase of TOGAF-ADM</td>
<td>20</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>Research design</td>
<td>23</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>L-STSD framework in relation to ADM-TOGAF framework based on theory</td>
<td>28</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>L-STSD framework in relation to TOGAF-ADM based on practice (diagnosis phase)</td>
<td>35</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>STSD-L framework in relation to ADM-TOGAF framework based on practice (Design phase)</td>
<td>36</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>STSD-L framework in relation to ADM-TOGAF framework in practice (Implementation phase)</td>
<td>40</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>STSD-L framework in relation to ADM-TOGAF framework based on practice (Evaluation phase)</td>
<td>41</td>
</tr>
<tr>
<td>Figure 5.1</td>
<td>The suggested solution to be applied to TOGAF-ADM based on L-STSD</td>
<td>48</td>
</tr>
</tbody>
</table>
### List of Tables

- **Table 1:** External and internal functional requirements according to L-STSD .......................................................... 5
- **Table 2:** Respondents’ nicknames, their roles, and the matching basic requirement .............................................................. 25
- **Table 3:** The popular Enterprise Architectures in the Netherlands .................................................................................. 32
- **Table 4:** Respondents feedback about the three qualities and reducing complexity .......................................................... 44
- **Table 5:** Scenario number that has been selected respondents .......................................................................................... 45
- **Table 6:** The visited organizations overview .................................................................................................................. 54
- **Table 7:** Respondents and interviews information ........................................................................................................ 55
- **Table 8:** The coding book ........................................................................................................................................ 61
Chapter 1

1 Introduction

This chapter gives an introduction to this research and the motivation for doing it. It first starts with presenting the problem that this research aims to solve. Subsequently, it provides the research questions. Then, it presents the practical and theoretical relevance. Finally, the organization of thesis is explained.

1.1 Problem description

Many organizations nowadays are competing to stay viable in a rapidly changing environment. The revolutionary development in technology caused many companies to go bankrupt, regardless of the fact that these companies were key players in the marketplace. CEOs and strategists have realized that they have to lead their organizations in very tough conditions heading them towards viability, innovation, and sustainability. This has driven many scientists, strategists, and practitioners to think of solutions to keep their organizations up to the changes in the marketplace and react proactively to those changes when needed.

Enterprise Architecture approach (EA) is an important capability for organizations as it provides a powerful solution to the problem mentioned above by aligning IT and business. It has been evolved from an ICT-focus to a more encompassing business focus. This approach provides enterprise architects with the needed blueprint to (re)design organizations and to perform transformations. However, regardless of more than twenty-five years of practice in the field of Enterprise Architecture, deriving value out of it is still a challenge which organizations and enterprise architects are still claiming about (Ernst, 2008). Many programs fail to reach the goal intended from deploying EA (Schekkerman, 2005), and 40% programs are predicted to shut down during the first 3 years (Sessions, 2008). Accordingly, enhancing the outcome of this approach also becomes a necessity.

If we dig deep in the evolution of this approach, it can be seen that several Enterprise Architecture frameworks have emerged, like the Federal EA Framework (FEAF), the Zachman Framework, and The Open Group Architectural Framework (TOGAF) (Armour, Kaisler, and Liu, 1999). They all suggest defining the blueprint of an enterprise as a set of architectures that aims to reach business goals by aligning them with the ICT systems being (re)designed. Regardless of the differences in these frameworks, this set of architectures incorporates four layers: business, data, application, and technology (infrastructure) (Aerts, et al, 2004), i.e. any change according to EA involves altering one or more of these four layers. However, three architectures of this set represent the ICT systems of an organization. That means, EA puts much focus on ICT systems when (re)designing organizations. “To keep the business from disintegrating, the concept of information systems architecture is becoming less of an option and more of a necessity for establishing some order and control in the investment of information system resources” (Zachman, 1987; Land, 2009, p40). Accordingly, redirecting the focus of EA to another point could be a solution to enhance its outcome and increase its success factor.
On the other hand, another approach called the sociotechnical system design in the Lowlands (L-STSD), suggests that it is always necessary for organizations to keep balancing between social and technical aspects. This approach assumes that (re)designing organizations involves thinking of a solution in which the complex structures can be first modified and simplified (De Sitter, Hertog, Den, and Eijnatten, 1990). Then, ICT and information systems could be designed and aligned to support the new structure (de Sitter, den Hertog, and Dankbaar, 1997). This has been referred to by Lekkerkerk (2017) “Systems follow structure”. Following this could be a good opportunity to enhance the viability of organizations.

The degree to which The EA approach is ignoring the opportunity of reducing the complexity of the organizational structure is unknown. Thus, it is very useful to investigate how the EA approach deals with the organizational structure and whether giving more attention to it could help increase the success factor of transformation programs and redesigning initiatives.

1.2 Personal motivation

In addition to the problem mentioned above which my research tries to solve, I have also a personal motivation which led me to start working on this research. During my past employment in a period of almost ten years, I have experienced, as a change recipient, many successful and unsuccessful change initiatives. Later, I had the chance to follow several change management courses at the School of Management at Radboud University. At that point in time, I understood completely what I had experienced in the period of my previous employment from a change recipient point of view.

That motivated me to start thinking of the same issue but from a change agent point of view. Several questions came to my mind, about how designers or enterprise architects in practice contribute to having a successful design? To what extent can I benefit from the knowledge that I have learned at Radboud University to enhance the outcome of an ICT-based approach like the Enterprise Architecture?

All these questions made me start working on this research to explore the process of (re)designing organizations in reality.

1.3 Research questions

This research provides a comparison for both the Lowlands-SocioTechnical Systems Design approach (L-STSD) and the Enterprise Architecture approach (EA). In addition, it investigates whether enterprise architects (re)design organizations by taking the existing organizational structure for granted and start making changes to the information system or they start with redesigning the organizational structure and then match the information system with the new structure. Finally, the aim of this research is to provide enterprise architects with recommendations to help them in the (re)designing process of organizations, and to enhance the Enterprise Architecture framework being used in this research.
1.3.1 **Main research question**
Do the practitioners of the Enterprise Architecture approach (EA) think of redesigning the organizational structure before they start to build the ICT systems when (re)designing organizations as the Lowlands-SocioTechnical Systems Design approach (L-STSD) suggests? And to what extent the integration of L-STSD into the EA framework can lead to designing viable organizations?

1.3.2 **Sub-questions**
- How does the implementation of Enterprise Architecture framework relate to L-STSD based on theory?
- How does the implementation of Enterprise Architecture framework relate to L-STSD in practice?
- To what extent do enterprise architects change the organizational structure of organizations in practice? And how does that contribute to having a better design?

1.4 **Practical and theoretical relevance**
Practically, the results of the research carried out on the effect of redesigning the organizational structure on the Enterprise Architecture approach are important for enterprise architects. They will enable architects to introduce several process improvements that will increase the transformation success rate and thus help to keep organizations viable.

The outcome of this research also aims at enhancing the Enterprise Architecture framework by integrating L-STSD into it, i.e. this research could be a starting point for an enhanced design framework, which optimizes the IT-Structure with a production and control structure view. This would eventually contribute to the success of the transformation programs of EA users and redesign healthy organizations.

Theoretically, this research will deliver a comparison between the two approaches L-STSD vs EA. This would help in understanding how Enterprise Architecture is implemented and contributes to the reduction of the gap in the literature about this point.

1.5 **Thesis outline**
The research is organized in the following way. In chapter 2, a summary of both the Lowlands-Sociotechnical Systems Design approach & its framework the Integral Design Model, and the Enterprise Architecture approach & its framework TOGAF will be given. In chapter 3, the research method is described. In chapter 4, two comparisons will be drawn and the findings coming from the interviews will be presented. Finally, the research ends in chapter 5 with the research conclusion and reflection, a set of recommendations, and a suggested solution for the framework of EA.
Chapter 2

2 Theoretical Background

In this chapter, the concept of both STDS-L and EA is introduced. Additional focus will be placed on a framework for each of them since this would help later in my research.

2.1 Lowlands Socio-Technical System Design L-STSD approach

In this section, I will give first a brief overview of the history of STS and modern L-STSD. Then I will discuss the main functions of L-STSD and how to design an adequate structure. Finally, I will introduce the integral design model which is considered as a powerful framework of L-STSD.

2.1.1 Introduction

After the end of the second world war, many organizations were forced to rethink of solutions to stand up again after a series of failures. In 1951, the central principles of the Sociotechnical theory were elaborated in a research introduced by Eric Trist and Ken Bamforth (Wikipedia, 2017). In this research, the term “socio” and “technical” was first introduced in a trial to put more emphasis on social factors after a long time of giving attention to technical aspects and economic values. It was then the birth of Sociotechnical system theory (STS) which had at that time a central role in enhancing the productivity of organizations on the one hand and solved several social problems (motivation, absenteeism, and others) on the other hand.

The results of this research were distributed around the world and later interpreted into many well-known approaches such as Lean Six Sigma. As a result, many different interpretations of the STS have been evolved in different countries (Mohr and Amelsvoort, 2016).

Ulbo de Sitter, a Dutch sociologist, and professor of business administration at Radboud University, has also introduced his own interpretation of the STS, which was later called the lowlands sociotechnical system design L-STSD. Because of De Sitter was not satisfied with the original version of STS, he tried to reform it based on Ashby’s law of requisite variety in cybernetics (Mohr and Amelsvoort, 2016). According to De Sitter, any organizational design should start from the point of reducing the structure complexity and increasing the flow capabilities in what is later called the division of work. In other words, organizations must transition to the state of having a simple structure with complex jobs to be able to deal with uncertainty, complexity, and environment changes (de Sitter, den Hertog, and Dankbaar 1997).

But the question is: what is structure? The structure can be defined as “the way tasks are defined and coupled to a network of tasks” (Achterbergh and Vriens, 2010). Mintzberg also defined the structure as the way in which the main task of the organization is broken into subtasks and then coordinated (Mintzberg, 1983). Thus, to combine both the
Definition of structure and cybernetics, De Sitter suggested that the formation of the new structure should be done by combining or splitting tasks in a trial to attenuate disturbances and amplify regulatory actions to deal with these potential disturbances (Achterbergh and Vriens, 2010). De Sitter uses three classes of criteria to evaluate organizational structures: quality of the organization, quality if work, and quality of work relations which represent the (un)desired behavior of a system and are defined as follows (Achterbergh and Vriens, 2010):

1. The quality of organization: requirements which enable an organization to realize its goals in an effective and efficient way in line with its vision toward high productivity and innovation.
2. The quality of work: involves good learning opportunities, employee involvement, and less stress. In other words, it is about enhancing the quality of working life by taking measures to reduce the burnout percentage among employees and give much room for learning activities.
3. The quality of work relations: refers to the effectiveness of communication in organizations, which play key role in fostering the sense of participation among individuals and improve and create also constructive relations between management and ground floor employees. (Achterbergh and Vriens, 2010).

<table>
<thead>
<tr>
<th>External functional requirements</th>
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<td>Quality of Organization</td>
<td>Order flexibility</td>
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<td>Short production-cycle time</td>
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<td>Sufficient product variations</td>
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<td>Control over order realization</td>
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<td>Reliable production and production time</td>
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<td>Effective control of quality</td>
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<td>Potential for innovation</td>
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<td>Strategic product development</td>
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<td>Short innovation time</td>
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<td>Quality of work</td>
<td>Low levels of absenteeism</td>
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<td>Controllable stress-conditions;</td>
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<td></td>
<td>Opportunities to (1) be involved,</td>
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<td></td>
<td>(2) learn, and (3) develop</td>
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<tr>
<td>Quality of working relations</td>
<td>Effective communication</td>
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<td></td>
<td>Shared responsibility</td>
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<td>Participation in communication</td>
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Table 1: External and internal functional requirements according to L-STSD (adapted from De Sitter, 1994, p. 42)

The above Table 1 lists the external and internal requirements according to De Sitter. However, De Sitter distinguishes between two categories of functional requirements which are essential to design an adequate structure. “The overall adequacy of an organizational structure should be evaluated in terms of its capacity to contribute to satisfying all internal, and hence external, requirements” (Achterbergh and Vriens, 2010, p.242). They are as follows:
1. External Functional Requirements: These requirements are set in order to secure the organization’s viability.
2. Internal Functional Requirements: These requirements are being derived from the external ones and should be met in order to have an adequate organizational structure (Achterbergh and Vriens, 2010).

### 2.1.2 Designing an adequate structure (Tasks and Design Parameters)

According to De Sitter, two main dimensions have been suggested in L-STSD to describe the structure of an organization: operational and control (regulatory) dimension. These two dimensions are formed by coupling and dividing tasks between men and machines to form an organizational structure which constitutes the hierarchy and division of work in a firm or an enterprise (Achterbergh and Vriens, 2010).

However, De Sitter argues that designing a structure is “defining and coupling tasks in such a way that so-called design parameters have a low value” (Achterbergh and Vriens, 2010). Here, two things should be defined in order to move further with the design process: tasks and design parameters.

#### Tasks in L-STSD

In order to define the types of tasks, two other definitions should be first presented: sub-transformation and decomposition processes.

Sub-transformation means transforming input into output, and it can be found in two forms based on its nature: operational sub-transformation and regulatory sub-transformation. Whereas decomposition is a process in which a new flow or segment can be formed. This process also can be done in either of two ways:

1. Horizontal decomposition: two new sub-transformations emerge which cover the whole original transformation. This process forms a flow.
2. Vertical decomposition: new sub-transformations emerge that are coupled serially taking into account that each output of one sub-transformation is the input of a next sub-transformation. This process forms a segment.

