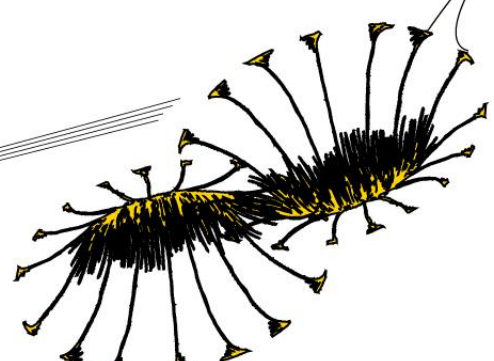



THE RELATIONSHIP BETWEEN  
ENTERPRISE ARCHITECTURE,  
BUSINESS COMPLEXITY AND  
BUSINESS PERFORMANCE

Master thesis Jacco Roest  
January 31, 2014





# MASTER THESIS JACCO ROEST

## THE RELATIONSHIP BETWEEN ENTERPRISE ARCHITECTURE, BUSINESS COMPLEXITY AND BUSINESS PERFORMANCE

Enschede, January 31, 2014

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“You may never know what results come of your actions, but if you do nothing, there will be no results.”

– Mahatma Gandhi

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# PREFACE

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This research is a master thesis to conclude my master study 'Business Information Technology' at the University of Twente. It also means the end of my time as a student, which I really enjoyed. During my time as a student I learned a lot of skills, which helped me to complete this project successfully.

This project is done in cooperation with Deloitte Consulting in Amstelveen within the department 'Enterprise Architecture'. While this research received input from different departments, the most is acquired within my own department. The aim of this research to quantitatively prove the value of enterprise architecture.

First, I would like to thank my university supervisors Marten van Sinderen and Maria Jacob for their support. They gave me guidance, room for development and shared their experiences and views on this research.

Also I would like to thank Deloitte for providing me this opportunity. I would really thank Niels de Vrij for his great supervision, feedback and energizing meetings which helped me through this months of graduation. Also, special thanks to Eric Onderdelinden with his interesting experiences in the field and his help within this research. Besides, I would like to thank the people who provided me contacts to collect the data needed for this research. Furthermore I would like to thank my graduation intern colleagues for their interesting views on this research. Especially thanks to Sander van den Bosch, because our discussions really helped me and boosted the quality of this master thesis.

Also special thanks to the organizations who filled in my questionnaire, this was the basis of my results. Without their help there were no results.

Finally, I would like to thank my girlfriend Claudia and my parents, who helped me through this project as well as supported me during my years of studying.

I hope that you will enjoy reading this research. And if you have any questions, please feel free to contact me.



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# EXECUTIVE SUMMARY

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“Enterprise architecture, so what?” is the phrase, which describes in short the actual research question of this master thesis. Nowadays organizations have to deal with a complex environment where it is hard to manage the whole organization. Enterprise architecture (EA) is an indispensable instrument in controlling this complexity. There is a continuously need for organizations to adjust to changing environments and therefore to change their business strategy. A higher level of maturity can help organizations to change faster. Changing environments and changing business strategies are business complexity factors organizations have to handle within their day-to-day business. Not only business complexity is handled by enterprise architecture, but organizations can also benefit from having enterprise architecture. Several professional studies have been done about this subject. For example, previous research shows that enterprise architecture reduces IT costs and reduces time to market.

The aim of this research is to empirically validate the influence of enterprise architecture maturity on business performance factors mentioned in literature. Furthermore it answers the question: When business complexity is high, does EA maturity needs to be high in order to reach a high business performance? Within this study the relevance of being mature in terms of enterprise architecture is discussed. And in particular the following question is answered:

**What is the relationship between enterprise architecture, business complexity and business performance?**

Thus, three constructs play a vital role within this research, namely: enterprise architecture, business complexity and business performance. These three constructs are described in detail and by questionnaire data was collected of these constructs of several organizations. According to these collected data, the correlations between the three constructs are analyzed.

Remarkable results of this research are:

- EA maturity influences business performance positively
- EA maturity proved not to be the moderating factor within the relationship business complexity and business performance
- EA maturity mainly influences strategic complexity within organizations
- The influence of EA Alignment is the strongest within the relationship strategic complexity on business performance

The overall result of this research is given in Table 1. This table shows how business performance is related to strategic complexity and enterprise architecture maturity. It also shows that enterprise architecture maturity needs to be high in order to reach high performance. Best performance can be reached when business complexity is low, and enterprise architecture maturity is high.

TABLE 1: THE RELATIONSHIP OF STRATEGIC COMPLEXITY AND ENTERPRISE ARCHITECTURE MATURITY LEAD TO A CERTAIN BUSINESS PERFORMANCE.

Business performance		Strategic complexity	
		Low	High
Enterprise architecture maturity	Low	Low/Medium	Low
	High	High	Medium/high





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# PART 1 – RESEARCH INTRODUCTION

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This part consists of the introduction of this research, where the subject of this research is introduced (chapter 1). Subsequently, background information is given about the subject in chapter 2 followed by the research proposal in chapter 3.

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## 1 INTRODUCTION

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“Enterprise architecture, so what?” is the phrase, which describes in short the actual research question of this master thesis. Nowadays organizations deal with a complex environment where it is hard to manage the whole organization and to take the correct actions. Enterprise architecture is an indispensable instrument in controlling this complexity, as well as controlling its processes and systems (Lankhorst, 2005). So, is this the time to invest in enterprise architecture? For structural analysis within business management and IT management, enterprise architecture is grown over the last two decades (Ross *et al.*, 2006; Winter and Fischer, 2007), and it is expected to grow over the next. Gartner have examined in 2011 (Gartner, 2013), in a global survey on enterprise architecture, the importance of having an information architecture, where ‘delivering strategic business and IT value’ (28%) and ‘aligning business and IT vision and strategies’ (17%) were linked with business drivers. A total of 45% of the respondents linked information architecture with their business drivers. This number was in 2012 increased to 61% (23% and 38% respectively). This increasing number describes the growing relevance of enterprise architecture within organizations nowadays.

The goal of enterprise architecture is to deliver value for an organization by giving recommendations to the business and IT leaders to adjust their projects, and furthermore to achieve the targeted business outcomes (Gartner, 2012). Furthermore, it can help to identify the future state as well as opportunities and behavioral constraints to achieve this future state (Gartner, 2012). Zachman can be seen as one of the founding authors of enterprise architecture with his Zachman framework (Zachman, 1987) and suggest that it enables: alignment, integration and change (Zachman, 2001). After the Zachman framework several other models are introduced to measure enterprise architecture maturity, both in literature and in practice.

Considering enterprise architecture, several factors influence the degree of maturity. According to Schmidt and Buxmann (2011), enterprise architecture management has influence on the IT flexibility and IT efficiency. Also the factors organizational size and organizational decentralization influence IT flexibility and IT efficiency (Schmidt and Buxmann, 2011). Collinson and Jay (2012) describe drivers and dimensions influencing complexity, these drivers and dimensions are factors of a maturity model. These dimensions are: external, organizational design, people, process, product and strategy. They also state that complexity has influence on business performance (Collinson and Jay, 2012).

Organizations can benefit from having enterprise architecture. Several professional studies have been done about this subject. According to Aziz and Obitz (2007), examples of organizational benefits are: reduced IT costs, enabling business and process flexibility, improved customer satisfaction and enabling business and process change. Also, benefits are related to the increased knowledge about the organization and its goals. An example is better understanding of business processes. Tamm *et al.* (2011) speaks about organizational benefits, which are defined as: “outcomes that contribute directly to organizational performance”.

Several models are introduced to measure enterprise architecture maturity in practice and literature, but is it really true that being more mature has more advantages than disadvantages? And do mergers and acquisitions lead to a lower maturity? Does being more mature mean that you lower your IT costs? The topic of this master thesis is enterprise architecture maturity and its influence on business complexity and business performance. The reason why this topic is chosen is because this subject interests me much and it is a subject on the intersection of business and IT. So this subject also suits well within my study Business Information Technology.

This master thesis is structured in four parts. This first part gives an overview of the research. This first part also provides a background and the research proposal. Part 2 of this research includes the literature review. Part 3 consists of the solution design and part 4 gives the conclusions of this research.

## 2 BACKGROUND

In this background high-level information is given. It starts with elaborating on enterprise architecture (section 2.1). In section 2.2, the link between enterprise architecture and alignment is discussed, as well as the business complexity factors and business performance factors. Section 2.3 includes the problem statement.

### 2.1 ENTERPRISE ARCHITECTURE

To describe enterprise architecture a well-known metaphor of ‘the enterprise architect as building architect’ is given. During designing a house, there is a continuous discussion to get to an agreement on the master plan. In this case both parties know the terminology (e.g. ‘Room’, ‘Door’ and ‘Stairs’), their function (e.g. ‘Bedroom’ and ‘Kitchen’) and relation (‘Door’ is to connect rooms). A building architect knows the basic requirements of architecting a building. This implies that a building architect uses an architectural model, which defines its major functions and structure. Also, this model is rather abstract; no details are given (e.g. color of a door, brand of the door). An enterprise architect also uses an architectural model, with pre-defined principles and processes, to describe the architecture at the level of the entire organization. Both architects describe on a high-level, the details are described by other people. An important note in both cases, they need to change systems while the system is in use.

Enterprise architecture can be described as architecture at the level of an entire organization, describing the different aspects, domains and relations as a coherent whole. Gartner states Enterprise architecture as (Gartner, 2012): “a discipline for proactively and holistically leading enterprise responses to disruptive forces by identifying and analyzing the execution of change toward desired business vision and outcomes”. Providing a holistic view of the enterprise in the most important characteristic of an enterprise architecture (Lankhorst, 2005). Where classical approaches tackles problems one by one, enterprise architecture aims to tackle problems from a coherent and integral view. In order to govern enterprise development, it also offers a shared conceptualization and understanding among all stakeholders involved (Op ’t Land, 2009). An important factor to gain to this shared conceptualization and understanding is generating an overview; Lankhorst (2005) states that enterprise architecture gives an overview from technology to business.

### 2.2 ALIGNMENT

Enterprise architecture has a clear relation with alignment. Henderson and Venkatraman (1993) can be seen as fundamentalists with their early work according to this subject. Business alignment is stated as: “applying IT in appropriate and timely way, in harmony with business strategies, goals and needs” (Luftman *et al.*, 1999). Although many definitions exist, a general consensus about the components alignment entails is present, namely: business strategy, IT strategy, organizational structures and processes, and IT structures and processes (Henderson and Venkatraman, 1993; Luftman *et al.*, 1993; Chan, 2002). The strategic alignment model of Henderson and Vankatraman (1993) is given in Figure 1. As Enterprise architecture concerns both business and IT, potentially it can bring IT in closer alignment with the business vision (Gregor *et al.*, 2007; Ross,

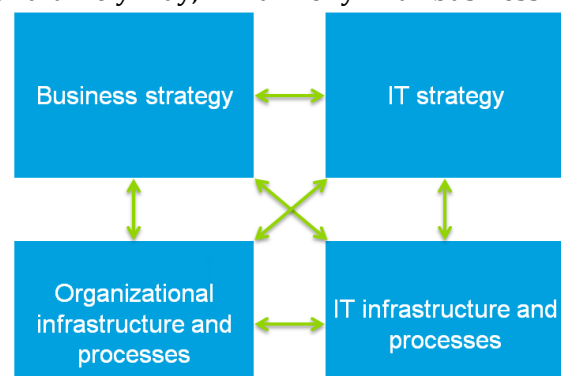


FIGURE 1: STRATEGIC ALIGNMENT MODEL BY HENDERSON AND VENKATRAMAN (1993)

2003). According to Bricknall *et al.* (2006) it is even required to use an integrated approach, such as an enterprise architecture, to achieve business IT alignment.

As stated, enterprise architecture is an instrument in controlling the complex environment of an organization. In controlling the complex environment, business IT alignment plays an important role. One of the goals of Business IT alignment is supporting all IT activities for the entire business (Chan, 2002). Because enterprise architecture its' objective is to support business IT alignment, this is one of the top reasons for organizations to invest in it (Aziz and Obitz, 2007; Obitz and Babu K, 2009).

## 2.3 PROBLEM STATEMENT

---

Business complexity factors are mentioned in literature, but the explicit link to enterprise architecture maturity is not present. Implicitly some relations are discussed, but due to the missing link with enterprise architecture this is an interesting subject. Collinson and Jay (2012) see the link between business complexity and business performance. And Schmidt and Buxmann (2011) see the link between 'organizational decentralization and size' and 'IT flexibility and IT efficiency'. Both are interesting links and trigger the link between business complexity and enterprise architecture. Business complexity factors can be seen as organizational characteristics, because every organization has their own complexities and this characterizes the organization.

According to Tamm *et al.* (2011) many studies make enterprise architecture benefits claims, but how it leads to these benefits is not explained, is incomplete, fragmented, or is not grounded in theory. Empirical evidence is even more scarce, to back explanations. Tamm *et al.* (2011) did a literature review; systematic review in combination with an exploratory approach about the status of current literature and the relationship between enterprise architecture and benefit claims. Tamm *et al.* (2011) even state that further empirical enquiry is essential. This is where my research can play a role, acquiring empirical evidence to back the current benefit claims. Although it is hard to distinguish whether business performance directly leads from being more mature considering enterprise architecture, in this study this is examined thoroughly.

Besides, within the service-line Enterprise architecture of Deloitte Consulting often is asked to what extent an organization mature is, considering enterprise architecture. A while ago, a manufacturing company asked Deloitte to give advice and implement an enterprise architecture, because they have extensively grown over the past several years through acquisition and want to grow further in the coming 5 years. These acquisitions caused highly fragmented processes and systems. At the beginning of this assignment it became clear that the manufacturing company did not know what enterprise architecture holds, they thought it was only the IT architecture. The first challenge for Deloitte was to explain what enterprise architecture is and how it can contribute to their current situation. In the end they came round and saw the importance of enterprise architecture and Deloitte started to map the situation of this company on an enterprise architecture model. While the models in literature are too complex to understand for laymen, Deloitte Consulting in the Netherlands developed a simplified model and roadmap to make it understandable for the customer. The model is based on the Enterprise Maturity Model of The Open Group (The Open Group, 2009) and contains the different aspects from practice. After several appointments within Deloitte Consulting in the Netherlands, a first model was developed. This model will soon be presented within the service line, but there is definitely an expansion possible in this area. Recently, there is also rolled out a world-wide Deloitte Enterprise Architecture Maturity Model (DEAMM). It is made by people from the U.S., but based on current models from practice (from different countries, including the model from my service line) and on the GAO (Government Accountability office) model from US federal department. So also within Deloitte Consulting, all over the world, this is a hot topic to consider.

## 3 RESEARCH PROPOSAL

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This chapter contains the research outline. First, the main research question with the additional sub questions are given (3.1). Second, the research relevance is given and how this research contributes to theory and practice (3.2). The research methodology is presented in section 3.3. This chapter ends with the research overview (3.4).

### 3.1 RESEARCH QUESTIONS

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The questions as mentioned at the end of the introduction motivate the relevance of this study. Within this study the relevance of being mature in terms of enterprise architecture is discussed. And in particular the following question is answered:

#### **What is the relationship between enterprise architecture, business complexity and business performance?**

Within this research business complexity is investigated and its influence on the maturity with respect to enterprise architecture of an organization. Also the influence of this maturity on business performance is discussed.

To make this main research questions and the research more concrete, the following sub questions are formulated. These sub questions are answered in the different chapters. The questions are categorized in three parts, namely business complexity, enterprise architecture maturity and business performance. These sub questions are:

#### **Business complexity**

1. What business complexity factors are used to categorize organizations?
2. How can business complexity of an organization be measured?
3. What influence has business complexity on enterprise architecture maturity and business performance?

#### **Enterprise architecture maturity**

4. What components does an enterprise architecture maturity model contain?
5. How can the enterprise architecture maturity of an organization be measured?
6. What influence has the enterprise architecture maturity on business performance?

#### **Business performance**

7. What business performance factors are used to categorize organizations, which are related to enterprise architecture?
8. How can business performance of an organization be measured?
9. What influence has business complexity and enterprise architecture maturity on business performance?



## 3.2 RESEARCH RELEVANCE

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The research has following expected contributions to both the theory, as well as the practice:

1. Extending current literature by describing the correlations between the enterprise architecture maturity and business complexity of an organization. This is a contribution to theory.
2. Extending current literature by describing the correlations between the enterprise architecture maturity and the business performance of an organization. This is a contribution to the theory.
3. Extending current literature by describing the moderating value of enterprise architecture within the relationship business complexity and business performance
4. Make a first step in proving the relevance of having an enterprise architecture. For Deloitte this is a valuable addition for selling assignments to customers. This is a contribution to practice.

Thus, this research has academic relevance, as well as practical relevance. The practical relevance also lies in the example given at the end of the problem statement. This research is relevant to Deloitte because they can determine the value of enterprise architecture for organizations. Furthermore the outcome of this research is where, and where not, improvements have to be made in order to perform better.

## 3.3 RESEARCH METHODOLOGY

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This study is done in several steps. These steps are described shortly. The first step is literature study. Within the literature study the business complexity factors, enterprise architecture maturity factors and business performance factors are investigated, as well as the correlations from literature are described. Consequently, hypotheses based on this study are set up. In order to test this questions are set up based on the literature study and the questionnaire is send out to organizations to discover the business complexity, enterprise architecture maturity and business performance of every organization. The fourth step is to analyze the data collected from the questionnaire. The last step is concluding this research based on the analyzed data. These steps are given in Figure 2.

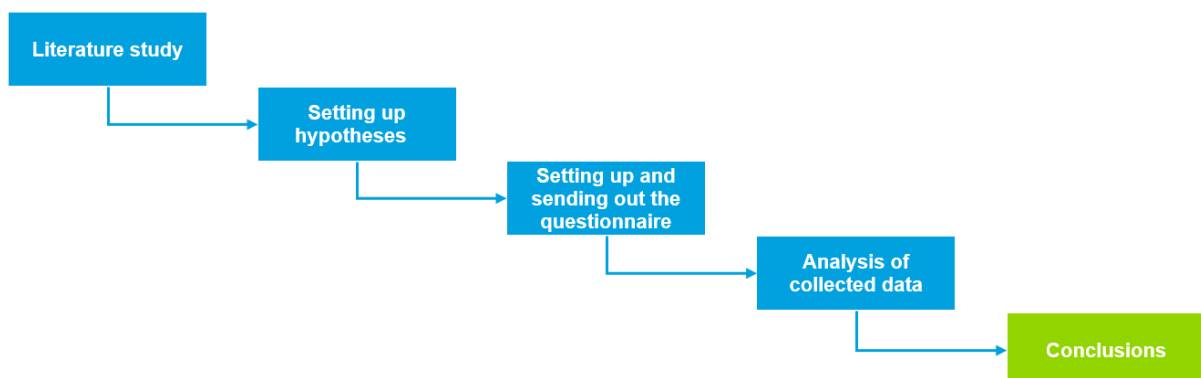


FIGURE 2: RESEARCH MODEL

This questionnaire is set up to discover the (non-)described correlations from literature and/or the impact of the (non-)described of the correlations. The analysis of the data collected leads to the description of the (non-)described correlations and/or the impact of the (non-)described correlations. This research is therefore quantitative research. In order to support the described problem the model in Figure 3 is formulated. This model is used to describe the impact and correlations found within this research.

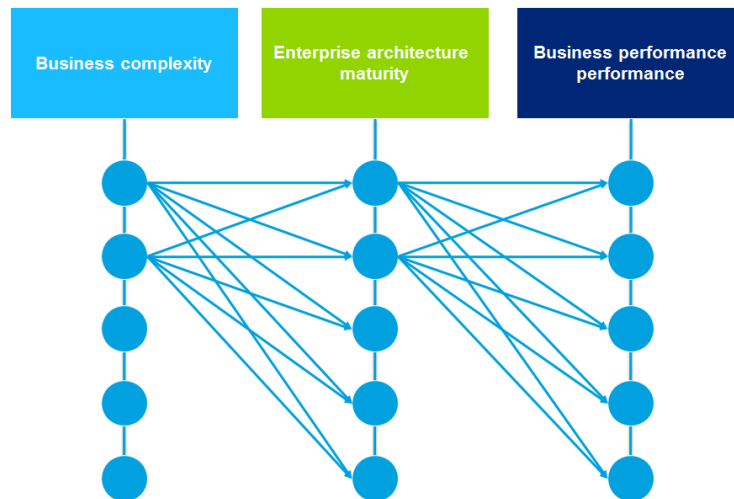


FIGURE 3: MODEL RESEARCHED

### 3.4 RESEARCH OVERVIEW

As described in 3.1, my main research question is:

**What is the relationship between enterprise architecture, business complexity and business performance?**

In order to answer this research question, sub-questions are formulated. These sub-questions are answered in different chapters.