These two types of decomposition processes can be applied to the original transformation repeatedly until ends up with a set of sub-transformations. Based on the mentioned description, a task can be defined as a set of sub-transformations that is assigned to an “operational unit” (person, team, department, business unit, etc.) (Achterbergh and Vriens, 2010).

As a result, two sorts tasks can be formulated: operational and regulatory. Operational tasks contribute directly to the formation of the end-product. In contrast, regulatory tasks don’t contribute directly to the formation of the end-product, but they facilitate the process.

#### Design parameters in L-STSD

According to De Sitter, seven design parameters should be considered when designing the production and the control structure of an organization. These parameters enable designers to evaluate the efficiency of the new structure based
on the internal and external requirements described in Table 1. Design parameters should always have low values to come up with an adequate organizational structure. Some of these parameters define the characteristics of the production structure, while others define the characteristics of the control structure. They are described as (Achterbergh and Vriens, 2010):

a) **Parameters describing the production structure**

1. **Parameter 1**-The level of functional concentration: it refers to the grouping of operational tasks with respect to orders. Maximum value means that all operational tasks of the same type are concentrated into the specialized department. Minimum value means that all operational tasks required to realize an order are grouped together into one production flow.

2. **Parameter 2**-The level of differentiation of operational transformation: three types of operational sub-transformations can be differentiated: making, preparing, and supporting. Maximum value means that operational sub-transformations of each type are grouped together. Minimum value means that operational tasks contain all three types (make, prepare and support sub-transformation).

3. **Parameter 3**-The level of specialization of operational transformations: this parameter refers to how much tasks are split up into short sub-tasks. Specialization is increased if the operational transformations become more specialized. While it is decreased as sub-transformations of a transformation are integrated and become one task.

4. **Parameter 4**-The level of separation between operational and regulatory transformation: it is maximal when operational transformations contain very few regulatory sub-transformation and regulatory transformations are grouped into tasks separated from its operational aspects. However, it is minimal if a task consists of both regulatory and operational sub-transformations.

b) **Parameters describing the control structure**

5. **Parameter 5**-The level of differentiation of regulatory transformation into aspects: it is maximal if the three main types of regulatory activities, as defined by Ashby (control, regulation by design and operational regulation), are divided into different tasks. While it is minimal if they are combined together.

6. **Parameter 6**-The level of differentiation of regulatory transformation into parts: this parameter focuses on a particular decomposition of the regulatory transformations (monitoring, assessing, acting). It is maximum when if one differentiates regulation into the three mentioned aspects, and minimal when these regulatory aspects are integrated into one task.

7. **Parameter 7**-The level of specialization of regulatory transformations: this parameter refers to how much tasks are split up into small sub-tasks. Specialization increases if the regulatory transformations become more specialized. While it is decreased as sub-transformations of a transformation are integrated and become one task.
The resulted structure based on L-STSD, provides fewer interfaces and interactions between the different units in the same organization. That means less need for external managerial activities to supervise the work at the shop floor level. On the other side, making parallel production flows could initiate more room for self-driven activities and functional de-concentration among teams (De Sitter et al., 1990).

![Figure 2.1: Structure design (Achterbergh & Vriens, 2009)](image)

### 2.1.3 L-STSD framework of designing the organizational structure

Like how the design process is prescribed in the book “Het Nieuwe Organisieren” (Kuipers, Van Amelsvoort, and Kramer, 2010), six steps form what is called the integral design model. This model is considered as a framework in which organizations are designed based on L-STSD. These six steps are iterative in nature and are part of the four-phase intervention in organizations, which comprises the following higher-level phases: diagnosis, design, implement, evaluate.

- **Diagnosis phase:** the problematic behavior variables of an organization are being investigated by doing a gap analysis between the norm and actual values of these variables. Then, the causes of these problematic behavior are being analyzed in order to come up with the solution space.
- **The design phase will be later explained in the integral design model.**
- **Implementation phase:** the design coming from the second phase will be implemented and changes to infrastructure will be made. In other words, the gap which has been determined in the diagnosis phase will be fulfilled in this phase.
- **Evaluation phase:** an evaluation of the implemented changes will be done to determine whether they have had the desired effects which have been estimated in the diagnosis phase or not.

### The six steps of the integral design model

As mentioned earlier, the integral design model incorporates six steps as follows:
Step 1: Scope of redesign
This step aims at setting the borders of the organization being changed, or part of this organization like a business unit or a department. This step is very important in this integral design approach due to the need for having an accurate consideration about which part of the organization is going to be altered. In other words, it is about setting the work scope which should fit with the internal and external factors surrounding this organization like environment, stakeholders, etcetera. As we will continue in this model, we will see that building the production structure is a top-down process. That means we must look at an organization as a whole, then dive deep towards business unites and the shop floor. However, it is extremely important to know why we are going to change? Is that because of a change happened to the surrounding environment which in turn engages the organization to respond? Or, due to some internal problems that have raised to the top which put the organization in an embarrassing position and push it towards change? Absenteeism that a business unit suffers from could be a good example for the latter reason (Kuipers et al., 2010).

Step 2: Goal, vision, mission, and strategies definition
During this step, much consideration should be given to establishing the goal, the mission, and the vision of an organization before intervening. If the goal of an organization does not fit with the global vision and mission, it should be optimized or even modified. In general, the goal of organization involves altering one or more of the following components in any organization’s infrastructure: structure, HR, and/or technology. For example, the change could involve altering the leadership style inside an organization as a goal of improving the work relations among individuals and their superiors. On the other hand, the mission of an organization should explicitly establish its role in the surrounding environment and community (Kuipers et al., 2010). Moreover, an organization’s mission should be a way to keep organizations viable by describing what the organization would look like in the future taking into consideration the norms and values as a baseline. Subsequently, the vision of an organization would be an interpretation of its mission in the eyes of its stakeholders and how they foresee the future. For the purpose of setting goals and strategies, many aspects should be considered. For instance, it is the thinking of a valuable end-product which customers or stakeholders appreciate. It is not always the case that the profitability of an organization or even maximizing shareholder’s economic values should be the main goal of a change. However, it is also the multiple values brought to different stakeholders, customers, community, or environment.

Step 3: Specs designing
This step is considered as the starting point of (re)designing the Production Structure (PS) of an organization based on its mission and vision, which are both defined in the previous step. The specification of the target structure should be defined regardless of the current specs. This definition should include all primary processes of the organization or part of it which has been defined in the scope of the redesign process. Moreover, it is also essential to define the specs of every process could contribute to the end-product, like support and control processes which later create the Control Structure (CS). This step is to be handled as a part of the planning phase, which is very important for the next steps when the primary processes are grouped together or split up aiming to build an adequate structure. As De Sitter
suggested in L-STSD, a designer should first think of several propositions of how the primary processes can be grouped to create an order flow. This involves setting the properties of the order itself based on the end-product that will be produced in this flow. The definition of order can be varied from place to another and from profession to another. With reference to integral design approach, defining order properties can be done on three sequential levels.

First, on the macro level, we should always determine what we mean exactly by order. Is it the possession of an educational degree in a learning system for example? or is it the production process of talented human resources who would provide the market with the needed workforce? Based on defining the exact order, several parallel flows possibilities can be created as alternatives to decide later what would best fit in our design and match the three main qualities defined by L-STSD. By that, the basic properties of the flow orders could be established based on the design specs of the primary and secondary processes (Kuipers et al., 2010).

Second, it is important to determine the properties of the interrelated activities which can define the production structure on the meso to the micro level. This involves the following:

1. Describe the preparatory, make and support processes which are needed in the targeted organization.
2. Analyze the processes and their needed capacity in order to give a further estimation of the added value could be gained by adding or removing these processes to or from a flow. Furthermore, it is also required to determine which processes can be fully automated without the need for human intervention and which not.
3. Processes which involve human intervention should be determined and their properties should be realized.

Moreover, the nature and the strength of the relationship between the diverse processes in any flow should be analyzed. Besides, the similar processes in different flows should be also studied to make sure if there is any difference in nature, which involves a change in the definition of processes with respect to the flow (Kuipers et al., 2010).

Third, it is essential to determine the properties of the job requirements (like flexibility, management, innovation and so forth) needed to a function in the workflow. These properties are highly needed by the organization to enable it to stay viable in the market, and sometimes they might be imposed by the surrounding environment. It is also worth mentioning that these properties should be established based on the target structure, despite the properties of the current one.

**Step 4: Structure design**

In the previous step, a set of requirements and design specs have been established including the processing orders, activities patterns, and the functional requirements. The next step would be starting the structure (re)design process based on the specs mentioned above and with respect to the vision and the mission of the organization.

As we already discussed in section 2.1, De Sitter has based his theory on Ashby’s work “law of requisite variety”. According to Ashby, any structure should maintain variety in orders, activities, and function requirements. This means a set of diverse regulatory activities should be created to attenuate disturbances. Based on L-STSD, two main structures should be built: operational /production and control/regulatory (Achterbergh and Vriens, 2009). The key point here is, the building of the production structure should lead the building of the control structure.
Step 4.2: The Production Structure design is Top-Down
The building process of the production structure involves basically two main actions: parallelization and segmentation of primary processes. The building process will be handled in this step on three levels: macro, meso, and micro level (Kuipers et al., 2010).

On the macro level, the general view of the organization is taken into consideration to have parallel flows or segments which fit best with the level of complexity and variety intended for this unit or section. On this level, we look at the character of an order flow as a whole and then see what are the possibilities that can be obtained in terms of parallelization or segmentation. Consequently, different units will be made based on orders or end products with a team consists of no more than 200 employees. For instance, the result of this step could be forming the different business units of an enterprise like HR department, finance department, procurement department and so forth (Kuipers et al., 2010).

On the meso level and after creating the main units, it is time now to zoom in and dive deep towards splitting the units into more concentrated order flows with teams formed of no more than 20 individuals per flow. In other words, it is the answer to the question: are we going to make more segments or more parallel flows in the same unit? This can be done by considering two things: the characteristics of the workflow designed on the macro level and the need for having diverse order flows. It is also worth mentioning that if a complex order flow has been established, more segments then should be created to overcome the complexity issue. On the other hand, it should be assessed which preparatory and support tasks should be assigned to these orders to make them function well and reduce complexity.

On the micro level, the activities of the teams formed earlier on the meso level should be defined in more details to obtain the tasks and functions intended from these activities. As a result, three types activities will be established out of this step: primary(make), prepare, and support activities. In addition, several units contain no more than 200 individuals, several teams contain no more than 20 individuals, and lastly, tasks and functions assigned to those teams in a way aiming to reduce complexity and increase variety and self-control.

Following these rules will decrease the number of interfaces between units and teams that serve one end-product. This, in turn, will decrease the lead time and latency towards getting high-quality end-product within a reasonable lead time. Supporting activities aim to help in producing the final product but do not participate in the production process like helpdesk and maintenance teams. Preparatory activities contribute in the planning phase aimed to deliver the product (Kuipers et al., 2010).

Step4.2: The Control Structure design is Bottom-Up
Basically, any control structure contains regulatory transformations, which do not have any tangible output in the end state, but have influences on the operational transformations which lead to the end state (Achterbergh and Vriens, 2009). De Sitter used the same control activities which are defined by Ashby: operational regulations, regulation by design and strategic regulations. Operational regulations are considered as regulatory actions, which according to Ashby’s notion of transformation, deal with internal and external disturbances (Achterbergh and
The regulation by design activities, which sometimes are referred to as innovative activities, aims to come up with unique ideas which improve the operational activities. The strategic regulations contribute to making changes to the goal of an organization.

Like we already said, building the control structure is a bottom-up design process. That means, a designer has to start form the flows on the micro level which represent the process of producing the end product. Then, the control design process should go up to a higher level until reaching the highest control system of an organization.

To sum up, in this process, we have discussed the process of designing the production and the control structure according to L-STSD. However, this design should take into consideration the complex jobs which might result. Thus, two types of job redesign should be considered to motivate people to do their jobs. First, job enlargement which is a horizontal process per flow aims to give people more responsibilities. Second, job enrichment which is a vertical process aims to give people more privileges and power like delegating people to do some managerial tasks (Chung and Ross, 1977).

**Step 5: Technical system design**

After designing the organizational structure of an organization, technology has to be adapted to match that structure and facilitate performing the operational and control activities. Not too much mentioned by Kuipers et al., (2010) in the integral design framework about how to design the technical or information system. But they stress the key role of information systems to support the newly-designed structure. This step involves building the technical system for the following tasks which are the outcome of the previous design step:

- **PS-Activities**
  - Make (e.g. designing equipment needed to reach ‘make’ activities like machinery)
  - Prepare (e.g. CRM systems needed to manage procurement activities)
  - Support (e.g. Security systems)

- **CS-Activities**
  - Operational Regulation (e.g. Systems that control the weight of the end-product)
  - Innovation (e.g. Computers required to design innovative products like simulation systems)
  - Strategy (e.g. Equipment and analytic tools needed to analyze Big Data)

It could be sometimes designing mixed systems for combined activities like SAP ERP system which incorporates the key business functions of an organization (Wikipedia, 2017). Here, ICT is considered as the part which will be designed at this step. However, it could sometimes part of the production or the control structure.

**Step 6: Soft factors design**

This phase involves designing the soft factors like behavior, leadership, and culture of the organization which should be implemented after the organization has been changed. According to Kuipers et al. (2010), it could take more than two years before the organization works as it is intended in the initial design, since moving from the state of having centralized control system with high level of specialization among team to the state of having self-managing teams with decentralized control system is not that easy thing.
To conclude, section 2.1 has presented a summary of the lowlands sociotechnical system design (L-STSD) and its framework the integral design model as it is prescribed by Kuipers et al. (2010). Now, a similar summary will be presented in section 2.2 of the second approach, Enterprise Architecture (EA) and its framework (TOGAF 9.1). This introduction will help me further in my research to investigate how L-STSD can contribute to TOGAF framework when designing organizations.