Table 2 shows an overview of the structure of this thesis. It described where the research questions are answered and by which methodology the answer is obtained. Also, the outcome of each research question is discussed. This thesis is divided into four different parts. In this part, research introduction, the research is introduced. Part 2 contains the literature review of the important subjects of this research; question 1, 4 and 7 are answered in this chapter. Part 3 contains the solution design, in this chapter the description how the questionnaire is designed; question 2, 5 and 8 are answered within this part. Subsequently, part 4 describes the results and the conclusion of this research. The data obtained via the questionnaire is analyzed and this resulted in the conclusion of this research. In this part question 3, 6 and 9 are answered.

TABLE 2: RESEARCH OVERVIEW

Research question	Described in	Methodology	Outcome
<b>Business complexity</b>			
1. <b>What business complexity factors are used to categorize organizations?</b>	Part 2: Literature review	Literature study	Business complexity factors of an organization
2. <b>How can business complexity of an organization be measured?</b>	Part 3: Solution design	Field experiment	Questionnaire to identify the business complexity
3. <b>What influence has business complexity on enterprise architecture maturity and business performance?</b>	Part 4: Results and conclusion	Analysis of field experiment	Identified correlations between business complexity combined with enterprise architecture maturity on business performance
<b>Enterprise architecture maturity</b>			
4. <b>What components does an enterprise architecture maturity model contain?</b>	Part 2: Literature review	Literature study	Components of an enterprise architecture model
5. <b>How can the enterprise architecture maturity of an organization be measured?</b>	Part 3: Solution design	Field experiment	Questionnaire to identify the enterprise architecture maturity of an organization
6. <b>What influence has the enterprise architecture maturity on business performance?</b>	Part 4: Results and conclusion	Analysis of field experiment	Identified correlations between enterprise architecture and business performance
<b>Business performance</b>			
7. <b>What business performance factors are used to categorize organizations, which are related to enterprise architecture?</b>	Part 2: Literature review	Literature study	Enterprise architecture factors influencing business performance
8. <b>How can business performance of an organization be measured?</b>	Part 3: Solution design	Field experiment	Questionnaire to identify business performance of an organization
9. <b>What influence has business complexity and enterprise architecture maturity on business performance?</b>	Part 4: Results and conclusion	Analysis of field experiment	Identified correlations between business complexity, enterprise architecture and business performance

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# PART 2 – LITERATURE REVIEW

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This part consists of the literature review of this research, where the constructs of this research are described in detail.

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## 4 LITERATURE REVIEW

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In this chapter the relevant literature reviewed is discussed. In section 4.1, the way the literature review is conducted is discussed, followed by the added value of enterprise architecture to organizations in section 4.2. Subsequently, the left side, center and right side of the model given at the end of part 1 is described. So first, business complexity is discussed (4.3), then enterprise architecture maturity (4.4) followed by business performance (4.5). Concluding the choices made are described in section 4.6 and the complete conceptual model of the literature reviewed is given. This is an extension of the given model at the end of part 1. Figure 4 shows the steps taken within this literature review.

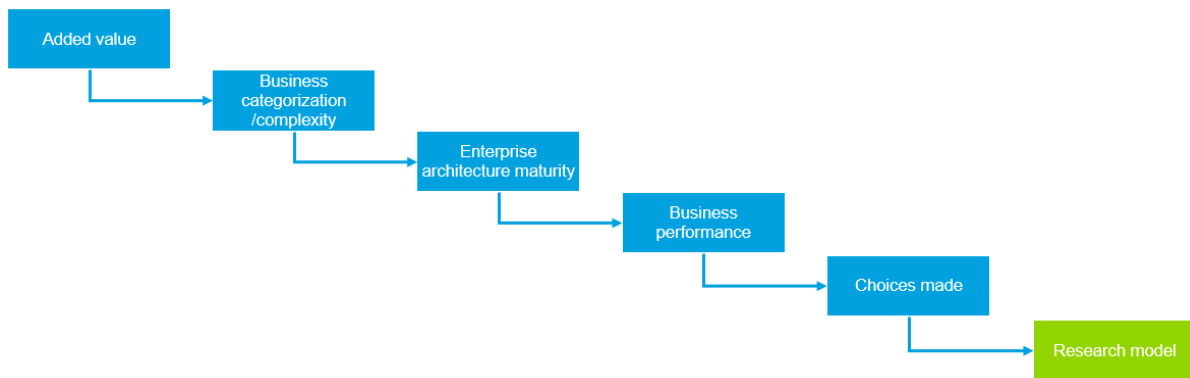


FIGURE 4: STEPS TAKEN TO REVIEW LITERATURE

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### 4.1 STRATEGY TO REVIEW LITERATURE

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Literature research is done semi-structured. Literature research is done by using different search engines for scientific papers and chapters using different keywords to search these. The most commonly used scientific paper search engines used are: Scopus and Google Scholar.

To find the relevant information to answer the research (sub) question(s), the following searching strategies are used:

- Different key words are used to research the (sub) question(s). During the research the list of different key words has been extended, by keywords found in articles and books. For example different synonyms are used for business performance to gain the best articles for this research. Also the combination between the different keywords is used to gain the best articles. This is called concept-centric literature research (Webster and Watson, 2002).
- List of publications of an author is used to find other relevant articles around the subject. For authors, who are known for contributions to literature around the subject, relevant articles are searched to extent the number of articles relevant to this research. This is called author-centric literature research. (Webster and Watson, 2002).
- Searching within specific proceedings is used, because these proceedings focus around the topic which is relevant for this research.

The above mentioned strategy is used within the search engines Scopus and Google Scholar. To make sure that all relevant articles are noticed also websites like Science Direct, IEEE, Emerald Insight and Springer are used to scan for other articles with a similar topic or author. At a given moment in time the same results came up with different search requests. This probably suggests that the majority of the topic is covered.

To select the relevant papers some checks are done. These checks are used to give an indication for the relevance and the quality of the literature. These checks are:

- Read the abstract, introduction and conclusion – The first impression of the article regarding the research is used to further scan and read the article.
- Check the date of the publication – An article could be outdated and therefore less relevant for this research.
- Check the amount of citations – The number of citations indicates the acceptance of the paper within the scientific world.
- Scan other articles of the author – Other articles by an author published with a similar topic could indicate that the researcher is known within the research area.

Relevant literature is chosen by using these checks; a well-considered decision was made per paper.

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## 4.2 ADDED VALUE ENTERPRISE ARCHITECTURE TO ORGANIZATIONS

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Adjusting to changing environments and business strategies is continuously needed for organizations (Stanford, 2007). A higher level of maturity can help organizations to change faster. Changing environments and business strategies are business complexity factors organizations have to handle within their day-to-day business. Not only business complexity factors have to be handled; Enterprise architecture can also have positive influence on business performance according to previous research. For example, Zachman (2001) states four reasons why you want to invest in enterprise architecture, namely: alignment, integration, change and reduced time to market. Are these the reasons why organizations should invest in enterprise architecture?

---

### 4.2.1 HOW TO COST-JUSTIFY ENTERPRISE ARCHITECTURE?

---

The value proposition for computers was better, cheaper and faster. Nowadays systems become more and more complex and this cost justification does not always count anymore. In the past people were even replaced by computers and this replacement improved the quality, reduced time and saved money. Zachman (2001) even states that architecture is an asset and organizations are investing in assets “in order to enable you to do something you otherwise are unable to do” (Zachman, 2001). According to Schelp and Stutz (2007) and Lankhorst (2005), it is a challenge to quantify the value of enterprise architecture; no suitable cost-justification method is found so far. Bruce (1998) even states that not only financial benefits should be measured considering IT investments. Brown (2004) states that you do not justify the costs of an activity such as strategic planning; creating knowledge, clarifying think and decision making are not activities which people quantify in costs. This reasoning also holds for enterprise architecture; why do you want to value enterprise architecture when it includes activities such as creating knowledge and clarifying thinking? Therefore, the acceptance of enterprise architecture is relatively low within organizations (Van der Raadt *et al.*, 2007)

So, in order to invest in the asset ‘enterprise architecture’, benefits of implementing have to be given and these benefits are given and quantified within this research. The current qualitatively and quantified researched benefits are given in 4.5, while this research generates new benefits or quantify the researched benefits that were only qualitatively proved so far for implementing or

extending enterprise architecture, in order to justify enterprise architecture. Boucharas *et al.* (2010) even states that the benefits given in literature should be seen as potential benefits, because contextual factors can have influence their realization on real-world scenarios. Also, this assumption is researched while different organizations within different industries filled in the questionnaire.

### 4.3 BUSINESS COMPLEXITY

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This section describes the answer on the question:

#### **What business complexity factors are used to categorize organizations?**

In order to answer this question, another two questions are formulated:

1. What is business complexity?
2. What business complexity factors for organizations are present in current literature?
3. What business complexity factors for organizations are present in current practice?

Common used and traditional way of categorizing organizations is using the common characteristics of the organization. Mintzberg (1980) uses age, size, technical system, environment and power to categorize organizations, where these contingency factors should fit with the design parameter. Not only in 1975 this way of categorizing is used, but it does nowadays. For example Schmidt and Buxmann (2011) use firm size, firm age and firm decentralization. Also in the practical situations these categorization is used, according to Clark and Montgomery (1999); they state that in practical situations correctly classifying organizations is preferably done with easily available characteristics, such as firm size, firm' performance and firms' product range. Another characteristic is industry. Needs for IT use is different per industry, so 'industry' is an organizational characteristic as well.

Other ways to categorize organizations is based on their business strategy. The business strategy, the classification of Defender, Analyzer and prospector of Miles *et al.* (1978), has influence on the perceived business performance (Sabherwal and Chan, 2001). According to their empirical research, the overall business performance in Prospectors and Analyzers seems to be influenced by alignment; this is not the case with the Defender strategy. This holds for the overall business performance including IT effectiveness.

While above mentioned ways are interesting to categorize organizations, much is written in literature about these subjects. Another way of categorizing organizations is making use of business complexity factors. Business complexity of organizations is about the internal and external capabilities of an organization. Enterprise architecture is an instrument to reduce business complexity, but the acceptance of enterprise architecture is relatively low within organizations (Van der Raadt *et al.*, 2007). In addition, this combination of subjects is relatively new. To create insight into complexity of an enterprise architecture, enterprise architecture models are used (Lankhorst, 2013). These models are described in section 4.4.

An important side note is that business complexity does not include IT complexity. IT complexity is ignored within the complexity factors of this research, due to time limitations. Also, IT complexity can be seen as part of the enterprise architecture maturity (described in section 4.4) and as an underlying factor of business performance factors described in section 4.5. The contents of business complexity is described within section 4.3.1.

### 4.3.1 BUSINESS COMPLEXITY DESCRIBED

Where Porter and Millar (1985) states that competitive advantages can be gained due to the introduction of IT and also state enhancing differentiation is part to gain these advantages. The consideration of Collinson and Jay (2012) is that this differentiation has a certain tipping point, concerning business performance, see Figure 5. Within this figure 20 of the 200 researched organizations are given, while the figure is based on all 200 researched organizations. Based on this figure there is a certain profit and a certain complexity per organization. Some organizations have the same level of complexity but a different profit. Therefore the question of this research is: Does Enterprise Architecture play a role in this tipping point? It is considerable that when an organization has a higher maturity they can handle more complexity and achieve a higher business performance. Therefore in the part of this section business complexity is discussed. A remarkable quote concerning architecture is a quote by Zachman (2002): “Seven thousand years of human history would establish that the key to complexity and change is Architecture”.

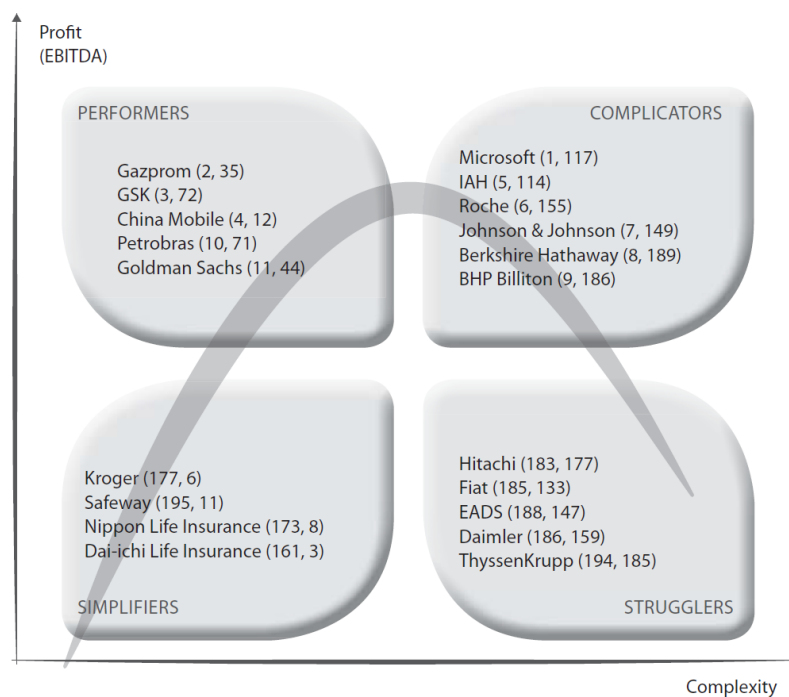


FIGURE 5: COMPLEXITY VERSUS PROFIT. A MODEL BY JAY AND COLLINSON (2012), FROM COMPLEXITY TO SIMPLICITY, UNLEASH YOUR ORGANIZATION’S POTENTIAL; P. 15

Relatively little is written about business complexity. As a starting point is chosen to use the categorization of Collinson and Jay (2012), which categorizes business complexity in:

- People
- Organizational design
- Strategy
- Products and services
- Processes
- External

These six categories are used within this literature review. These categories are described from section 4.3.1.1 till 4.3.1.6.

The opposing site of complexity is simplicity. Collinson and Jay (2012) state simplicity as: “Simplicity in business exists when you have exactly the right number of essential components and connections to achieve a successful result. No more, no less. Complexity is the opposite of this”. So simplicity is not that an organization is not complex, but has the right number of essential components. Furthermore, it is vital that a company can handle these complexities.

Ashkenas (2010) see reducing complexity, in other words getting simpler, as a method to gain competitive advantage. It is not only making things easier to get things done, but it also increases the capacity to address issues more quickly and effectively.

The paradigm of simplicity and complexity is also seen in online blogs and LinkedIn discussions, these discussions always have an open end and there is no general conclusion.

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#### 4.3.1.1 PEOPLE

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The first category for business complexity is ‘People’. People is the most intriguing category, because people are the cause of all complexity for an organization. Due to the behavior of people regulations change, processes change and product/services change. This category focuses on the internal influence of people. Glenn and Malott (2006) call this category ‘cultural complexity’.

An important measure for people complexity is the way people communicate. Ashkenas (2010) state that effective communication is the way to get things done, while enormous complexity is created by poor communication due to blocked or misunderstood signals. Jay and Collinson (2012) state this measure as ‘internal communication behavior’. Reporting requirement of senior management is one of the leading causes of frustration according to the research of Jay and Collinson (2012).

Another important measure of people complexity is general management behavior. Individual choices and actions lead to more complexity (Ashkenas, 2010). Managers choose different paths and override or modify process flows. Ashkenas (2010) states that managers can overdo their strengths and can avoid areas of discomfort. Jay and Collinson (2012) also support this statement; good leaders keep things simple. Furthermore micro-management and over-intervention is a common problem.

The last measure of people complexity is politics within an organization. In the research of Collinson and Jay (2012) politics was one of the measures with the highest complexity impact score. Senior management can ignore information, due to politics of relationships. Politics dictate strategy in that case. This is supported by expert interviews, which also indicate that politics is an important measure of business complexity.

According to the above mentioned arguments, people complexity has different aspects which effect business complexity. The following ‘people’ complexity factors are most commonly mentioned within literature:

- Internal communication behavior
- General management behavior
- Content and politics of meetings

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#### 4.3.1.2 ORGANIZATIONAL DESIGN

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In many ways, organizations are like living organisms and it shapes its identity (Wheatley, 2010). The organizational design can be seen as one of the identity measures of an organization. Nowadays people create organizational structures with too many levels, unclear roles and redundant functions (Ashkenas, 2010). An organizational structure with the number of levels in



an organization hierarchy is called vertical complexity by Daft (2009) and hierarchical complexity by Glenn and Malott (2006). The number of levels in an organization hierarchy can be seen as an important complexity factor within the category organizational design. Collinson and Jay (2012) called this factor 'levels of management'.

Another measure of organizational design is the span of control. This is called horizontal complexity by Daft (1992) and Jay and Collinson describe it as 'organizational structure'. Daft (1992) describe horizontal complexity as: "the number of job titles or departments across the organization". Organizational structure also includes the number of elements that constitute within an organization. This is called component complexity (Glenn and Malott, 2006). For example, when someone has to report to different people from different levels and different departments, the internal organizational structure is complex.

Ashkenas (2010) describes that in reality organizations are changing structure to suit people, instead of getting the right people on the right places within their organization. This generates overall complexity, as well as inefficiency and confusion. This leads to unclear roles and redundant functions within an organization.

Another measure of organizational design is the decision making process. Collinson and Jay (2012) state that the decision processes and sign-off processes could be unclear or laborious. Governance could counter this measure. Within this research decision making is used as a business performance measure, as stated in 4.5.

From expert interviews another measure of organizational design came up, namely operating in different markets, segments and/or countries. Imaginable is that when an organization operates in different countries, different languages have to be spoken, different leaders from different countries with different cultures have to be aligned with the business strategy, and a wide variation of customers and suppliers are added. Collinson and Jay (2012) state that the globalization geographic spread of inputs and outputs and the increased specialization of expertise and knowledge adds complexity to organizations. Daft (1992) states this as spatial complexity.

According to the above mentioned arguments, organizational design has different aspects which effect business complexity. The following 'organizational design' complexity factors are most commonly mentioned within literature:

- Levels of management
- Span of control
- Unclear roles and redundant functions
- Operating in different markets/segments/countries

#### 4.3.1.3 STRATEGY

Strategy is an important component of business complexity. Ashkenas (2010) states that organizations have to focus on strategy before focusing on structure. Hamel (2000) designed a business model, which includes strategy. This strategy is the beginning of the business model and has to focus on the objective of the organization, products and market segments and differentiation. So both Ashkenas (2010) and Hamel (2000) state that an organization has to begin with its strategy. The other side of strategy is that it must continually meet the changing needs of customers and markets (Collinson and Jay, 2012).

Within this strategy several complexities can occur. First the core strategy itself can be complex, for example due to initiative overload or confused priorities (Jay and Collinson, 2012). This leads

to too many strategies or an unclear strategy. Also, the translation into operational plans is part of this complexity.

Second complexity measure within strategy is changes in company strategy. As stated above an organization has to continually meet the changing needs of customers and markets. But this has a certain tipping point, changing strategy too much leads to bad complexity. This is one of the complexity factors with a high impact within the research of Collinson and Jay (2012).

Third, the annual budgeting process is another complexity measure. This measure is also one of the complexity factors with a high impact within the research of Collinson and Jay (2012). The clarity and the centralization of control are important parts of the annual budgeting process, according to expert interviews.

According to the above mentioned arguments, strategy has different aspects which effect business complexity. The following 'strategy' complexity factors are most commonly mentioned within literature:

- Changes in company core strategy
- The core business strategy itself
- The annual budgeting process

#### 4.3.1.4 PRODUCTS AND SERVICES

Another complexity category within organizations is 'products and services'. The overall product portfolio of organizations is not reducing; Organizations are adding products and services (Ashkenas, 2010), while old products are phased out in a relatively slower pace. Ashkenas (2010) divides product and service complexity into volume complexity, support complexity, system complexity and design complexity. Volume complexity is about the number of products and services added; each product or service needs to be designed, produced etc. Design complexity is about designing products and services. The characteristics of volume complexity and design complexity are also seen in the products and services complexity of Collinson and Jay (2012); the most important measures are launching new products/services and creating new products/services.

Another important objective is diversity in customer demands. According to the definition of Morins complexity (1985), complexity suggests diversity in customer demands. Organizations which sell technology intensive products are most struggling with this complexity factor, because these organizations are sensitive to customers' variations (Prahalad and Ramaswamy, 2000). According to Jay and Collinson (2012), this is one of the main complexity factors regarding 'products and services'. Diversity in customer demands creates product complexity. Herein the understanding of customer needs is vital. Most of the times it is not the issue that the capabilities are not present within an organization, but it can be seen as a misalignment between customer needs and manufacturing capabilities (Bozarth and Berry, 1997; da Silveira, 2005). This occurs because customer needs are variable and not always clear. Possibly, organizations are creating and launching more products than needed. Imaginable is that when you create and launch more products, this makes an organization more complex. Also, customer demands can be diverse. This line of reasoning also leads to the creation and launch of more products and/or services.