### 2.2 Enterprise Architecture Approach

In this section, a brief summary about Enterprise Architecture (EA) will be presented. Then, the much-used EA framework, TOGAF 9.1 and its ADM model, will be presented.

#### 2.2.1 Introduction

Many organizations claimed failure during the past period. More than 60 percent of ICT change projects have failed. This caused many practitioners, strategists, and CEOs to think of alternatives and solutions for this major problem. “Enterprises fail to actually realize the desired transformation even thought it might be the case that all projects are finished on time and within budget” (Greefhorst and Proper, 2011, p15). The rapid shift of technology and globalization could be the reasons that make organizations in a continues fight to stay viable in the market. This results in the need for an instrument to enable organizations to innovate and to be more agile in such a fast-changing environment. The emerging instrument is Enterprise Architecture EA according to Land, (2009). This instrument has helped and is still helping organizations to overcome the complexity resulting from the rapid change in the environment. EA plays a major role to keep enterprises always ready to take proactive measures and govern their development in a systematic and integral way.

Several frameworks have been introduced based on the concept of Enterprise Architecture to help organizations in their transformation process (Land, 2009). These frameworks have a common vision when dealing with the design of an enterprise. In general, EA deals with business as one entity. That means, any business unit, which is a part of an organization, is considered as a coherent unit driven by the executive board, who has the mission of reading the information coming from inside and outside their organization and reacts accordingly. This board should always observe the surrounding environment and anticipate any changes that could happen in the future. While this executive team is moving the business forward, there are also stakeholders and shareholders who sit in the back to watch what is happening in the organization and respond when needed. Indeed, any business will not go forward without technology and human intervention which are very important factors when running any business. Enterprise Architecture provides a holistic view of the whole business and tries to align business and IT to help stakeholders, shareholders, managers, employees, and top management in steering the change process towards the future state.

Enterprise architecture ensures that these mentioned aspects and factors should fit together in a manner to produce a cohesive enterprise which able to maneuver sometimes and compete with other organizations in the other times. In most cases, the output of EA is the change plan which will take the organization from the current state to a future state (Open group, 2011). Sometimes, it provides management with an outlook of the coming 3-5 years (Land, 2009). But,
it is important to emphasize that architecture should focus on the main goal and the mission of an organization in a way that leads to having organizations’ needs and neglect what it is not needed (Greefhorst and Proper, 2011).

Like what I introduced in section 2.1 about the framework used by STDS-L, I am going here to introduce one of the most popular frameworks established by the open group and has been later updated many times until reaching version 9.1. TOGAF relies completely on applying the Architecture Development Method (ADM), which is considered as a reliable and integral model. This method is iterative in function, allowing iteration in the whole processes and phases (Greefhorst & Proper, 2011). According to Open Group, four main sorts architectures are defined as a subset of the whole enterprise architecture and are being tackled through iterations and phases when applying ADM (Open group, 2011). These four architectures are almost defined in most enterprise architecture’s frameworks and they are as follows:

1. Business architecture: It represents the business strategy, governance, and key business processes in an organization.
2. Data architecture: It deals with logical and physical data assets and data management resources in an organization.
3. Application architecture: It provides a design of the applications which will be adopted in addition to their relationship to the main processes in an organization.
4. Infrastructure: It is sometimes called technology architecture. It provides a description of the technology and IT infrastructure needed to adopt business processes.

2.2.2 TOGAF Approach’s main parts

Based on TOGAF, three main parts will be dealt with throughout the run of EA framework:

1. The Architecture Development Method (ADM): It is a model used to deliver on the outcome of the change based on the content of the enterprise continuum. It will be described in detail later.
2. The Enterprise Continuum: It is a virtual repository contains all architecture assets, models and their description, and some other artifacts (Open group, 2011). It has been first defined by IEEE (Edward, Shalannanda, and Agusdian, 2014). Enterprise continuum, as shown in figure 2.2, encompasses two separate horizontal layers: the top layer defines the architecture continuum while the bottom defines the set of solutions. The content of this repository is being created through the phases of ADM. It is usually started from defining the foundation architecture which is the high-level view of the enterprise including an estimation of how a set of building blocks (BB) can be grouped together in line with the estimated change goal. The same concept of the building blocks was also introduced in a similar way by Henry Mintzberg when he said, “Designing organizations has to be more like playing Lego” (Mintzberg and Quinn, 1996, p460). After having the big picture, the next step would be moving forward from generic to more specific aspects by building common system architectures like HRM system. A step forward would be acquiring some available structures in the market which could help in shaping the end organizational architecture. For instance, using the supply chain architecture of a well-known company
which operates in the supply chain industry. The last step in the direction to be more specific is, the organizational architecture which is a process in which the whole previous information is shaped further to form a very specific structure like HR hierarchy. The bottom horizontal layer, on the contrary, is a virtual container of all solutions brought by top layer (Edward, et al., 2014).

3. **The TOGAF Resource Base**: It contains all information, guidelines, and resources needed when applying the ADM method (Open group, 2011).

![Figure 2.2: The Enterprise Continuum layers and phases (moving from generic to specific)](image)

### 2.2.3 Architecture Development Method (ADM)

The ADM method involves 9 phases and 4 main iterations. In this section, I will try to briefly cover all of these phases which are illustrated in figure 2.3. Then, I will list the 4 iterations and their functions during the ADM cycle.

**Preliminary Phase (framework and principles)**

It is all about how to deal with complexity. In this phase, the whole organization or part of it should be divided into small partitions in a trial to simplify the complexity by dealing with small pieces. Partitioning, in general, can be geographic-based, client-based, or product-based, according to the needs of the change being implemented, or to match the global strategy of the organization. Thus, an organization’s global strategy which represents the high-level vision of an organization, should be translated by moving down towards the low-level functions. Three main architectures are the result of this process: strategic, segment and capabilities. For example, it could be breaking down a multinational organization operating across the globe to have separate segments in diverse countries, then dividing those segments to reach small building blocks which represent the capabilities in the ground level (Open group, 2011).
Phase A: Architecture vision

This phase represents the start of every iteration or spin-off in the enterprise architecture. The requirements of an organization in this iteration should be extracted and understood based on what is required at this level of execution. So, if the work is done at the level of specific segment resulted from the preliminary phase, then the vision of this segment should be considered as the vision of this iteration. The output of this phase is the architecture vision document, which defines what an organization is going to achieve through this particular iteration. In other words, it can be said that architecture vision means giving answers to the following questions:

1. What strategy should be followed in this iteration?
2. What sort business, data, application, and technology pieces have to be assembled in order to achieve that strategy?
3. Is this organization ready to perform change?
4. Who are the stakeholders involved in this iteration (spin-off) and what are their concerns and point of views?
Strategic thinking model is used in this phase in order to define the vision of an organization, then translate it into goals and objectives. This model can easily explain how an organization will transition from the current state to the end state. As illustrated in figure 2.4, mission, strategies, and tactics are all means used to achieve vision, goals, and objectives respectively. This process will be ended up establishing so-called business motivation. It links between both architecture vision and the business architecture which will be discussed in the following step of ADM. The linking process can be determined by getting inputs about the required capabilities for this spin-off and use them to formalize an outcome of SMART objectives.

![Figure 2.4: Strategic thinking model in TOGAF-ADM](image)

**Phase B: Business architecture**

This phase is considered as a foundation for the following two phases in the architecture development iteration, which will be later explained. Thus, changes to data, application and technology layers should be done based on the output of this phase, which aims to take all strategic pieces of a business and then start looking for how this business can be shaped. But, it is important to mention that this process does not give a solution of how to implement the change. "The business strategy typically defines what to achieve - the goals and drivers, and the metrics for success - but not how to get there" (Open group, 2011).

The first thing that must be addressed in this phase is, determining the viewpoints of all stakeholders who will be affected by the goal of this iteration. These viewpoints represent the stakeholders’ concerns and problems which they suffer from. A clear estimation should be given about how the big-picture solution on the business level would look
like. For example, CEO’s concerns could differ from the one who works on the shop floor. Furthermore, a reference model can be determined in this phase with regards to the business drivers, the stakeholders, and their concerns.

One more important point is, the gap analysis which will be done during this phase by assessing the baseline state and the future state, then calculate the gap between them. Every analysis report is stored in the architecture repository (Open group, 2011). Business scenario model is also one of the most important outcomes of this phase. It describes and defines the problems of an organization taking into account the whole pressure made by the surrounding environment and people, and try to find and add a suitable solution to the solution space. In parallel, the strategies should be interpreted into tactics in line with the suggested solutions.

**Phase C: Information system architecture**

The information system architecture is considered as the solution domain of the business concerns coming from organization’s stakeholders. It comprises two main domains: data domain and application domain. In the data domain, an architect tries to design a database to contain certain information which reflects the needs coming from different stakeholders, capabilities, products, and functions being applied. In other words, it is the translation of business into processes, functions, and database (Open group, 2011). On the other hand, a piece of software is built in the application domain to bring both the business world together with the data world. That means, all business functions and database assets will be gathered and automated in a way to build an integral information service or system. For both, the data and application domains, a gap analysis should be done to understand how the future state can be reached starting from the current state.

**Phase D: Technology architecture**

This phase of the ADM is responsible for providing the technological infrastructure needed to run and automate database and applications resulted from the previous phase in line with the organization’s business needs. An architect has to come up with a solution or set of solutions about how to build and design business processes and applications, and then determine what technical requirements are needed to run those applications (Open group, 2011).

A gap analysis should be also done to understand how the future state can be reached starting from the current state. For example, it might be the use of computers, network equipment, servers, developing tools, licenses, backup systems, etcetera. Therefore, this architecture is called sometimes the Infrastructure Architecture (Land, 2009).

As a matter of fact, the last three processes B, C, and D are performing together aiming to align business and IT.

**Phase E: Opportunities and solutions**

In this phase, an initial roadmap for the intended change will be generated based on the following factors:

1. The gap analysis that has been already done in the previous processes.
2. The enterprise readiness for change and risks might occur during transformation.
3. The identified opportunities (Open group, 2011).
Within this roadmap, a set of potential solutions will be suggested and gathered in the solutions space to be input for next processes in the ADM. It is important to mention that the key focus on this iteration is the target goal through realizing incremental business values (Open group, 2011). Many outputs can be represented in this process like producing Gantt chart, migration plan or roadmap plan by looking for the current state and future state, and then introduce how to get to the future state through running a set of projects.

**Phase F: Migration planning**

In this phase, many project management aspects of time, cost, and efforts will be applied to implement the set of solutions and opportunities resulted from the previous step. An architect tries to work on prioritizing solutions and aspects by getting a rough idea of the sequence of events need to be occurred (Open group, 2011).

In other words, the aim of this phase is how to establish the blueprint generated in the previous steps from project management perspectives. On the other hand, another project management disciplines are also being used in this phase to determine the constraints and impediments might be encountered through the transition process from the baseline state to the future one. For example, risk management is being used to assess the risks might happen to a change project throughout execution.

**Phase G: Implementation governance**

In the implementation governance phase, an architect plays the role of legislator and policeman in an organization at the same time when applying a change plan. This means he or she has to enact the roles, policies and performance indicators to enable people to be productive on the one hand, and compare regularly the actions done versus plans and give indicators when something wrong is taking place on the other hand. “The objectives of Phase G are to Ensure conformance with the Target Architecture by implementation projects and perform appropriate Architecture Governance functions for the solution and any implementation-driven architecture Change Requests” (Open group, 2011).

When looking to the governance phase, as shown in figure 2.5, three top-level models should be addressed: Strategic model, architecture model, and solution model. These three models should be covered in this phase by taking a downwards or upwards closer look, to evaluate if an organization is working according to the change plan or not. “A key aspect of Phase G is ensuring compliance with the defined architecture(s), not only by the implementation projects, but also by other ongoing projects within the enterprise” (Open group, 2011).
Phase H: Architecture change management

According to Open Group, (2011) “The goal of an architecture change management process is to ensure that the architecture achieves its original target business value”. In this phase, some sort of analysis is being made to evaluate and govern the architecture itself.

In other words, an architect tests his or her work based on the results that have been achieved so far. Based on this evaluation, simplification changes can be made using a certain change management discipline, or there could be some incremental changes to the architecture itself. In other times, it could result in making revolutionary changes in the architecture, and in turn making modifications in the preliminary framework and principles (Open group, 2011).

ADM internal iterations

The ADM cycle contains four iterations. Open group has defined these iterations as follows:

- **Architecture Capability** iteration supports the creation and evolution of the required Architecture Capability. This includes the initial mobilization of the architecture activity for a given purpose or architecture engagement type by establishing or adjusting the architecture approach, principles, scope, vision, and governance (Open group, 2011). The architecture capability can iterate through the preliminary and phase A, but it can also iterate through the preliminary phase and phase H as shown in figure 2.3.

- **Architecture Development** iteration allows the creation of architecture content by cycling through, or integrating, Business, Information Systems, and Technology Architecture phases. This iteration ensures that the architecture is considered as a whole. In this iteration stakeholder’s reviews are typically broader. As the iterations
converge on a target, extensions into the Opportunities and Solutions and Migration Planning phases ensure that the architecture's implementability is considered as the architecture is finalized (Open group, 2011).

- **Transition Planning** iteration supports the creation of formal change roadmaps for a defined architecture (Open group, 2011). It iterates through phase E and F as shown in figure 2.3.

- **Architecture Governance**: as shown in figure 2.3, it iterates through phase G and H in the ADM model. It is governing both the implementation of the architecture and the actual feedback about the architecture. This iteration supports the governance of change activity progressing towards a defined Target Architecture (Open group, 2011).