Besides the above mentioned measures, number of customers can also be seen as an important measure; more customers can make an organization more complex (Jay and Collinson, 2012). In the manufacturing market potential drivers is also the number of customers, as well as the heterogeneity of customers' needs and the variability of demand (Bozarth *et al.*, 2009). So creating new products/services could potentially lead to misalignment between manufacturing

capabilities and customer needs, due to the customer needs which are variable and not clear (Bozarth and Berry, 1997; da Silveira, 2005). According to Jay and Collinson (2012) this is also one of the main factors of complexity within the category 'products and services'.

According to the above mentioned arguments, products and services complexity can be seen as an important issue of complexity within organizations. The following 'products and services' complexity factors are most commonly mentioned within literature:

- Launching new product/service
- Number of customers
- Diversity of customer demands
- Creating a new product/service

#### 4.3.1.5 PROCESSES

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Within the whole organization processes are present. Many organization build processes with too many steps and loops (Ashkenas, 2010). When processes change, processes are mostly not managed. This leads to complexity within processes. Also, multiplication of steps and loops and lack of cross-functional or cross-unit transparency play an important role in the complexity of processes (Ashkenas, 2010). Six Sigma and Lean could increase simplicity in order to automate and standardize processes. According to Ross *et al.* (2006), a less complex technology environment can be achieved by implementing standardizing and automating processes.

The three most important process for organization, according to the research of Collinson and Jay (2012) and regarding expert interviews are: major project processes, production processes and core business processes.

So the most important processes in order to measure process complexity are:

- Major project processes
- Production processes
- Core business processes

#### 4.3.1.6 EXTERNAL

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In order to understand the capabilities of an organization as a whole, also the external complexities need to be included. The external complexity consists of several performance measures. External complexity is called environmental complexity by Glenn and Malott (2006) and has the following definition: "The factors external to the organization that affect organizational performance". Organizations are changing inside their organization, but they also have to adapt their internal organization due to external movements.

Glenn and Malott (2006) and Collinson and Jay (2012) both see competition and economic fluctuations as important measures of external complexity. A high competition or a high number of competitors suggests a higher complexity, because you have to adapt to these competitors or keep an eye out for competitors.

As stated, economic fluctuations is also an important measure; it has significant impact on the environment of an organization according to Glenn and Malott (2006). Also the research of Collinson and Jay (2012) concludes that economic fluctuations is one of the 'hot topics' regarding external complexity. In times of welfare, profit, wages and production increases. When the welfare continues prizes will rise, as well as the production costs, but at a certain point consumers

will buy less due to these increasing prices. Then the time of depression takes over and investments and production decreases, as well as unemployment.

Another important measure according to expert interviews and the research by Glenn and Malott (2006) is government regulations. Regulations can have significant impact on internal processes and operations. These regulations are dependent on the industry of an organization; some industries have to handle more regulations than other. Also, from expert interviews this is an important measure. How to handle laws and regulations has an important impact on the complexity of an organization.

Also, a social change in the customer base is an important measure. This measure is based on expert interviews. Nowadays this is getting more important with for example the influence of social media. Also, people with reputation within a certain domain can relatively easy give their opinion about a product or service.

According to the above mentioned arguments, external complexity has different aspects which effect business complexity. The following factors are most commonly mentioned:

- Fluctuations in the performance of the economy
- Number of competitors
- Laws and regulations
- Social changes in the customer base

#### 4.4 ENTERPRISE ARCHITECTURE MATURITY

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In order to measure maturity, different models are developed. These models have been developed in different disciplines and are therefore focusing on different dimensions of an organization. Several models are used In order to answer the following question:

##### **What components does an enterprise architecture maturity model contain?**

The following sub questions are discussed within this section:

1. Which enterprise architecture maturity models are currently present in literature and what are their components?
2. How can these enterprise architecture maturity models and its components be generalized to make an understandable enterprise architecture maturity model?

An overview of the maturity models present in current literature is given. In Table 3 the maturity models which are taken into account for this literature review are mentioned. Only these maturity models are used, because these are useful for measuring enterprise architectures within this research. Other maturity models like SEI CMM are capability models; those models focus too much on software engineering. Other models like LISI are interoperability models, which are too focused on the integration. The chosen models have a good balance between business and IT. Another motivation to choose the models within Table 3 is that these models mention the word 'Enterprise Architecture' within their document or even in their title. The goal of this literature review is to identify the different components of the different models, in order to create an understandable enterprise architecture maturity model with the most commonly mentioned components.

TABLE 3: ENTERPRISE ARCHITECTURE MATURITY MODELS FROM LITERATURE

Name	Publisher	Year of last version	References
Enterprise Architecture Maturity Model (EAMM)	NASCIO	2003	National Association of State Chief Information Officers (2003)
Extended Enterprise Architecture Maturity Model (E2AMM)	IFEAD	2004	Schekkerman (2006)
Enterprise Architecture Capability Maturity Model (EACMM)	US DoC	2007	Department of Commerce (2007)
Strategic Alignment Maturity Model (SAMM)	Luftman	2007	Luftman and Kempaiah (2007)
EA Management Maturity Framework (EAMMF)	GAO	2007	U.S. Government of Accountability Office (2007)
Deloitte Enterprise Architecture Maturity Model (DEAMM)	Deloitte	2013	

These models are studied in detail in order to generate an understandable enterprise architecture maturity model. The understandable model is given in 4.4.1.

#### 4.4.1 UNDERSTANDABLE ENTERPRISE ARCHITECTURE MATURITY MODEL

In order to make the enterprise architecture maturity models understandable for non-specialists and to make the models more generalizable in order to ask less questions to measure enterprise architecture maturity the model in Figure 6 is developed. This model is based on the model by Lankhorst (2005). This model encloses the most common used components in literature. The model consists of four categories, which are discussed in detail: EA Foundation, EA Development, EA Realization and EA Alignment.

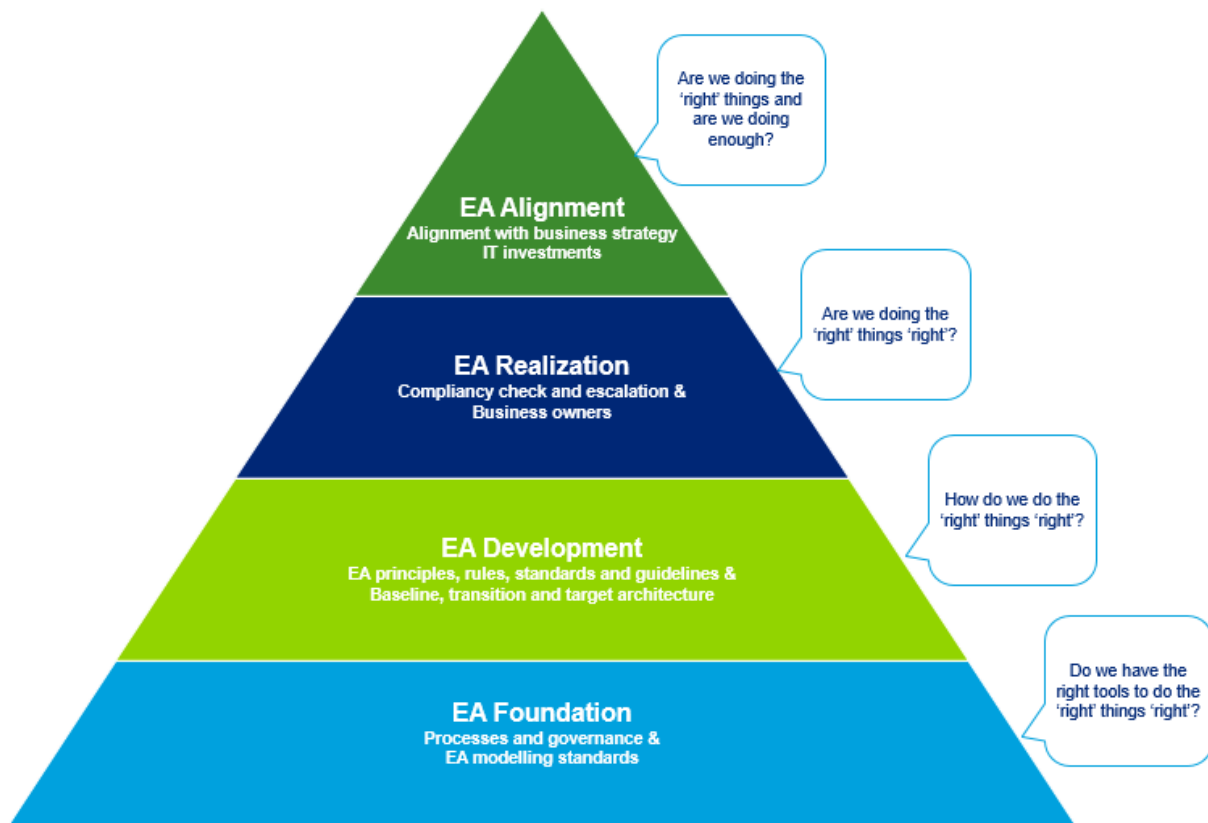


FIGURE 6: UNDERSTANDABLE ENTERPRISE ARCHITECTURE MODEL

#### 4.4.1.1 EA FOUNDATION

The foundation of EA is having the right tools in order to describe the enterprise architecture. The question that can be stated in this stage is: Do we have the right tools to do the 'right' things 'right'? This is basis in order to describe enterprise architecture.

Within this stage the following components are assigned:

- Processes and governance
- EA modeling standards

#### Processes and governance

Processes and governance are about the administration of processes and governance concerning enterprise architecture. EAMM speaks about administration, which contains the governance roles and responsibilities. E2AMM states this category as extended enterprise involvement, which contains a governance structure to manage the enterprise architecture activities. EACMM has two components to describe this category, namely architecture process and governance. Architecture process contains to what extent efforts are done to continuously improve architecture processes. Governance is about the presence of a governance process and the acceptance of that process by senior management. Also SAAM includes governance as a component of their maturity model. IT consists of a decision tree for IT processes to be used on different levels by IT and business managers. The EAMFF also contains a governance part that needs to be managed, it includes the core elements that need to be managed within the EA program. Next to the governance part, EAMFF also contains a process element in its model. This includes plans, policies and procedures how people have to execute within the EA program. Also DEAMM includes architecture processes and governance in their model.

## **EA modeling standards**

EA modeling standards is about the presence of modeling standards within organizations. EAMM states this category as Architecture framework, containing processes, templates and forms used for documenting enterprise architecture within your organization. Furthermore based on expert interviews and DEAMM, this component is also included in the understandable maturity model. The basis of enterprise architecture lies also in the presence of the modeling standards. When modeling standards are not present, different departments use different standards or tools. EAMFF has a component tools within its model, containing frameworks, methodologies and analytical tools to assist people to execute processes. DEAMM has a category called 'architecture tools', which includes tools to model enterprise architecture elements.

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### **4.4.1.2 EA DEVELOPMENT**

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When the right tools are selected, the steps how to use this tools right can be described. The question that can be stated in this stage is: How do we guide the 'right' things to do it in the 'right' way?

Within this stage the following components are assigned:

- EA principles, rules, standards and guidelines
- Baseline, transition and target architecture

#### **EA principles, rules, standards and guidelines**

EA principles, rules, standards and guidelines is about the compliancy of the use of the tools and processes to describe the enterprise architecture of an organization. Within EAMM this is part of the category compliance. Compliance contains the published standards, processes and other elements. EACMM includes architecture development, containing documentation, processes and standards to drive business improvements. Finally, DEAMM contains guiding principles and standards.

#### **Baseline, transition and target architecture**

Baseline, transition and target architecture is about the current state and the future state of the architecture, as well as the transition to accomplish this future state. EAMM calls this stage architecture planning, which contains the EA program roadmap and implementation plan. E2AMM speaks about architecture developments, including projects portfolio and landscape. EACMM includes architecture developments, which is also includes to continuously develop architecture. DEAMM states this category as architecture prints.

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### **4.4.1.3 EA REALIZATION**

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When the EA Foundation and EA Development stage are handled and the level of maturity is high the EA Realization stage can be exploited. Within this stage the following question plays a vital role: Are we doing the 'right' things in the right way?

Within this stage the following components are assigned:

- Compliancy check and escalation
- Business owners

## Compliance check and escalation

Compliance check and escalation is about the check if the current way of operation is in line with the formulated procedures. The category compliance within EAMM is also part of this category; reviewing the current state to ensure that services and programs are operating efficiently is important during the realization phase. E2AMM states this as program office, containing the continuous management and measurement of the program activities and results. EAMFF also has a program management element within its model.

## Business owners

Business owners is about the ownership and responsibility of specific parts or a whole program within enterprise architecture. Business ownership is part of the category 'program management' within E2AMM. It includes the ownership and the responsibility of people on specific parts of the whole program. Furthermore, based on expert interviews and DEAMM, this component is also included in the understandable maturity model. In practice this is an important part of enterprise architecture.

### 4.4.1.4 EA ALIGNMENT

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The last stage, but not less important, is the stage where in the alignment between business and IT takes place. In order to score a high maturity within this stage a high level of the above mentioned stages is needed. The question within this stage

Are we doing the 'right' things and are we doing enough?

Within this stage the following components are assigned:

- Alignment with business strategy
- IT investments

## Alignment with business strategy

Alignment with business strategy is the most important category of EA Alignment and it is part of every enterprise architecture maturity model. E2AMM states this category as 'Business & Technology strategy alignment', which contains aligning business strategies, drivers and procedures with IT strategies, drivers and procedures. EACMM contains business linkage, including to what extent enterprise architecture is linked to business strategies or drivers. SAAM includes a category 'value', which consists of metrics for accessing business and IT contributions of the IT organization and its technology.

According to E2AMM, a cost/benefit calculation can be used for validation. EACMM states that this category also includes architecture process metrics in order to optimize the business linkage. Part of alignment with business strategy is the category integration of the EAMM by NASCIO. They state that integration is one of the touch-points of management processes to enterprise architecture.

## IT investments

IT investments is about the involvement of the enterprise architecture within the strategy of IT investments and acquisition. E2AMM contains a component Enterprise budget & procurement strategy, which includes investments plans. EACMM states this category as IT investment and acquisition strategy, containing the influence of enterprise architecture on the investments and



the acquisition strategy. Within the research of Ross *et al.* (2006) CIO's business cases for architecture investments is high prioritized.

Part of IT investments is the involvement of managers and employees. Involvement is needed to get the support of the EA program throughout the organization. This is a category in EAMM, E2AMM (Executive management involvement and business units involvement) and EACMM. Also, DEAMM has partly included IT investments with its category 'EA sponsorship', which includes the business involvement and investment agreement of senior management.

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#### 4.4.1.5 GENERAL

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In order to score high on EA Alignment a high level in the lower levels is needed. So, when the EA foundation is low it is quite impossible to score high in EA Development and EA Realization. In other words, if there are no tools to do the right things right, it is quite impossible to know how to do the right things right and even harder to do the right things right.

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### 4.5 BUSINESS PERFORMANCE

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As stated in Tamm *et al.* (2011), only five studies were found which gave considerable attention in the role of enterprise architecture in achieving business benefits. Within this section the business performance factors, influenced by enterprise architecture are discussed. The main question of this section is:

**What business performance factors are used to categorize organizations, which are related to enterprise architecture?**

In order to answer this question, two sub questions are formulated:

- a. What business performance factors for organizations are present in current literature?
- b. What business performance factors for organizations are present in current practice?
- c. Which correlations between enterprise architecture maturity model factors and business performance are present in current literature?

Business IT alignment, as well as organizational alignment, is related to improved organizational performance positively (Chan *et al.*, 2006; Kearns and Lederer, 2003; Miller, 1986; Porter, 1996; Sabherwal and Chan, 2001). The topic of alignment and organizational performance is seen as an important topic within broader management literature (Miller, 1986; Porter, 1996). This section foresees the performance factors which are influenced by enterprise architecture maturity.

Remarkable is a research by Lange and Mendling (2012), which interviewed experts. These experts reported no objectively measure or tracking of benefits derived from enterprise architecture is done within organizations, but these interviewed experts do see the need and demand for measuring or tracking these benefits.

A recurring business benefit of a high level of maturity is increase of business IT alignment (Aziz and Obitz, 2007; Obitz and Babu K, 2009; Schmidt and Buxmann, 2010). A way to reach this benefit is to follow an active architecture implementation (Schmidt and Buxmann, 2010). While, enterprise architecture is a tool to align business and IT this benefit is not recognized within this research as a benefit of using enterprise architecture.

The focus of this chapter is on business performance factors which are explicitly related to enterprise architecture. Many other performance factors could be mentioned not explicitly

related to enterprise architecture, like the nine performance areas of Mintzberg (1980). This is a consciously choice, because of time limitations and to sharpen the focus of this research. The focus is not to find new business performance factors, but to quantify relations between enterprise architecture and business performance factors mentioned in literature and which create value according to experts within Deloitte.

#### 4.5.1 BUSINESS PERFORMANCE FACTORS OF ORGANIZATIONS DESCRIBED

Business performance factors can be stated as the benefits of a company; benefits are financial and non-financial. The performance factors as stated in this section are factors when enterprise architecture is present within an organization. An overview of these benefits and sub-benefits are given in Figure 7. These benefits and sub-benefits are discussed within this section.

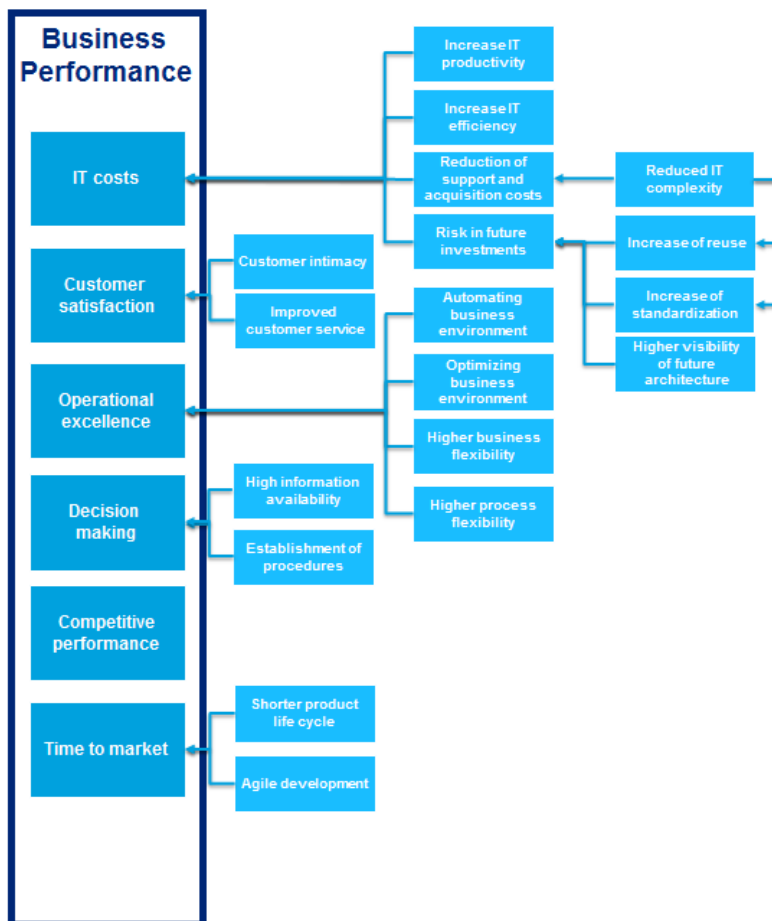


FIGURE 7: BUSINESS PERFORMANCE (SUB) FACTORS

##### 4.5.1.1 REDUCED IT COSTS

Reduced IT costs is the most occurring business benefit of a higher level of maturity within enterprise architecture (Aziz and Obitz, 2007; Obitz and Babu K, 2009; TOGAF, 2009; Schmidt and Buxmann, 2010; Tamm *et al.*, 2011). Schmidt and Buxmann (2010) see reduced IT costs also as increase IT efficiency or increase IT productivity. So the reduction of IT costs is often not caused by less applications or systems, but due to an increase of IT efficiency or IT productivity. Also, Morganwalp and Sage (2004) do see reduction in cost, but specify them as the reduction of support costs and acquisition costs. An example of reduction of support costs is the reduction of IT complexity. Reduction of IT complexity is supported by TOGAF (2009) and Schmidt and Buxmann (2010). An example of reduction of acquisition costs is the smaller set of components

and a higher visibility of legacy, as well as a higher visibility of the future architecture, what reduces risk. The reduction of IT complexity is also linked to the increase of standardization and the improvement of reuse (Schmidt and Buxmann, 2010). The increase of reuse, increase of standardization and higher visibility lead to reduced risk for future investments. According to TOGAF (2009), reduced risk for future investments is an important benefit. Ross *et al.* (2006) mentions this as improved risk management. A reduced risk leads to reduced IT costs, or a better assessment of these costs.