In summary, chapter 2 has presented a summary of the two approaches L-STSD and Enterprise Architecture and their frameworks. Now, I will next present the research methodology in chapter 3, and then a comparison between the two approaches will be presented in chapter 4 because it is considered part of the results of this research.
Chapter 3

3 Research Methodology

In this chapter, the research design will be first presented. Subsequently, the data collection and the interview samples used in this research will be explained. Finally, the data analysis procedure and the ethics of this research will be presented.

3.1 Research design

According to Tamm, Seddon, Shanks, & Reynolds, (2011) and Ylimäki, (2006), the majority of EA researches and literature are focusing on planning, modeling, and values aspects. However, less or even no research can be found that compares the framework of Enterprise Architecture with L-STSD or investigates how L-STSD can contribute to EA. This has been explicitly concluded based on a systematic literature review I have conducted using Google Scholar with the protocol prescribed in Appendix 1.

The need for a comparison to be conducted, as it is prescribed in the research question in section 1.3, has emerged from the fact that less or even no such a comparison has been done before. The results of this comparison and the facts that would pop up out of this research could help practitioners to understand what the position of the organizational structure or ICT systems is in both approaches. Consequently, this comparison between the two approaches will be the basis of this research.

In order to enhance the outcome of this research, two comparisons between the two approaches will be conducted as the reader can see in chapter 4. The first comparison will be based on the literature review that has been done in chapter 2. The outcome of this comparison will give a rough estimate of the main commonalities and variations of the two approaches based on the researcher understanding of the literature. A set of hypotheses would be concluded upon doing this comparison which represents the preliminary estimate of the main variations and commonalities in addition to how the EA framework deals with the organizational structure.

The second comparison will be conducted by investigating the real world looking for practical answers that might accept or refute the set of hypothesis that has been concluded in the first comparison. At this point, the research phenomena should be studied inside its natural settings and the focus on contemporary events is highly needed to reflect to what extent the theory matches the reality. Based on that, conducting a qualitative exploratory research would fit best in this situation (Benbasat, Goldstein and Mead, 1987).

For conducting both comparisons, I chose the four-step cycle of: diagnosis-design-implement-evaluate, which is described in section 2.1.3. Logically, the four-step cycle is a systematic framework which can help to compare and recognize the commonalities and variations of both approaches from an organizational design perspective. This systematic framework involves doing the following actions. First, the diagnosis phase starts with prescribing and identifying the problems that an organization has (Achterberg et al., 2009). Then, the causes of these problems should
be identified and recognized. The last step in this phase is, delivering a set of suggestions based on the description of the problems and their anticipated causes (Achterberg et al., 2009). Second, in the design phase, the six steps of the integral design model, which is prescribed in chapter 2 based on the work of Kuipers et al., (2010), will be used. Much focus will be given to the first and the second phases since they concern the core concept of the organizational design theories. The third phase of the four-step cycle will be about implementing the design and the proposed changes to the organizational structure and the ICT systems. Finally, the evaluation phase will be about determining whether the implemented solutions have had the desired effects.

Figure 3.1 shows the research design that has been used in this research. Data collection method and data analysis procedure will be explained in the following sections.

![Figure 3.1: Research design](image-url)
3.2 Data collection methods

In this research, the goal of data collection is to provide an adequate description of the implementation of EA as it is prescribed by practitioners. In order to reach this goal, a proper data collection method should be identified.

Given that this is a qualitative exploratory research, the best method to collect data is conducting interviews. The purpose of interviews, “is to explore the views, experiences, beliefs and/or motivations of individuals on specific matters” (Gill, Stewart, Treasure & Chadwick, 2008, p. 291). In this research, that could mean the following:

- The views, experience and beliefs of enterprise architects and business consultants with regard to the implementation of Enterprise Architecture.
- The opinion of enterprise architects and business consultants on the failure of EA/ICT projects.
- The revealing of the fact that EA/ICT does not use the term “systems follow structure” which has been introduced by Lekkerkerk, (2017).
- To investigate whether designing the structure then building the other ICT systems could increase the success factor of ICT transformations according to EA practitioners.

For this research, I chose the semi-structured interview design for two reasons. First, it gave me the possibility to change the sequence of questions according to the background and interests of my respondent (Kvale and Brinkmann, 2009). Second, due to the limited time span of this research, the optimal way to analyze data is to have semi-structured interviews which are not considered as time-consuming comparing to open unstructured interviews.

3.3 Interview sample

In this research, eight respondents, who belong to different well-known organizations, have been selected and interviewed. The selection criteria were based on the following basic requirements:

1. A respondent must be either an enterprise architect, a business consultant, or a researcher active in the field of organizational development and design.
2. Every respondent should belong to a different organization. A detailed list of the organizations that my respondents belong to can be found in Appendix 2.
3. A respondent has to be active in the domain of Enterprise Architecture or/and organizations design.
4. Being TOGAF certified is a plus.
5. Basic knowledge in Socio-Technical Systems is a plus.
6. A respondent is willing to participate in this research and have time for that in the period from April till mid-June.

It was difficult to find those people who comply with the basic requirements of the selection criteria. Initially, a set of three respondents was found through LinkedIn and they have accepted to be interviewed. Two respondents, who are of my acquaintance, have also accepted my invitation and were later interviewed, and one of them introduced me
to another respondent. Finally, a snowball sampling was used to identify the rest of my respondents; every interview was concluded with a question seeking the interviewee to suggest one person to be interviewed. The interviewees and their nicknames can be found in Table 2 in addition to the number of the basic requirements mentioned above that the respondent complied with. A detailed list of my respondents and their roles can be found in Appendix 3.

<table>
<thead>
<tr>
<th>Interview</th>
<th>Respondent Nickname</th>
<th>Role</th>
<th>The matching requirement #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Consultant A</td>
<td>Policy advisor</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>2</td>
<td>Researcher B</td>
<td>PHD, researcher ODD</td>
<td>1,2,3,5,6</td>
</tr>
<tr>
<td>3</td>
<td>Consultant C</td>
<td>Business architect</td>
<td>1,2,3,5,6</td>
</tr>
<tr>
<td>4</td>
<td>Architect D</td>
<td>Enterprise architect</td>
<td>1,2,3,4,6</td>
</tr>
<tr>
<td>5</td>
<td>Architect E</td>
<td>Enterprise architect and partner</td>
<td>1,2,3,4,5,6</td>
</tr>
<tr>
<td>6</td>
<td>Architect F</td>
<td>Enterprise architect</td>
<td>1,2,3,6</td>
</tr>
<tr>
<td>7</td>
<td>Architect G</td>
<td>Lecturer/ Enterprise Architect</td>
<td>1,2,3,4,6</td>
</tr>
<tr>
<td>8</td>
<td>Consultant H</td>
<td>Advisor/ Partner</td>
<td>1,2,3,5,6</td>
</tr>
</tbody>
</table>

Table 2: Respondents’ nicknames, their roles, and the matching basic requirement

The interview questions model has been developed based on two aspects. First, based on the four-step framework of: diagnosis-design-implement-evaluate which has been described earlier in chapter 2. Second, based on the hypotheses which have been drawn by doing the first comparison. Several modifications were made to the structure of the interview questions model according to the feedback of my respondents, so that the quality of questions and their relevance to the research were enhanced. The final version of the interview questions model can be found in Appendix 4.

### 3.4 Data analysis procedure

In this research, seven face-to-face interviews and one phone interview were conducted in English in the period from mid-April till mid-June. These interviews lasted from 60 to 150 minutes; an average of 85 minutes, totaling 11 hours. Each interview was audio-recorded, transcribed and assigned with time indicators. Detailed notes were also taken during the interviews to facilitate data analysis. The interview transcriptions are not included in the appendix of this research since they are extremely large.

Data coding and analysis were carried out using Atlas.ti. Transcripts were analyzed through several phases of coding. First, three transcripts were analyzed and provided with open coding. Every sentence and passage of the interview were analyzed and labeled with a suitable code and time indicator (Boeije, 2002, p.395). After that, the resulting open codes were reviewed looking for codes with the same meaning. The list of codes with the same meaning was subsumed in a higher-level code. The resulting high-level codes were used to code the rest of interviews. During the process of coding the rest of interviews, it has been also looked for similar codes to update the higher-level codes. The process was repeated until all interviews were coded. In the end, all transcripts were listed with the higher-level codes. Every code has been described with its meaning.
The codes and their meanings are documented in a codebook after each round of coding in order to show the changes in codes until reaching the final transcript. The list of codes, their definition and transcripts were visualized using Atlas.ti. The final list of the coding book can be found in Appendix 5. Then, groups of codes were created based on the similar codes which belong to the phases of the four-step cycle of: diagnosis-design-implement-evaluate and other criteria like structure characteristics and organization characteristics. A network of neighboring transcripts for each code has been created using Atlas.ti to help the researcher to analyze and gain insights into the collected data in a structured way in the one hand, and to interrelate codes to develop meaningful conclusion on the other hand.

3.5 Research limitations

Due to the fact that this research relies completely on the empirical experience of the enterprise architects and the consultants who gave answers to the semi-structured interview questions when they were interviewed, the interpretations of questions could be varied between respondents and might lead to different answers than it is intended from the question itself. It could be also the case that people might sometimes leave out important information which adds or maybe change their feedback when answering questions.

On the other hand, the data collected from the interviews show reality as it is perceived from the respondent point of view. However, it could be sometimes that respondents give some answers that they think the researchers want to know even if the researcher tries not to be biased.

3.6 Research ethics

Several measures have been taken to assure that this research is done with regard to the general research ethics. First, the influence of the researcher on the end results has been taken into account, therefore I tried as much as I can to be conscious when concluding my findings. Second, I tried to be neutral as much as I can when interviewing people in order not to make them bias to a certain point of view. Third, I tried to let my respondents know from the very beginning about the duration of the interview, the expected research benefits, the level of confidentiality of their data and feedback. Finally, to increase the credibility of my research, the right people with the relevant work experience to my research were contacted and invited to participate in this research.
Chapter 4

4 Findings and research results

After providing an overview in Chapter 2 of both the TOGAF framework and the integral system model in L-STSD, in this chapter I will draw a comparison between them based on theory, then I will do the same comparison but based on practice. In section 4.1, I will analyze both frameworks based on the theory provided in chapter 2, then make some hypotheses based on my analysis to conclude the similarities and variations between these two frameworks. In section 4.2, a thorough analysis will be made to the data collected from my interviews based on the data analysis procedure described in chapter 3. Then, after the data is interpreted, a reflection will be made to see which hypothesis, that has been drawn in section 4.1, should be refuted and which should be accepted. Finally, in section 4.3, an answer will be given to the third sub-question mentioned in section 1.4.2 based on the data analysis procedure described in section 3.4. This answer will present to what extent could change the production structure of an organization, in reality, lead to a successful change project.

4.1 A comparison between TOGAF-ADM and the integral system design in L-STSD based on theory

It can be inferred from the literature summary which I have done in chapter 2, that each framework has its own way of dealing with the process of (re)designing organizations. Complexity, for instance, is one of the most important issues that both frameworks claim that they are trying to solve, but each from a different perspective. While the TOGAF framework provides a holistic view of the whole organization and tends to align business and IT to help management team in their mission to manage and deal with the complexity of their organizations (Giachetti, R. E., 2010). The other framework of L-STDs tries first to simplify the complexity of the organizational structure by designing parallel flow-based teams then turns to design the information and technological architectures (Moher and Amelsvoort, 2016).

As it has been explained in chapter 3, the four-step cycle of: diagnosis-design-implement-evaluate will be used to draw this comparison between the integral system model of L-STSD and the ADM cycle of TOGAF framework as it is shown in figure 4.1.

In each phase, the commonalities and variations between these two approaches will be explained based on the researcher understanding of the literature summary of chapter 2. Subsequently, a set of hypotheses will be created in each phase which needs to be supported or refuted in the second round of comparison in this research that will be explained in section 4.2.
4.1.1 Diagnosis phase

This phase, in general, represents one of the big differences between the two frameworks. Even though it seems that both frameworks explicitly involve making some sort of gap analysis to guaranty having a good outcome of the (re)design process, they are in fact doing that in a completely different way. As mentioned earlier in Chapter 2, L-STSD suggests doing a gap analysis to diagnose the symptoms which can be a potential cause of the problems that the organization suffers from. Doing this involves determining the variables which describe the problematic behavior
of an organization. That can be done by calculating the difference between the current values and the norm values which are described as the internal and external requirements in Table 1 from chapter 2. In other words, any (re)design process, according to L-STSD, involves giving more attention to this list of requirements and take it into consideration when designing the new structure.

However, as the open group’s framework suggests, the design process relies completely on the strategy and the goal of change suggested by the steering board and strategists in the preliminary and vision architecture phase. The translation of this strategy will produce the requirements needed for the transformation process. Any requirements do not go in line with the strategy and the goal of the transformation will be neglected. Another difference can be also seen between the two frameworks is the sequence in which the gap analysis is done. The gap analysis step is done in the diagnosis phase according to L-STSD, however, in TOGAF this is done in the phases B, C, and D to define the future planned architectures and determines later the actions needed to achieve this future state. Figure 4.1 shows the relation between the diagnosis phase and the ADM model.

This conclusion needs to be more investigated and assured by researching how it is being dealt with in practice. A further explanation will be given in chapter 4.2 based on the analysis of data coming from the exploratory research that I have done.

### 4.1.2 Design phase

With reference to the sequence of the six-step design model mentioned in section 2.1.3, and in comparison with TOGAF-ADM model, it can be inferred that some of the steps are similar and have the same order but some are not. Figure 4.1 provides a clear illustration of the design phase as it is prescribed in the six-step design model.