#### 4.5.1.2 CUSTOMER SATISFACTION

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Customer satisfaction is another important benefit from literature. Musuka (2006), Aziz and Obitz (2007) and Obitz and Babu K (2009) state improved customer satisfaction as an outcome of the use of enterprise architecture. Ross *et al.* (2006) state customer intimacy as one of the most important strategic outcome from enterprise architecture and this outcome increases dramatically when the level of maturity is increases. Customer intimacy can be achieved by serving customer more extraordinary by having deep knowledge of the customer itself. Customer intimacy focusses on customers' need understanding in order to increase customer satisfaction (Butler, 2000). Thus, when customer intimacy is higher, customers are generally more satisfied. Musuka (2006) even states that a higher level of operational efficiency contributes to improved customer service, what eventually can lead to a higher level of customer satisfaction. To satisfy the customer is becoming harder, because customers are more selective and demanding nowadays. Mass customization is getting more important for organizations to fulfill the needs of its customer. Adapting to the dynamic behavior of customer is one of the main capabilities organizations should have to meet the ever changing needs of their customers.

#### 4.5.1.3 OPERATIONAL EXCELLENCE

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Also, operational excellence is stated as a benefit (Tamm *et al.*, 2011). Operational excellence can be achieved by automating and optimizing the business environment. A higher level of operational efficiency supports and creates new capabilities, which directly contribute to improved business performance (Musuka, 2006). Beside IT flexibility, higher business and process flexibility is also a benefit of a high level of maturity (Musuka, 2006; Aziz and Obitz, 2007; Obitz and Babu K, 2009; Schmidt and Buxmann, 2010). According to Schmidt and Buxmann (2010), the manageability is also a benefit flowing out of this benefit. Operational excellence does not only enable change, but also makes business process improvements and standardization possible (Obitz and Babu K, 2009). Also, Ross *et al.* (2006) see the importance of operational excellence. They state it as one of the four important strategic outcomes from enterprise architecture. According to Ross *et al.* (2006) operational excellence leads to predictable operations.

#### 4.5.1.4 DECISION MAKING

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Another benefit is improved decision making. Decision making is supported by having an enterprise architecture (Johnson *et al.*, 2007; TOGAF, 2009; Op 't Land, 2009; Tamm *et al.*, 2011). According to Tamm *et al.* (2011) better and faster decision making is possible due to higher information availability. Ross *et al.* (2006) describes that data can make decision making easier, when you know which data you have to use. Also, IT governance improves decision making because formalization of procedures. Thus, the establishment of procedures makes it easier to delegate decisions. This is a notable result of the research of Child (1975). This includes without losing control, because formalization leads to prescribed standards and it sets limits in the role for subordinates; in an informal setting this is not present. The size of an organization does not matter in this case, although larger organizations tend to assign to have more documentation and more standardized procedures.

#### 4.5.1.5 COMPETITIVE PERFORMANCE

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Competitive performance is a benefit of EA as well. Bozarth *et al.* (2008) uses competitive performance as performance measure. Market share is widely accepted as a measure for competitive performance. Perreault & McCarthy (1996) describe market share as the measure of competitive performance, and state it as the organization's proportion of the market in comparison with the competition. Lall and Albaladejo (2004) state two options to measure competitive performance, namely relative market shares and profitability. They even state that organizations use competitive strategy to improve their performance in relation to their competition. Ross *et al.* (2006) support this statement; more strategic agility is one of the key strategic outcomes of enterprise architecture. Strategic agility enables organizations to react on competitors and new market initiatives. They even state that reacting on competitors and new market initiatives is easier when reaching a higher level of enterprise architecture maturity.

#### 4.5.1.6 TIME TO MARKET

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Another recurring benefit is time to market. Time to market can be defined as: the time from idea generation to a new product launch. Zachman (2001) states this as one of the four reasons to invest in enterprise architecture. Organizations are struggling with the shortening of product life cycles, but also the windows of opportunity are getting shorter of duration (Millson, Raj and Wilemon, 1992; Tekeuchi and Nonaka, 1986). Afonso *et al.* (2008) state that the products have reduced life cycles and therefore the need of a reduction of time to market is needed to ensure their success in the market. The pressure to develop a product more quickly is therefore getting higher. While this pressure is getting higher and the time to develop products is shorter, some risks are insurmountable. Lilien and Yoon (1990) and Zirger and Harley (1996) have written about the closely relationship of success rate, value delivery to customers and product performance. They state that the effect of a shorter time to develop has its influence on ultimate success, so the risks as mentioned cannot be ignored. There are some studies that report that the development cycle time has cut up to 50%, without hurting the success rate (Crawford, 1992; Millson, Raj and Wilemon, 1992; Towner, 1994). Furthermore Cooper and Kleinschmidt (1995), Ittner and Larcker (1997) and Griffin (1997) have researched that the reduction of new product development cycle time can create advantages, by means of profit, market share and long-term competitiveness. Calantone and Di Benedetto (2000) even state that the product cycle time can be reduced without diminishing performance. Swink (2003) showed in his research that time to market is positively influenced by involvement of top management and negatively related to higher product complexity. Everaert and Bruggeman (2002) and Afonso *et al.* (2008) state that time to market is correlated with the success of new product development. Furthermore this can result in higher market share and economic success. Also, Cooper and Kleinschmidt (1995) agree that reduced time to market determines new product success. Agile development can be used to achieve a shorter time to market (Hen-Tov *et al.*, 2009).

## 4.6 CHOICES MADE DURING LITERATURE REVIEW

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Due to time limitations and to sharpen the focus of this research some choices are made. The focus of this research is to quantify the moderating value of enterprise architecture maturity in the relationship between business complexity and business performance. Furthermore the relationships between business complexity, enterprise architecture maturity and business performance factors which are qualitatively researched and described in literature are quantitatively researched within this research. This research does not focus on the extension of the complexity factors, the enterprise architecture maturity factors, nor the organizational performance factors. In short the choices are discussed below.

First, the choice for business complexity is discussed. Many categorizations of organizations are possible and could be used to look at the relation between IT and enterprise architecture maturity. But the relation between business complexity and enterprise architecture is not explicitly mentioned in literature. Another reason for choosing business complexity factors is the research of Jay and Collinson (2012). Within this interesting research they made the link between business complexity and business performance. The link with enterprise architecture is missing; this is an interesting question and this is why this research is set up.

Also, IT complexity is ignored within the complexity factors of this research due to time limitations.

Second, the discussion about the choice for the five mentioned maturity models in Table 3. Only these five maturity models are discussed, because these models are useful for measuring enterprise architecture and have balance between business and IT. This last argument is useful regarding this research, because business complexity and business performance are the other constructs of this research. Another argument for these models is the presence of the word 'Enterprise Architecture' within their document or even in their title. Also, with the mentioning of these five models and the DEAMM, the goal of this part of this literature research is achieved; the different components of enterprise architecture maturity models have been identified. Furthermore the components have been generalized to an EA pyramid based on the model of Lankhorst (2005). This is done because it summarizes the several enterprise architecture maturity models. Furthermore with this generalized EA pyramid, enterprise architecture maturity is easier to measure within the questionnaire.

And third, the choice for the mentioned business performance factors. Much research is done to identify business performance factors, but not much research is focused on the link with enterprise architecture. Due to time limitations and to focus this research literature only the business performance factors linked to enterprise architecture are included within this research. As stated above, the focus is not to find new business performance factors, but to quantify relations between enterprise architecture maturity factors and business performance factors.

In the model in Figure 8 the literature reviewed is summarized. This model is the complete model of this review. Based on the literature reviewed in this chapter hypotheses and a questionnaire are set up to quantify relationships between business complexity factors, enterprise architecture maturity and business performance factors. These hypotheses, the questionnaire and which relationships are quantified by this questionnaire, is discussed in the part 3.

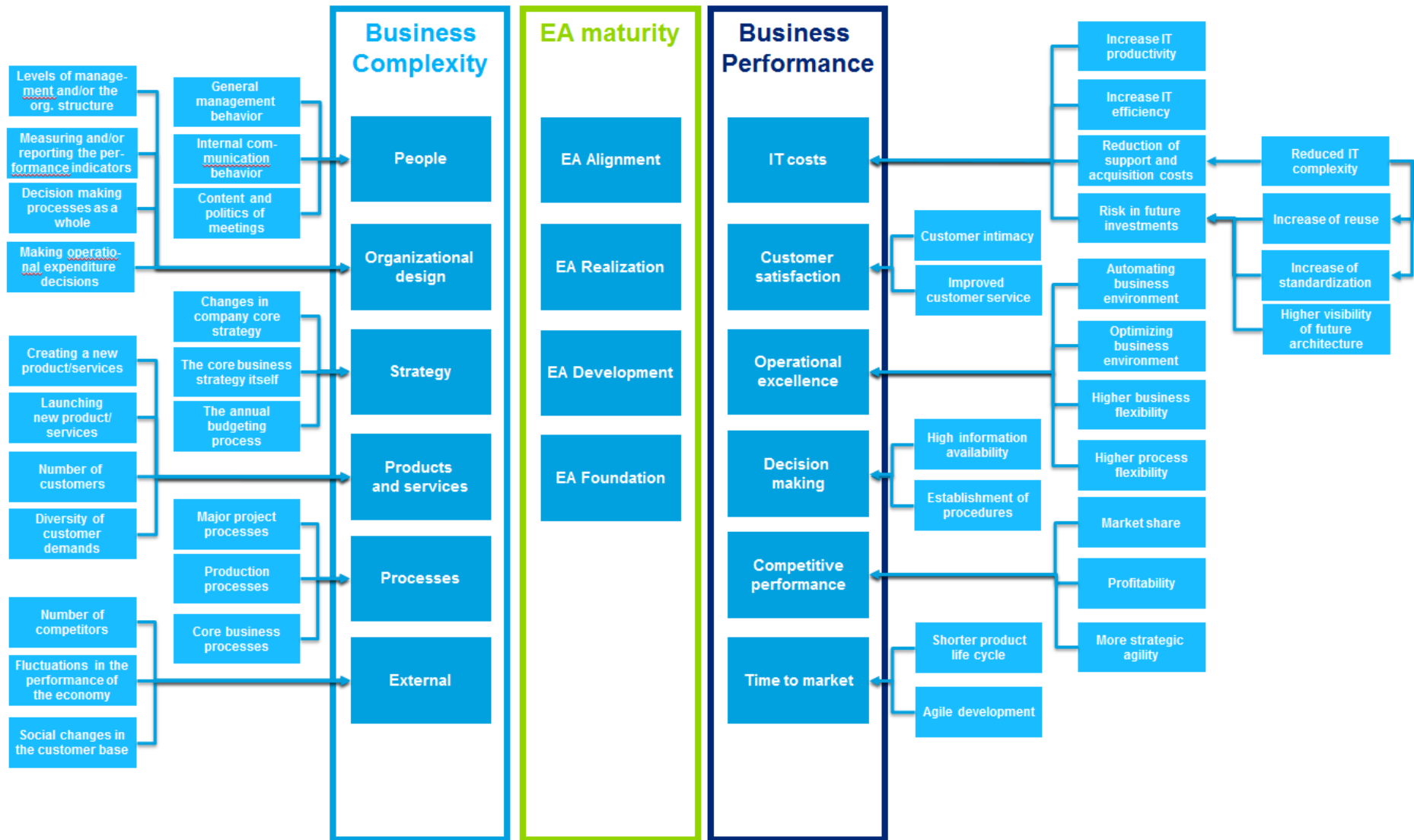


FIGURE 8: RESEARCH MODEL BASED ON LITERATURE REVIEW

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## PART 3 – SETTING UP THE QUESTIONNAIRE

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Based on the model given at the end of part 2 the questionnaire is set up. The choice for which factors are included in the questionnaire is given in this part, as well as the hypothesis based on these factors (chapter 5). In chapter 6 the way the questionnaire is set up is discussed. The questionnaire is pre-tested and the results are given within the chapter. The final deliverable of this part is the final questionnaire.