Both frameworks suggest in the beginning of the design phase that defining the scope of change and the triple (mission, vision, goal) is central, and then every following step should follow that scope. That means, step 1 and 2 from the integral design model in L-STSD can be matched with the preliminary and phase A from the ADM model in TOGAF.

However, the way in which both frameworks deal with the rest of the design steps is completely different. In the integral design model of L-STSD, it is suggested to start designing a new production structure which comply with the seven parameters described in section 2.1.2 in a top-down designing process. After that, a bottom-up designing process for the control structure should be done to match the new production structure. In other words, step 4 is aimed at designing a new flow-based production structure and control structure. On the other hand, the ADM model of TOGAF does not explicitly mention any mandatory actions that should be taken to redesign the organizational structure. That means, if there is a need for redesigning the production structure based on the high-level strategy and the goal of change which are already defined in the earlier phases of the ADM model, then TOGAF will suggest doing that, otherwise there is no need to make any changes to the organizational structure. I concluded that based on the literature review which I have done in chapter 2, but to some extent it is still vague. Therefore, I tried in my interviews with enterprise architects to particularly investigate this issue in addition to many other ones which will be explained in section 4.2.
Step 5 of the integral design model in L-STSD can be matched with phases B, C, and D of TOGAF-ADM in which the designing of the business, information and technology architectures take place respectively.

However, step 6 of the integral design model in L-STSD cannot be matched with any phase in TOGAF. Therefore, I tried in my interviews to investigate how enterprise architects deal with the behavior and the culture of the formed teams after the change, and how do they determine the right leadership style which best fits with the new design.

Figure 4.1 shows the concluded relation between the diagnosis phase of the integral design model of L-STSD and TOGAF-ADM model based on theory. This conclusion needs also to be more investigated and assured by researching how it is being dealt with in practice. A further explanation will be given in chapter 4.2 based on the analysis of data coming from the exploratory research that I have done.

### 4.1.3 Implementation phase

As I discussed in chapter 2, the implementation phase according to De Sitter is aimed to reach the future state based on the outcome of the design phase. That means, a set of actions and an implementation plan should be defined (Achterbergh and Vriens, 2010).

As it is shown in figure 4.1, the implementation phase can be considered as similar to phase E and F from the ADM cycle. Both frameworks tend to assess the readiness to change inside the organization being altered. This action is done in a trial to make the organization ready for change by reducing the level of resistance and by fostering the feeling that there is a need for change to keep the organization viable. However, TOGAF framework advises making use of another project management approaches to create the required change plan with respect to time, cost, and quality.

To conclude, both frameworks are similar in general with a very small difference in the way how to handle the migration phase. This hypothesis will be further investigated and explained more in Chapter 4.2.

### 4.1.4 Evaluation phase

Based on my summary in chapter 2, the goal of this phase is to determine whether the implemented change has had its desired effect or not. In other words, it is a way to test and evaluate the efficiency of the implemented change. However, if it is the case that the change was not successful or did not achieve its goal, then analysis should be done in this phase to find out what are the reasons for failure? Did that happen due to an uncontrolled behavior of the surrounding environment for instance, or it was because of a wrong design? This set of actions could be to a certain extent matched with phase G and H in TOGAF framework.

However, there are still some variations in how each framework evaluates and supervises the outcome of the change process. In TOGAF, a regular evaluation and supervision of the implementation process are being done to see if the change project is being implemented according to the initial plan. Thus, some correction to the implementation plan can be made when needed. This action can be also linked to the implementation phase as shown in figure 4.1. In contrast, the evaluation in L-STSD is being done in the end.
Finally, the evaluation phase also suggests a set of alternatives in case the suggested design does not lead to the desired change values. This activity can be also matched with Phase H in TOGAF framework.

In section 4.1, a comparison between both the integral design model of L-STSD and TOGAF-ADM framework of Enterprise Architecture has been drawn. A set of hypotheses has been also concluded that need to be further researched in practice. Based on the outcome of this comparison, the interview questions model has been modified to match the points that should be further investigated in my interviews. The following section will explain the feedback of my respondents and how they perceive the both approaches.

4.2 A comparison between TOGAF-ADM and the integral system design in L-STSD based on practice

In this section, I will reflect the data analysis of the interviews, which I have conducted, on the four-step model as it has been discussed in chapter 3. As I already mentioned, this model comprises four phases of: diagnosis-design-implement-evaluate. In the previous section 4.1, a comparison has been presented between the two frameworks: TOGAF-ADM and L-STSD framework based on my understanding of the literature review, and consequently several hypotheses have been concluded. Now, I will interpret the data coming from my respondents to support or refute these hypotheses.

First, I will give in section 4.2.1 a brief introduction to the Enterprise Architecture frameworks including the popular frameworks in the Netherlands and EA capabilities and usage in practice. Then, the comparison based on practice will be presented in section 4.2.2.

Readers not acquainted with the organizations, which I have chosen in my exploratory research, might refer to Appendix 2 and 3. Appendix 3 provides an overview of the respondents in my research. Appendix 2 provides a brief overview of the organizations which my respondents belong to.

4.2.1 Enterprise Architecture frameworks in practice (Popular frameworks, Usage, Capabilities)

Popular Enterprise Architecture frameworks in the Netherlands

Eight respondents have participated in my research. According to them, different frameworks are being used in the Netherlands to (re)design organizations. Some frameworks are wide-spread ones like TOGAF, Archimate, Zachman, and Bizbox. Other frameworks are being nowadays used to enable architects and organizations to be more agile like SAFe. As reported by Architect-D, another enterprise architecture framework is provided by Oracle company. This framework is being particularly applied by Oracle company when introducing new services to its clients to support the software and hardware equipment supplied by Oracle. As stated by Architect-F, who is also a researcher works for a consultancy firm in Utrecht, an enterprise architecture framework called GEA has been developed by him as a part of his Ph.D. This framework has been later applied to real cases and it is also being provided as a training material to many clients and organizations in the Netherlands.
Table 3: The popular Enterprise Architectures in the Netherlands

<table>
<thead>
<tr>
<th>Framework name</th>
<th>Designed by</th>
<th>Region</th>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOGAF</td>
<td>Open group</td>
<td>Worldwide</td>
<td>TOGAF 9.1</td>
</tr>
<tr>
<td>Archimate</td>
<td>Open group</td>
<td>Worldwide</td>
<td>Archimate 3.0</td>
</tr>
<tr>
<td>Zachman</td>
<td>John Zachman</td>
<td>Worldwide</td>
<td>Zachman</td>
</tr>
<tr>
<td>Bizbox (BIZBOK® Guide)</td>
<td>Enterprise Architecture Guild</td>
<td>Worldwide</td>
<td>Bizbox 5.5</td>
</tr>
<tr>
<td>SAFe (Scaled agile framework)</td>
<td>Scaled Agile</td>
<td>Worldwide</td>
<td>SAFe V4.0</td>
</tr>
<tr>
<td>Oracle enterprise architecture model</td>
<td>Oracle</td>
<td>Worldwide</td>
<td>Oracle EA</td>
</tr>
<tr>
<td>GEA- General Enterprise Architecture</td>
<td>Roel Wagter</td>
<td>The Netherlands</td>
<td></td>
</tr>
<tr>
<td>DEA- Dynamic Enterprise Architecture</td>
<td>Sogeti</td>
<td>The Netherlands</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 provides a brief summary of the frameworks mentioned in my interviews.

**Enterprise Architecture usages and capabilities in practice**

Enterprise architecture is being widely used by organizations nowadays. The digital transformation and the high demands among organizations for being more agile in responding to the market and environment changes have changed architects’ perceptions about how they can lead this digital transformation process. In the words of Architect-E “So we need to move by doing the digital transformation, and therefore we need an architectural approach” [Interview 6, 00:20:15].

Enterprise architecture and its diverse frameworks are very helpful to keep organizations viable and surviving in the changing environment. The cost of deploying EA could be high, but it can be considered as an investment which has to be compared to the outcome earned by spending every euro. The revenue coming from this investment relies completely on how mature the organization is in Enterprise Architecture. Architect-E highlighted that “If it is the first time doing an architecture in an organization, then it is very likely to fail, but if it is the second or the third time, then it could be a successful trial” [Interview 5, 00:14:14].

Moreover, when an organization sits in an unstable environment, it is then not so wise to negotiate the cost of deploying Enterprise Architecture at the expense of the viability of the organization. It can be said that the cost of deploying EA is very high, but we have to accept this fact in order to survive. Consultant-B disclosed an example of “I would like to use the metaphor when you are focused on stability and the boat is going down and sinking, then it is very important to look at the points make you steer the boat in the right way rather than thinking of the cost is being paid to get the boat to the right way” [Interview 2, 00:06:10].

For the most of my respondents, working with Enterprise Architecture is a daily process being used in many occasions like the following listed below:

- **Designing organizations**: Enterprise architecture is used to (re)design departments and business units when needed in order to come up with the required data and infrastructure architectures. EA frameworks work as
facilitators to help architects to come up with a holistic view of their enterprise, so that architects can incrementally redesign their organizations. As consultant-C stated, “We use EA when designing a new department” [Interview 3, 00:15:00]. Architect E has also said “In my view, all of these frameworks are just tools and you use whatever you want to use” [Interview 5, 00:13:10].

- **Responding to strategic decisions:** Based on the feedback of my respondents, EA is widely used to provide an integrated translation of the strategic plan coming from the top management of an enterprise. Architect-E said, “Someone says that we have or we need an architecture, why because we have an architecture, but responding to a strategic decision” [Interview 5, 00:14:30]. Enterprise architects translate and interpret the high-level strategy into requirements which are needed to redesign the organization and come up with a new architecture in order to cope with the changes in the environment or the marketplace. The drivers for the new design could be a competition in the marketplace, a proactive change activity, or even reacting to crises. As Consultant-C reported “But often strategists are not capable of translating them into concrete requirements so you have to help them with that” [Interview 3, 00:20:50].

In this section, several popular frameworks of Enterprise Architecture in the Netherlands have been presented according to the feedback of my respondents. Subsequently, the capabilities of Enterprise Architecture frameworks and how they are used in practice are presented. In the following section, a comparison will be made based on the feedback and the perception of my respondents in reality.

### 4.2.2 The Enterprise Architecture framework TOGAF-ADM in relation to the four steps of L-STSD

As it is stated in chapter 3, the four-step cycle of: diagnosis-design-implement-evaluate is used for this comparison and to guide the interviewing process of my respondents. The nine phases of the TOGAF-ADM framework will be linked to the previous four steps according to the feedback and data coming from my respondents. This means that I will try to focus on how Enterprise Architecture is being applied in practice from the L-STSD point of view.

#### I. Diagnosis phase

Like I said in the previous section, Enterprise Architecture is being widely used to redesign organizations and solve their problems. In accordance with Architect-F, it always starts when top management reads the dashboard which includes data about the marketplace and the surrounding environment. If an alarm is raised, then the management investigates that alarm and try then to find a proper solution [Interview 6]. Diagnosis is a very critical in which many different parties collaborate to identify the problem that an organization has. It could be sometimes that top management sees that there is, for instance, a financial issue, and to cope with this problem, a decision is taken by management to cut cost. For strategists and management teams, such a decision is a high-level strategy, but they don’t know how to proceed towards having a concrete interpretation of this strategy. At this point, the task will be forwarded to an enterprise architect, who is capable of translating this high-level strategy to tangible requirements. As Architect-
G put it “Change starts from strategic people who define things, architects who define solutions, project managers and program managers who really go in details” [Interview 7, 00:51:45].

Another key point is, that different parties must gather to think of the problems that an organization has. All respondents stressed in their interviews that several meetings, workshops, or any kind of effective communication channels should be held to let everyone, concerned with the problem in the organization, talk and participate in the change process from the very beginning. Consultant-C said, “So good communication strategy is very helpful in that case but you have to know precisely who are your stakeholders and who might be influenced by the change” [Interview 3, 00:58:50].

On the other hand, 5 out of 8 respondents have stated that Enterprise Architecture is just a tool or a facilitator. It does not include any kind of pre-defined requirements like the functional requirements suggested by De Sitter, which mentioned in Table 1. As Architect-E said, “If you start using the ADM, typically at the beginning, you don't have a list of requirements” [Interview 5, 00:21:50]. Consultant-C also said “I don't think there is a pre-determined list. It is worth mentioning that those requirements sit always in the brain of the strategist who is designing that organization” [Interview 3, 00:22:00]. However, Architect-G has had a different opinion when he stated: “TOGAF does have such requirements, so it can provide some predefined requirements to help Architects in their design” [Interview 7, 00:22:05].

Even though the functional requirements, which have been suggested by De Sitter, are very useful in any design, we have to admit that they are not lasting forever. Especially, that they were introduced in a period where ICT was not that popular compared to now. As Consultant-C reported, “I think social technique is not time proof, so when we evaluate organizations I don't think that those requirements will last forever so they have to be updated in the future according to the changes happened to the market and environment” [Interview 3, 00:49:25].

The last step in the diagnosis phase suggests the solution space based on the problematic behavior that an organization has. Although EA frameworks are IT-based models that very often suggest having ICT-based solutions, the most respondents admitted that these solutions are temporary in most cases. Therefore, it is always advised to look for the main causes of organizations’ problems by doing a proper diagnosis and suggest long-term solutions. However, there are still some organizations that favor quick solutions which rely completely on ICT. Again, business IT alignment should be highly considered at this point since business people are not always able to see the full picture, and so do IT people. So, solutions should be a result of a mutual work between business and IT people in a trial to avoid half solutions and be in line with the high-level strategy of an organization. Architect-G believed that “I believe ICT can come up with a good solution but meanwhile it is wise to dig deep and search for the motivator of the problem” [Interview 7, 00:49:50].

However, according to Researcher-B, we should always pay attention to the surrounding environment and try the suggested solution to balance between the complexity of the organization’s structure and the complexity of the environment in order to survive. He said, “An organization needs sufficient complexity to be able to synchronize with the complexity of the environment” [Interview 2, 00:02:30].

To conclude, the following points can be inferred based on the data analysis of the interviews that have been conducted:
1. Enterprise architecture’s framework is a tool used by architects to interpret the high-level strategy coming from top management.

2. Problem awareness can be optimally done by involving people and suggested solutions should maintain a high level of business IT alignment.

3. Gap analysis is a way to help architects and people understand the future-state and have a clear estimation on how to achieve that point regardless of the phase in which it is implemented.

Accordingly, both L-STSD (diagnosis phase) and TOGAF-ADM frameworks can be related as shown in figure 4.2, which matches to a certain extent what I concluded in section 4.2.3 based on theory.

II. **Design phase**

In relation to the six-step model of L-STSD framework mentioned in section 2.1.3, I tried in my interviews to question my respondents about how they design new architectures using EA in practice. As stated by Architect-G, architects should be smart and selective when using TOGAF-ADM. He added, “I don't go through the whole phases of ADM for instance, but I really go towards what the organization is doing and I apply that and translate it into a specific situation of the organization” [Interview 7, 00:08:12]. So, in practice following the sequence of steps A to H is not a must.

Based on the feedback of my respondents and my data analysis, I will draw a comparison to show the commonalities and variations in the design phase. The six-step model will be also followed.

1) **Scope:** Setting the scope of change is an up-front process. It is being implemented in the very beginning of the design phase. Enterprise architects either receive the strategy made by top management or rely on the diagnosis reports coming from the diagnosis phase to proceed in the design phase. Then, they try to set the borders of their change and define their stakeholders.
Based on my data analysis, six respondents believed that in most change projects there should be a change steering committee which is responsible for taking any decision relevant to the transition process in line with the set of privileges granted from top management. In case there is a decision should be taken at a higher level, this committee should refer this issue to top management. As Architect-D stated, “Top management has created a steering committee, this team is responsible for the design process, they are fully dedicated to steering the change process” [Interview 4, 00:26:10]. Diverse people from different backgrounds (multi-disciplinary people) should join this committee to provide a successful IT business alignment which could lead to a successful transition.

If I compare how enterprise architects in practice deal with this phase, it can be deducted that this step of the design phase in L-STSD can be linked to the preliminary and vision architecture phase in TOGAF-ADM as shown in figure 4.3.

2) **Mission, vision, and goal:** The goal of the organization is not a thing that enterprise architects have to come up with. It is often the case that top management sets goals. The strategy of an organization, which involves setting the mission, vision, and goal, is believed to be a difficult decision as Researcher-B stated. He said, “When you are living in an unpredictable world, as a strategist it is very difficult to estimate decisions, so that is really a difficult process or step in the design cycle” [Interview 2, 00:40:10]. However, it does not mean that management has to say, architects have to do what we have foreseen and that’s it. People, who are influenced by a change in organizations, should be also involved in the decision-making process by opening the door for two-way communication channels.
between management and people. Architect-E said, “you really need to think about your vision not only the top management say oh here it is and good luck and have fun, but to the whole organization, there are different key players” [Interview 5, 00:28:20].

Enterprise architects should take that high-level strategy and then translate it into requirements and parameters. Having a pre-defined list of requirements could help architects in doing that. As consultant C stated, “In practice, I see strategies being written and we as business architects have to deduct the external and internal requirements from that strategy and we use this list in the back of our minds” [Interview 3, 00:54:30].

On the other hand, architects tend to carefully deal with this phase. Therefore, they try to set up workshops and giving presentations to their stakeholders who are influenced by change. Stakeholder management is one of the most popular disciplines used by architects to deal with people and assess their readiness to change. Architect-E stressed the importance of stakeholder management in this regard” It is stakeholder management, stakeholder management stakeholder management” [Interview 5, 00:28:10].

If I compare how enterprise architects in practice deal with this phase, it can be deducted that this step of the design phase in L-STSD can be linked to the vision phase in TOGAF-ADM as shown in figure 4.3.

3) Design specs: In practice, an estimation of the future state will be created and described including some rough outline about how the end state would look like. At this point, not too much data should be collected about the end state of change, rather the big-picture view is desired. Architect-G believed that “I favor setting the far end goal and that is not very clear yet, just giving a clear direction and if everyone agrees on that direction then go and broaden the whole thing” [Interview 7, 00:37:34]. Then, a forward or backward movement is executed towards/from the future-state to calculate the gap and to work out what are the steps needed to transition from the current to the future state. Consequently, the architect addresses the steps describing how to reach the future state and ask for approval from top management or stakeholders concerned with that architecture. If the enterprise architect gets the approval to continue working on that architecture, he/she should dig deep to find out the complete solution space that leads the organization to that future state.

If I compare how enterprise architects in practice deal with this phase, it can be deducted that the design specs step of the design phase in L-STSD can be linked partially to the vision phase and the business architecture phase in TOGAF-ADM as shown in figure 4.3.

4) Designing the organizational structure: This step according to L-STSD aims at redesigning the organizational structure before touching the other architectures (information, application, technology). In practice and based on the feedback of my respondents, most enterprise architecture’s frameworks do not explicitly impose redesigning the organizational structure. According to the feedback of six respondents, altering the organizational structure is very important when designing organizations, but it is not a mandatory step in Enterprise Architecture. Another point of view is, Architect-F and Architect-G believed that changing the structure is not the first thing that they do when redesigning organization. Taking the decision of having such a change in the structure should be based on many factors depending on the case given in the organization being changed. For instance, if the problem involves changing the
structure, this should be discussed with top management to see if there is a will to do that, since it is a very costly action. Structure redesigning is considered as an investment which should be carefully studied case by case to see what are the consequences of doing that. However, decision makers tend not to invest in half solutions since these solutions are just temporary and will cost organizations a lot in the long run. Architect-E said “I will say if you look at management teams or places where decisions are being made, usually about 70%, maybe it is even 80%, I'm not sure I'm little bit careful with my estimate, tend to favor investing in new things and hesitate to fix the old stuff” [Interview 5, 00:40:20]. In accordance with Architect-G, redesigning the organizational structure could be done in phase B from the ADM model of TOGAF, but the decision to change structure usually comes from top management. He said, “When we look at the Enterprise Architecture and the processes that define Enterprise Architecture, processes can still be the responsibility of the enterprise architect but splitting up those processes in departments and structures is generally the activities of management team” [Interview 7, 00:43:30].

However, redesigning the structure does not mean always building flow-based teams. Even if the concept of flow-based and self-managing teams is spreading over and over, it still has some limitations according to Consultant-C. Designing flow-based teams mean giving people more tasks and increase the level of diversity in products being handled by the same team. In addition, it involves moving people from the state of being specialists to the state of being multi-disciplinary, and it is not that easy to implement. Researcher-B also stated,” It appeared in my research that people become exhausted in 2 or 3 hours when you have to switch very fast between tasks” [Interview 2, 00:34:10].

Another important thing has been frequently stated in my interviews is, designing the organizational structure should be always aligned with the information structure. Thus, this process should be always done in parallel. Architect-E said “One cannot be seen without the other. My point is that you cannot separate the two aspects, so if you are looking at one, then you are looking at the other” [Interview 5, 00:45:05]. Architect-D also stated, “Well, what I would like to say you have to do it together, you have always to align Business and IT but not doing one at the expense of the other” [Interview 4, 01:15:50].

Lastly, since L-STSD gives the social aspect high attention when designing organizations, I tried in my interviews to investigate how Enterprise Architecture deals with this issue in practice. According to my respondents, dealing with the social aspect when designing organizations is increasing day after day. That is not explicitly mentioned in the EA frameworks which my respondents deal with, but it is the mission of architects to think of it based on their experience. As Consultant-A stated “The main driver when you want to change is, you need people who would support that change, so they can see the urgency of the change, they understand the solutions and the bigger picture is made by management” [Interview 1, 00:41:00]. Architect-D also said “That's why I always say, organizations have to pay more attention to their people otherwise they will fail” [Interview 4, 00:11:40]. He also added “You have to change the structure in order to create another social networking environment with a high level of cultural experience” [Interview 4, 01:03:40].

If I compare how enterprise architects in practice deal with this phase, it can be deducted that the organizational and control structure design step of L-STSD can be linked conditionally (if there is need to change the structure) to the business architecture phase of TOGAF-ADM as shown in figure 4.3.
5) **Technical system design**: A lot of activities can be listed under this step based on the practical experience of my respondents. Information, application and technology architectures of ADM cycle are all part of the technical system design. Aligning business and IT is central, and all efforts should be done to come up with an effective alignment. Architect-E said, “I’m a big fan of inclusive thinking so whatever you do you need to consider both business and IT, and that is not either or question” [Interview 5, 00:45:00]. Enterprise Architecture puts much emphasis on this part of the design, because ICT is leading the digital transformation in the world and it comes with solutions which have been never thought about. Researcher-B believed that “I think one of the problems of ICT in organizations is that they have completely different language and they have a lot of solutions for things which we didn’t think that it was the problem at all. So, I think this is the key” [Interview 2, 00:27:20]. Architect-D also said “During the business architecture phase, business people see always that it is a greenfield, so they don’t have any problems except business. But in reality, it is completely different, nobody can decide on behalf of the other neither business nor IT” [Interview 4, 00:29:20].

If I compare how enterprise architects in practice deal with this phase, it can be deducted that the technical system design step of L-STSD can be linked to the information and technology architecture phase in TOGAF-ADM and partially to the business architecture phase to maintain the business IT alignment as shown in figure 4.3.

6) **Soft factors design**: Based on the feedback of my respondents, organizations increasingly show their willingness to give more attention to the behavior of their teams during and after the change. This is a very important factor in the design process, since it helps in leading organizations towards a successful transition. The role of an architect at this point is to make an up-front design of several soft factors like people’s behavior, leadership style, etcetera. This can help in dealing with resistance and making people and organizations ready to change. Architect-E said “I think that is a big point because now we see that we want to organize our value teams across lines of business and across departments, especially if you consider things like lean and self-organizing teams then you need to cross boundaries, and then vision of business really gets in the way” [Interview 5, 00:31:50]. It is also worth mentioning that many change management disciplines are being used among enterprise architects in this regard. If I compare how enterprise architects in practice deal with this phase, it can be deducted that the soft factors design step of L-STSD can be partially linked to the business architecture phase of TOGAF-ADM as shown in figure 4.3.

III. **Implementation phase**

As prescribed in chapter 2, the aim of this phase is to carry out the set of solutions and the suggested design coming from the previous phase. In practice, the role of enterprise architect during the implementation phase of redesigning organizations becomes more challenging. An architect should be able to work within multi-disciplinary teams which belong to different backgrounds and specializations because of the fact that many organizations nowadays tend to work agile. Therefore, educating enterprise architects in the area of project management, for example, becomes a top-priority issue, because they have to work closely with project managers during the implementation phase, understand their language, and use their tools. In other words, it can be said that the role of enterprise architects become very tough and involves having the multi-disciplinary knowledge to fulfill this function. An architect said, “I tend to work
more agile, you have to be involved in the actual change, this is the only way to learn and to see the effects of your architecture”.

Enterprise architects, in practice, have also the facilitator role during the implementation phase. For instance, architects could help in reducing the level of resistance among people and make them feel the importance of change. The lack of this role might lead to changing the organization but leaving people as they are. An architect said, “But, in spite of all of the changes happened to the company, people tend then to work as they worked before, so people didn't change although the organization changed a lot” [Interview 4, 00:11:40].

No more data was provided by my respondents about this phase. If we compare how enterprise architects in practice deal with this phase, it can be deducted that the implementation phase of L-STSD can be linked to phase E and F of TOGAF-ADM as shown in figure 4.4.

![Figure 4.4: STSD-L framework in relation to ADM-TOGAF framework in practice (Implementation phase)](image)

IV. Evaluation phase

As I explained in chapter 2, this phase aims at evaluating the implemented changes to see whether they have had the desired effects or not. In practice, there are differences between how the two approaches deal with this phase.

This phase according to my respondents is vital. Enterprise Architecture tends to supervise and check regularly the progress of the change initiative with respect to the initial plan. Architect-D believed that “You should evaluate the progress of your change process and get a regular feedback from your employees about the achievements that we've had so far” [Interview 4, 00:15:35].

Architect-E stated that, because of the extreme need for architects to be agile, they should always be involved in the actual change, work with teams and see the effects of their architectures since there is no way to think of things up-front. He said, “I always like to start with simple architecture and do a couple of iterations and then we find the suitable architecture, because once you see the effects of what you're envisioning that's the only way to learn and to improve your architecture” [Interview 5, 00:44:50].
In practice, it is not enough to just look at the results of your behavior or actions in the end, however, you have always to supervise the implemented actions and learn from their results and develop later your future actions. The implementation governance phase in TOGAF-ADM provides this functionality and always keep architects conscious about the actions that happening at the moment. As architect-D stated “You should evaluate the progress of your change process and get a regular feedback from your employees about the achievements that we've had so far. Could it be better in such a way for example?” [Interview 4, 01:15:40].

If I compare how enterprise architects in practice deal with this phase, it can be deducted that there is a major difference between Enterprise Architecture and L-STSD in the evaluation phase. While L-STSD tends to evaluate the end-result of change by comparing it to the norm values which have been determined in the diagnosis phase, Enterprise Architecture tends to regularly supervise the change actions and have a clear view about the outcome. Accordingly, the part of evaluating the resulted architecture can be linked to phase H, but the implementation governance phase of TOGAF-ADM should be partially linked to the implementation and the evaluation phase as shown in figure 4.5.

To summarize, a comparison has been drawn in section 4.2 between the L-STSD and TOGAF-ADM based on the feedback of my respondents. This comparison has supported or refuted the hypotheses, which have been assumed in section 4.1, so that an explicit description of the relation between these two approaches has been created. This comparison also revealed that EA/ICT does not use the term “systems follow structure” as Lekkerkerk, (2017) put it.

In the following section, it will be explained whether redesigning the organizational structure could increase the success of ICT transformation projects according to the EA practitioners whom I have interviewed.

4.3 Do we really need to redesign the organizational structure in practice?
In this section, I will give an answer to the third sub-question of this research which is prescribed in section 1.4.1. As suggested by De Sitter in his approach L-STSD, rebuilding the organizational structure is a mandatory and a lead
process in which self-managed teams are being formed in a flow-based structure. This approach sets the condition of rebuilding the production structure in order to have a better design. The question is: is that always possible to be done in practice? The answer of this question can vary from case to case.

In the case of designing a new organization or a new department, the mission will be easier to be accomplished because everything will be built from scratch. However, in the case of redesigning the existing structure of an organization or a department, the mission will be then much more difficult.

As I explained in section 4.2, designing the production structure process is being conditionally implemented based on how top management foresees the solution of the problem that the organization has. In order to have a clear understanding of how my respondents deal with the organizational structure when designing organizations, the following points were discussed with my interviewees:

- Examples about how respondents deal with the organizational structure.
- Do they believe that rebuilding the organizational structure will lead to achieving the three qualities presented by De Sitter (QoO, QoW, QoWR)?
- Do they believe that this process should lead the redesign process?

In the rest of this section, I will analyze the feedback of my respondents based on the data analysis procedure prescribed in section 3.4 to have a clear view of the three points mentioned above.

4.3.1 Examples about how respondents deal with the organizational structure

In my interviews, only two respondents have presented a case in which their organizations are trying to rebuild the organizational structure to cope with the environment changes and customers’ demands. I will present now these two cases and show how my respondents dealt with the organizational structure.

**Case1 ‘Het UAF’**

The UAF is an organization helps high-educated refugees coming to the Netherlands to continue their studies and find a job. As mentioned in a report published by the UAF, about its long-term policy plan for the years 2017-2020 called ‘Meerjarenbeleidsplan UAF 2017-2020’, it has been decided to change the organizational structure of the UAF in order to cope with changes in the surrounding environment. The increasing number of refugees coming to the Netherlands, pushed the strategy makers of the UAF to think of a suitable solution to cope with this big change. That is stated explicitly in the report “During the forthcoming policy period, the UAF will further develop the governance structure that exists from 2015. For this purpose, UAF focuses on the organizational structure, work processes, culture and behavior” (Het UAF, 2017). According to Consultant-A, who works for the UAF, redesigning the organizational structure is the best long-term solution for such a problem. He said “By combining the existing departments that we have, I’m coming up a multidisciplinary department which can serve and react to the needs of our clients. What I know so far that a new structure will be introduced in a way so the whole teams can co-operate efficiently” [Interview 1, 00:33:02].
In this case, the initiative of rebuilding the organizational structure was taken by top management, and then supported by consultants who advised to have a (semi flow-based) structure that provides having multi-disciplinary teams by combining the exiting departments.

**Case2 ‘Alliander’**

With reference to Interview 3, Consultant-C stated that he is now working on redesigning the customer care department within Alliander based on L-STSD. However, he stressed again the fact that business IT alignment is central. He said “I still support the saying that we must redesign first and then automate. But still, I have to mention that you, as an architect, have to take into account both information and production structure and work in parallel to redesign both” [Interview 3, 01:03:33].

These two cases represent real examples of how architects and consultants deal with structure when (re)designing organizations.

Moreover, Architect-H also agreed that redesigning the organizational structure is central providing that IT processes are assumed as operational tasks (tasks that contribute directly in the formation of the end-product) which also contribute in the design of the production structure. He said “When I worked on redesigning organizations, I discovered that ICT is a controlling system for data management, but it is also a part of the production structure, and it should be tackled in the shop floor like any other mechanical task for instance. So, IT can be a production factor, a control factor or the system itself” [Interview 8, 00:11:58].

However, not all my respondents have the same feeling about redesigning the structure. For example, Architect-F said “I do not start with designing the organizational structure of an organization, but that is also my way of working. I mean some people start with the structure from a managerial point of view, but I cannot look at it from that point of view! I look at it from an Enterprise Architecture point of view!” [Interview 7, 00:42:30].

Having said that and based on my findings in section 4.2 as well, redesigning the organizational structure, if needed, should be always done in parallel with designing the ICT systems. However, there is a consensus that redesigning the organizational structure is a long-term solution which can help in solving critical problems. This conclusion could be investigated more by interviewing more EA practitioners. My research and the interviews included in, could help in doing a further research on this issue.

### 4.3.2 Does rebuilding the organizational structure lead to high QoO, QoW, and QoWR

Three qualities, as suggested by De Sitter in L-STSD approach, represent the functional requirements which are needed to design organizations: quality of organization, quality of work, and quality of work relations (Achterbergh and Vriens, 2009).

In my interviews, I focused on two points. The first one is, can we achieve the three qualities mentioned above by relying on certain ICT or management solutions without altering the organizational structure? The second point assumes that these qualities can be only achieved by altering the structure. Table 4 summarizes how many respondents,
out of eight, responded to each case. The last row from Table 4 shows how can ICT or changing the organizational structure lead to reducing the complexity of organizations.

<table>
<thead>
<tr>
<th></th>
<th>Can be Achieved without altering the structure (Governance or ICT Solution)</th>
<th>Can be achieved only by altering the structure</th>
<th>No answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of organization</td>
<td>1*</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Quality of Work</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Quality of Work Relations</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Reducing complexity</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
</tr>
</tbody>
</table>

*Table 4: Respondents feedback about the three qualities and reducing complexity

*Numbers refer to the group of eight respondents who I have interviewed

As it is clear in Table 4, there was a consensus among my respondents that achieving the quality of organization, based on its definition in L-STSD, can be achieved by altering the organizational structure. However, achieving a good quality of work differs from case to case. So, it can be achieved in some cases by deploying an ICT solution, but in other cases it can be only achieved by changing the structure. Lastly, good quality of work relations, according to my respondents, could be often achieved by having some changes in the ICT systems or by enacting new policies or rules.

### 4.3.3 Do respondents believe that redesigning the production structure is a lead process

As it is prescribed in section 1.4, the main question of this research is about how to design a healthy organization. Does it mean that architects or consultants should redesign first and then automate like L-STSD suggests? or they should take the production structure for granted and optimize only the information systems serving the control structure?

To answer this question, four scenarios of a potential designing sequence model were given to my respondents during interviews to see which scenario fits best with the redesigning process based on their experience in the field of Enterprise Architecture and Organizational Design. These scenarios are as follows:

1. Determine strategy, build new structure based on sociotechnical systems, then build the information system based on the new structure.
2. Determine strategy, leave the old organizational structure as it is, build a new information system.
3. Determine strategy, if the strategy requires changing the structure, lets proceed with it, then build a new information system.
4. Determine strategy, then work in parallel on both the organizational and the information structure.

According to the feedback of my respondents as shown in Table 5, only one respondent chose scenario 1, two respondents chose scenario 3 and the majority of my respondents see that scenario 4 is the most suitable one. Architec-
E said “*I think number 4 should be that you have to consider both things at the same time so you cannot go for making a new organizational structure and then build your information system*” [Interview 5, 00:48:30].

<table>
<thead>
<tr>
<th>Interview</th>
<th>Consultant</th>
<th>Scenario #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Consultant A</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Researcher B</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Consultant C</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Architect D</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Architect E</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Architect F</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Architect G</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Consultant H</td>
<td>4</td>
</tr>
</tbody>
</table>

*Table 5: Scenario number that has been selected respondents*

Based on that, aligning the organizational structure with the information structure is very important when redesigning organization. That means, (re)designing the organizational structure should be always done in parallel when designing the ICT systems. Thus, I would say redesign and automate simultaneously.

In summary, two comparisons between the L-STSD and the framework of EA have been done in this research and explained in this chapter. The first comparison has been done based on the researcher understanding of the both approaches. The second comparison has been done in an explanatory research context by interviewing Enterprise Architecture and Organizational Design practitioners. The outcome of these two comparisons and the other findings that I have reached would lead to a number of recommendations will be explained in the following chapter.
Chapter 5

5 Conclusion and suggested solution

In this chapter, a conclusion will be given to this thesis by summing up the researcher’s contributions and the important findings. Subsequently, a solution will be given based on the findings to enhance the framework of Enterprise Architecture. Finally, critical reflection will be presented.

5.1 Conclusion

The first part of the main research question is: do the practitioners of the Enterprise architecture approach (EA) think of redesigning the organizational structure before they start to build the ICT systems when (re)designing organizations as the Lowlands-SocioTechnical Systems Design approach (L-STSD) suggests? Based on the findings presented in chapter 4, enterprise architects do not tend to change the organizational structure before they design the ICT systems. However, they tend to change it, if there is a strategic need, in parallel with designing the ICT and information systems. The second part of the main research question is: to what extent the integration of L-STSD into the EA framework can lead to designing viable organizations? The answer of this part based on the research results is: several steps of the L-STSD framework could be added to the EA framework to improve its outcome and increase the viability of organizations.

One of the major contributions of this research is the comparisons that have been done in chapter 4. The aim of doing these comparisons was to find out how L-STSD (Integral Design Model) and Enterprise architecture (TOGAF-ADM) approaches interrelate. They also provide the reader with knowledge about how both approaches deal with (re)designing organizations and how L-STSD can be integrated into the framework of EA to enhance the designing process and increase the probability of having successful transformation projects, which means designing healthy organizations.

Based on these comparisons, it has been found that both approaches could have a complementary role to each other. While L-STSD approach gives more attention to the redesign of the organizational structure and social aspects, the Enterprise Architecture approach provides a holistic view of the whole organization and tends to simplify the act of redesigning business, information, and technology structures which are not given that much attention by L-STSD.

The thesis also sets out to support enterprise architects in their mission to redesign healthy organizations. The interviews indicate that, the goal of designing healthy organizations can be achieved by giving attention to both: the social and technical aspects as it is suggested in L-STSD. However, the following points should be also considered to avoid ending up with an unsuccessful transformation:
1. The level of maturity in Enterprise Architecture is a very important factor that determines whether change would lead to success or not. The more the organization is mature in EA, the high the chance is to succeed.

2. Problem diagnosis is central in any change project, and this should be done in collaboration with people who are affected by change.

3. Giving people diverse or multi-disciplinary tasks, based on the new flow-based structure as suggested by L-STSD, could lead to negative consequences, since people need a long time to manage and learn how to deal with new complex tasks.

4. The list of requirements, suggested by L-STSD, can help architects in their mission of (re)designing organizations, but architects should pick up what is needed and add also other requirements based on several factors they might foresee, e.g. government regulations, lean and agile factors, etcetera. However, architects should be cautious when translating these requirements into the new design.

5. ICT sometimes provides more safe solutions for organizations. These solutions do not put organizations at risk and are easier to be implemented rather than altering the organizational structure. Therefore, they are rather preferable. However, such a behavior is not favored among architects because they tend often to follow long-term solutions rather than half solutions that might lead to failure!

6. The recent agile environments in organizations, requires enterprise architects to be more knowledgeable than before. That means, enterprise architects should be able to work within collaborative teams in which their members can do multi-disciplinary tasks, i.e. architects should not be only able to understand Enterprise Architecture for instance, but they are considered as well to know several project management disciplines in order to be successful. This drives me to say that the role of enterprise architects becomes very tough nowadays, since it forces architects to acquire a lot of knowledge to be up to the needs of this role.

After providing a conclusion to the research question prescribed in section 1.3, a solution will be suggested in the following section based on the findings have presented in chapter 4.

5.2 The suggested solution to integrate L-STSD into Enterprise Architecture

Two comparisons have been drawn in chapter 4 between the L-STSD and Enterprise Architecture framework. As prescribed in chapter 4, the four-step cycle of: diagnosis-design-implement-evaluate has been followed to make these comparisons. Hereby, a solution will be suggested to modify the Enterprise Architecture framework (TOGAF-ADM) based on the outcome of these comparisons and with respect to the same sequence followed in the four-step cycle.

5.2.1 Diagnosis

The findings in chapter 4 indicate that top management and strategists initiate and raise the problems that their organizations have. Then, it is the mission of the architect to analyze these problems in collaboration with every stakeholder affected by these problems throughout conducting awareness sessions, presentations, or any kind of communication. It is helpful in this phase to apply the process, as suggested by L-STSD, of making a gap analysis between the norm and actual values of the problematic behavior variables of an organization based on the basic design
requirements. However, since that Enterprise Architecture frameworks do not have pre-defined requirements, it is recommended to use the list of requirements suggested by L-STSD and update them with additional requirements based on the enterprise architect experience and according to the business needs. The gap analysis for the solution space would be left then as it is done in the EA framework (like phase B, C, and D in TOGAF-ADM). Figure 5.1 represents the suggested solution and shows how the L-STSD can contribute to TOGAF-ADM cycle.

Gap-Analysis will be done to determine whether the problematic behavior variables have achieved their norm-values

Use the pre-defined requirements of L-STSD

The structure type (flat/hierarchical) is determined by top management

<table>
<thead>
<tr>
<th>Modified processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td>Implementation</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
</tbody>
</table>

Figure 5.1: The suggested solution to be applied to TOGAF-ADM based on L-STSD

5.2.2 Design

The findings in chapter 4 indicates a big difference between L-STSD and Enterprise Architecture when it comes to the design phase. While the first three steps (setting the scope, defining the mission-vision-goal, and the design specs) are similar to a certain extent, the rest of the steps are completely different. As it has been found in chapter 4, the difference starts when the L-STSD approach suggests to start altering the production structure of an organization.
Based on the research findings, redesigning the organizational structure plays a crucial role in organizations design and development. However, it should be done in parallel with redesigning the ICT and information systems. Accordingly, the structure redesign process is suggested to be added to TOGAF-ADM in parallel with the information structure as shown in figure 5.1.

The rest of the design process, which involves building the information and technology structures are supported very well in the Enterprise Architecture approach comparing to the L-STSD approach as it has been shown in the researcher’s analysis. Therefore, the way how EA tackle this part of the design phase is recommended to be as it is in the suggested solution.

Ultimately, it is very important, as it is realized in the findings, to explicitly make an up-front design of the soft factors that the organization could possess in the future state. This design might include for instance, the leadership style that could be used, how the resulted division of labor characteristics would look like, or the characteristics of the new belief system aimed to be designed. This step can be added after phase D in the ADM cycle as it is shown in figure 5.1.

### 5.2.3 Implementation

In practice, the interviews indicated that Enterprise Architecture is a very powerful tool comparing to L-STSD in the implementation phase. Enterprise architecture provides architects with convenient processes (e.g. phase E and F in TOGAF-ADM) in addition to a set of project management tools to facilitate the implementation of the transformation process. It has also a specific step in which the implementation is being governed. This make EA much more powerful comparing to L-STSD, since makes a regular correction to the action plan in order to give a continues evaluation of the implementation. This feature is not supported in the L-STSD. Accordingly, nothing will be added to the implementation phase in TOGAF-ADM.

However, this phase was not covered completely in the interviews due to the fact that the most respondents have better experience in the diagnosis and design phase comparing to the implementation phase.

### 5.2.4 Evaluation

Both frameworks, according to the findings provided in chapter 4, act almost similarly in the evaluation phase. However, L-STSD suggests to make a deep analysis to investigate whether the implemented solution during the transformation process has had the desired effect. This can be done with accordance to the problem diagnosis that has been implemented in the diagnosis phase. The main desired effect is that all problematic behavior variables have reached their norm-values. The suggested solution is shown in figure 5.3 which includes all suggestions in the four main phases.

In summary, a solution has been suggested in this section to enhance the framework of Enterprise Architecture (TOGAF). The next section will provide a critical reflection on this research.
5.3 Critical reflection
This section will provide a critical reflection on the limitation of this research, and recommendations for future research. Reflection on the methodological choices that have been selected will be also implicitly stated as well.

5.3.1 Research limitation
Like it has been mentioned in the findings chapter, the diagnosis and design phases were covered and discussed thoroughly in this research. However, the coverage of the implementation phase in the comparison has not reached the saturation point during the eight interviews that have been conducted. This can be a logic result since this research has been done from an organizational design point of view and implementation is a broad subject that involves assigning more time and efforts.

On the other hand, the data collected from the interviews showed the reality as it has been perceived by respondents. At some parts of the research, like the point highlighted in section 4.3.2, respondents reacted almost equally to the questions asking about how the quality of work and work relations can be achieved as mentioned in Table 4.

5.3.2 Recommendations for further research
As it is explained in section 5.3.1, several limitation factors have been faced while working on this research. These limitation factors can be improved in a further research by interviewing more enterprise architects to have more explicit and concrete results.

Moreover, in this research, one of the most popular Enterprise Architecture frameworks was selected to investigate how it deals with the organizational structure when designing organizations and compare it with L-STSD. However, many other frameworks, which are also used in the Netherlands and worldwide, could be studied like Zachman, Bizbox and others can be found in Table 3. Using the findings of this research and conducting a further research based on a different EA framework could lead to a more generalized outcome.

Finally, the results of this research are mainly based on the empirical experience of different enterprise architects who gave answers to semi-structured interview questions when they were interviewed. However, people might vary in their interpretations of questions or may leave out important information. Therefore, a further research based on a participation observation could be conducted to observe the behavior of enterprise architects for an extended period of time. This could lead to assessing how architects on field design organizations and what are the consequences of their acts.
References

## Appendix 1: System literature review case

<table>
<thead>
<tr>
<th>Research questions and variables</th>
<th>Comparison between Enterprise Architecture approach with the Lowlands-Sociotechnical Systems Design approach.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rationale</strong></td>
<td>This literature review is conducted to show the previous research that has been conducted with reference to the research question. Based on the result of this literature review I am trying to fill the gap by conducting a comparison between L-STSD and Enterprise Architecture.</td>
</tr>
<tr>
<td><strong>Review approach</strong></td>
<td>In this literature review, I used the Meta-ethnography systematic literature review (SLR): which is the synthesis of only qualitative studies, focused on linking explanations and interpretations.</td>
</tr>
<tr>
<td><strong>Data sources</strong></td>
<td>Google Scholar has been used as a database for this systematic literature review.</td>
</tr>
</tbody>
</table>
| **Search strategy**              | The following keywords have been used in Google Scholar:  
Exact words: "comparison between"  
All words: "enterprise architecture" "socio technical system"  
32 publications have been found when applying this search criteria |
| **Study inclusion criteria**     | The search has been done for the last ten years without giving much attention to the level of the publication and the number of participants. |
| **Data extraction**              | A summary will be given based on the systematic literature review which has been done. |
## Appendix 2: Organizations overview

<table>
<thead>
<tr>
<th>Organization</th>
<th>Type</th>
<th>Area served</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>het UAF</td>
<td>Non-profit org</td>
<td>The Netherlands</td>
<td>Medium</td>
</tr>
<tr>
<td>Alliander</td>
<td>Energy company</td>
<td>The Netherlands</td>
<td>Large</td>
</tr>
<tr>
<td>Strategy Alliance</td>
<td>Consultancy firm</td>
<td>The Netherlands</td>
<td>Micro</td>
</tr>
<tr>
<td>Inholland university of applied sciences</td>
<td>Educational institution</td>
<td>The Netherlands</td>
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</tr>
<tr>
<td>Oracle</td>
<td>Software company</td>
<td>Worldwide</td>
<td>Large</td>
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<tr>
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<td>The Netherlands</td>
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</tr>
</tbody>
</table>

*Table 6: The visited organizations overview*
## Appendix 3: Respondents and interviews information

<table>
<thead>
<tr>
<th>No</th>
<th>Participant</th>
<th>Role</th>
<th>Knowledge main focus</th>
<th>Date</th>
<th>Duration(h)</th>
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*Table 7: Respondents and interviews information*
Appendix 4: Interview questions

Respondents:

Introduction to the interview (explained to the interviewee)

The goal of the interview: I research the process of redesigning organizations and see how the implementation of enterprise architecture can lead to healthy organizations. Based on the literature review I research to what extent can sociotechnical system contribute in the design process by suggesting that building the production structure first would support organizations and increases the chance of reaching their change goals. So, first redesign and then automate. I do so, by looking at the two approaches, how my correspondents deal with them in the real world, how is dealt with the three qualities of L-STSD, how is ensured that the right solution is provided for the problems that an organization want to solve and finally what can help more in the redesigning process from the correspondent point of view.

Lay out interview

- Numbers: indicate main questions
- Dots: indicate follow-up questions
- Topics: indicate the overarching theme of a group of questions
- Sub-topics: indicate the underlying theme of a group of questions
- Goals: indicate the overarching objective that underlies a group of questions

Topic 1: Introduction questions

Goal: get more insights into the background of the interviewee, the organization which he/she works for, and his/her intervention in the organizational design.

Sub-topic: Background information about the interviewee

1. Please describe briefly your role at the company/institution you work for.
2. Please describe briefly your experience in organizational design, change management or digital transformation (How long, the mastery level, work experience/academia).

Sub-topic: Information about the organization which the interviewee works for

1. If the interviewee works for a company as an internal job (internal consultant): what is the size of your organization? Does your organization have a hierarchical or flat structure? Do the employees of your company carry out multi-disciplinary tasks or they are more specialized?
2. If the interviewee has an external consultancy role: what is usually the size of organizations, you work in as a consultant? Do those organizations tend to have a hierarchical or flat structure? Do the employees of these organizations carry out multi-disciplinary tasks or they are more specialized?
3. If the interviewee is a researcher or a member of an academic institution: How many researches have you done about organizational (re)design? What was the size of organizations covered by your researches? Do those organizations tend to have a hierarchical or flat structure? Do the employee of these organizations carry out multi-disciplinary tasks or they are more specialized?
**Topic 2: Enterprise Architecture usage**

1. Are you familiar with EA?
2. If yes, which framework do you use (the Federal EA Framework (FEAF), the Zachman Framework, and the Open Group Architectural Framework (TOGAF))? 
3. How often do you use it? do you use it continuously or when needed and why? Give an example!
4. In what situations, do you use it (Designing organizations, proactive change management, competition, problem solving)?
5. Don’t you think that the budget spent on applying enterprise architecture is very high comparing to its outcome?

**Topic 3: Socio technical system usage**

1. Are you familiar with Socio technical system design? Which variant are you familiar with?
2. What does the structure of an organization mean in your perspective?
3. What does the organizational structure play in the division of labor in organizations to get things working?
4. In what situation, do you depend on it (Designing organizations, proactive change management, competition, problem solving)?
5. How often do you use it? do you use it continuously or when needed and why? Give an example!

**Topic 4: Diagnosis**

2. From your perspective, what is the goal(s) of an organization to introduce new enterprise architecture? What are the motivators to make you change?
3. Do you think that any major problem in an organization can be solved by making some modification to its information system? (e.g Absenteeism problem)
4. Does EA provide any sort of predefined requirements which should enterprise architects rely on when (re)designing organizations or even diagnosing the problems of organizations?
5. Do you think that having a pre-defined list of functional requirements could help in forming a good strategy and leading to a successful transformation process? Or it should be the mission of strategists to think of what is good and what is bad
6. Do you think that complexity in organizations is a problem which should be resolved?
7. From your perspective, how can EA and introducing a new ERP system help in reducing the complexity in organizations? Give an example?

**Topic 5: Design**

1. How do you define the scope of your transition process? And when? (Stakeholders, change boundaries)
2. If you don’t have any kind of factors or parameters that you, as an architect, how do you come up with the design specs?
3. Does EA pay any attention to the social aspects of organizations?
4. Do you agree that a flow-based organizational structure can lead to designing a healthy organization?
5. To what extent have you changed the division of labor when you introduced a new enterprise architecture design or a new ERP system which has been triggered by this design?
6. While companies and organizations are heading toward best IT business alignment, why then we suggest to change the structure first and not depend on ICT as a major and first lever in our solution space?
7. To what extent these two facets (structure and information system) are matching or conflicting?
8. Have you ever thought that you should change the organizational structure and later stopped (in the design phase) because you realized that this process involves altering your ERP system, and this means a lot of efforts and time?
9. Don’t you think that changing the production structure of a company is very costly?
10. Don’t you agree that rebuilding the production structure might be costly, but it would help in reducing the complexity of organizations and this in turn will reduce the cost needed to rebuild the information system?
11. How do you, as an enterprise architect, deal with the behavior and the culture of the formed teams after change, and how do they determine the right leadership style which fits with the new design.

**Topic 6: Implementation**

1. How do you assess that the organization including people are ready for change?
2. What is your role as an enterprise architect in the implementation phase of the transformation process?
3. What kind of tools do you use as an enterprise architect during the implementation phase? (project management discipline).

**Topic 7 Evaluation**

1. Do you think having a clear view of the transformation process could help people to effectively participate in that transition? Or it could reduce the level of resistance to change for instance?
2. Do you think paying more attention to the change process itself is very beneficial? (like planning change with respect to time, cost and quality: pure management discipline).
3. Do you think it is important to monitor the change itself or it is enough to determine in the end if it reaches its goal or not?
4. Do you think that having a tool that enables everyone to know in which phase of change the organization is? And see clearly what the organization is going to change?

**Topic 8: Summarizing questions**

1. Do you think that achieving a good quality of work can be done without changing the organizational structure? If yes, give an example? Example: Absenteeism (controllable stress conditions).
2. Do you think that achieving a good quality of Organization can be done without changing the organizational structure? If yes, give an example? Example: Short production-cycle time
3. Do you think that achieving a good quality of work relations can be done without changing the organizational structure? If yes, give an example? Example: participation in communication?
4. Do you think that achieving the three qualities mentioned above means a successful transition?

8. Do you think that building a new production structure is a lead process?

9. If you answer Yes, should this structure be flow-based, network-based?

10. Do you agree that solving organizations problem using ICT solutions could replace building a new structure option?

11. Which scenario do you prefer when (re)designing organization:

   1. Determine strategy, build new structure based on sociotechnical systems, then build the information system based on the new structure.
   2. Determine strategy, leave the old structure as it is, build a new information system.
   3. Determine strategy, if the strategy requires changing the structure, lets proceed with it, then build a new information system.
   4. Determine strategy, work in parallel on both the organizational and the information structure.

**Topic 9: Research improvement and enrichment**

1. Do you like to add any question to my list which you feel it is valuable and contribute in my research?

2. Do you propose anyone can participate in this research?

Thanks!
## Appendix 5: The coding book

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<tr>
<th>Group</th>
<th>Code</th>
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<td>● Design- Mission, vision and goal of change</td>
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*Table 8: The coding book*