So far, several theories are discussed on how the complexity factors influence enterprise architecture maturity, as well as the influence of enterprise architecture maturity on organizational performance. This led to the model given at the end of part 2. To gather data, a questionnaire is made and spread. The goal of this questionnaire is to empirically validate whether or not these correlations discussed in literature, actually exist. As discussed, there are several complexity factors which influence the organizational performance, but one of the goals of this study is to investigate the influence of enterprise architecture maturity on this relationship. Within this research the theory is empirically tested to see if there is coherence between this theory and practice.

A deductive approach is used for this research. Hypotheses are formulated based on literature and expert interviews. These hypotheses are tested by the questionnaire, and data is collected. Thus, the first step is to formulate statements based on the research model given at the end of part 2 and existing literature. These questions and statements are the first version of the questionnaire. These questions and statements are based on the material available within Deloitte and based on literature. After a first questionnaire is ready, this questionnaire is pre-tested to prove the measurement instrument as reliable. It is pre-tested until the questionnaire was proved to be reliable and ready to spread out. These steps are described within this chapter and are given in Figure 9. After these steps were done, the questionnaire is spread out and data is collected to support this research; this is described in part 4. This data is analysed and hypotheses are confirmed or rejected. After this phase the theory is rectified.

According to Wieringa (2010), validity is an important issue in the design of empirical research. Validity is discussed within section 6.1.

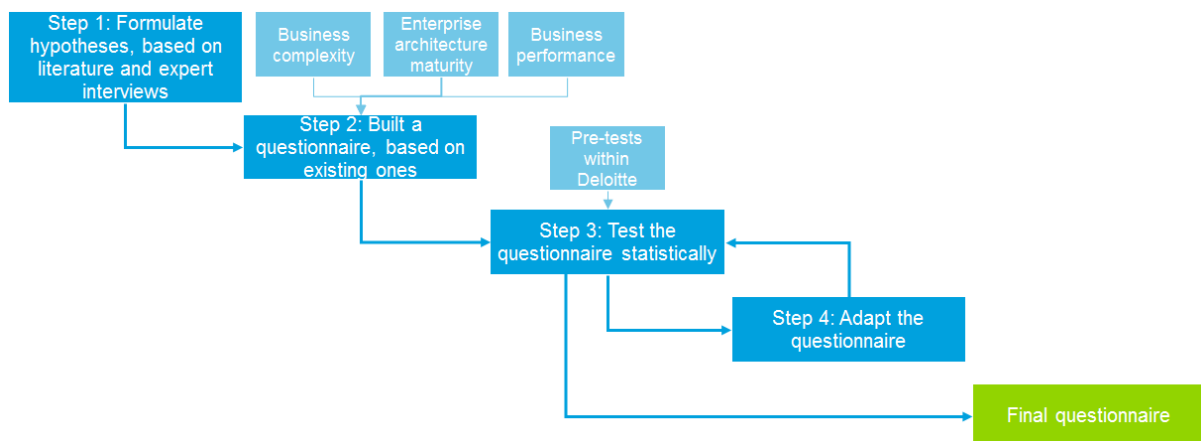


FIGURE 9: STEP-BY-STEP PLAN PART 3

## 5 FORMULATION OF THE HYPOTHESIS

Having reviewed the literature, a research model is formulated. This research model is based on the three constructs of this research, namely: business complexity, enterprise architecture maturity and business performance.

Business complexity is slowing organizations down; it affects the business performance (Collinson and Jay, 2012). Based on literature, it is theorized that business complexity plays a significant role as direct determinant of business performance. Business complexity is an independent construct of any theoretical perspective. The question of this research is, whether enterprise architecture maturity has influence on this relationship; enterprise architecture maturity is the moderating construct within this research. This leads to a research model as stated in Figure 10. All constructs are defined within this section, as well as the theoretical justification is provided for the hypothesis.

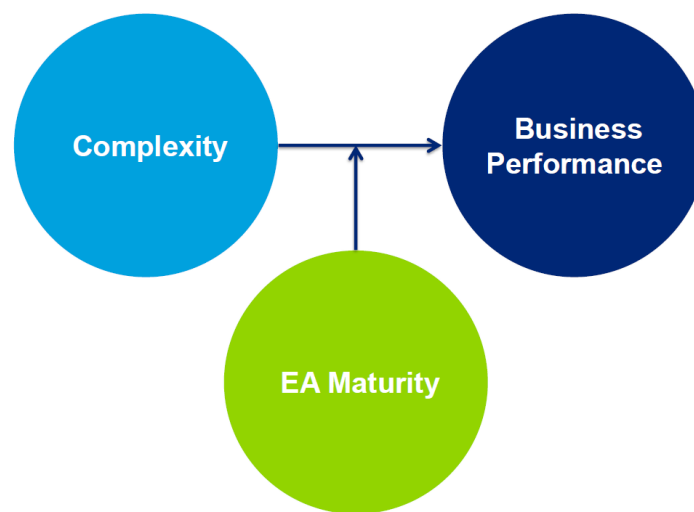


FIGURE 10: SIMPLIFIED RESEARCH MODEL

### 5.1 BUSINESS COMPLEXITY

Business complexity is about the internal and external capabilities of an organization. The six constructs from the book 'From complexity to simplicity' (Collinson and Jay, 2012) and backed by other literature that pertains to business complexity are: people, organizational design, strategy, products and services, processes and external.

The business complexity construct has significant effect on the performance of an organization (Raphel, 2005; Collinson and Jay, 2012). Enterprise architecture could be a moderator within this relationship, although this is not supported from a theoretical point of view. However, based on interviews with experts, this relationship could be present. Furthermore, literature describes the relationship between business complexity and enterprise architecture and the relationship between enterprise architecture and business performance.

The research by Collinson and Jay (2012) has shown that a relationship between business complexity and business performance is present. The results of this research show that organizations with high complexity can also have a high business performance, while also organizations with an even high business complexity can have a low business performance. Figure 11 shows the result of the research of Collinson and Jay (2012). Based on this observation, there must be a moderating construct that influences this relationship. For example, Fiat is a less



complex organization as Roche, Johnson & Johnson, Berkshire Hathaway and BHP Billiton, but gain far less profit than these organization. Thus, the expectation is that the maturity of enterprise architecture moderates the relationship between business complexity and business performance.

**H1: The influence of business complexity on business performance is moderated by the maturity of enterprise architecture of an organization.**

The question which flows out of this hypothesis is: When business complexity is high, does EA maturity needs to be high in order to reach a high business performance?

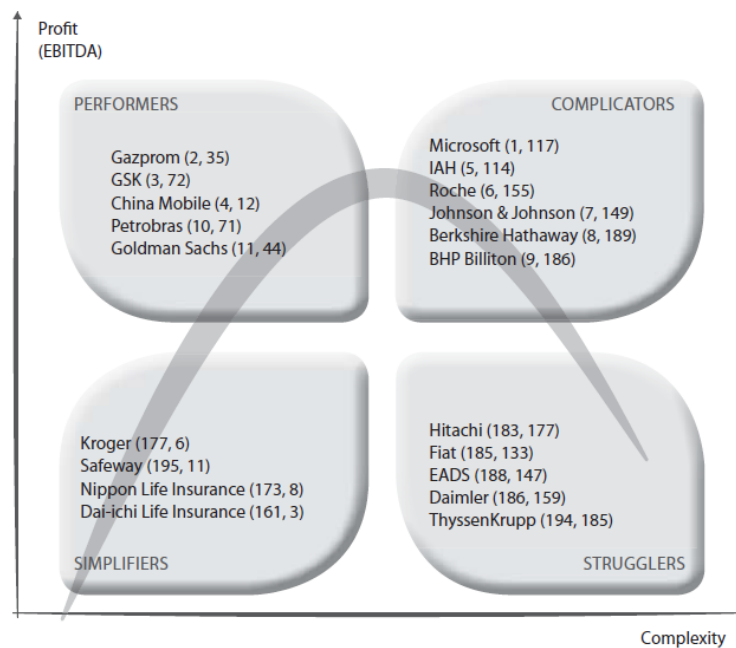


FIGURE 11: THE PERFORMANCE-SIMPLICITY MATRIX OF COLLINSON AND JAY (2012): SOME EXAMPLE FIRMS. BETWEEN THE BRACKETS, FIRST THE PERFORMANCE RANKING OF AN ORGANIZATION AND SECOND THE SIMPLICITY RANKING.

To measure business complexity performance measures are defined. These performance measures are based on literature. As stated above, these performance measures are: people, organizational design, strategy, products and services, processes and external. These performance measures are discussed below shortly. Within the literature review (Chapter 0) sub performance measures for complexity are discussed. Based on these sub performance measures the two most important measures are chosen to define a performance measure. This is based on expert interviews within Deloitte. This done because otherwise the questionnaire was too long to spread out and to gain enough responses for this research in the short time available.

The performance measure 'People' defines the internal complexity concerning people, with the most important sub performance measures 'internal communication' and 'politics'. These sub performance measures are used to define the people complexity. As Collinson and Jay (2012) state, people are the creators of complexity, as well as the victims of it. Organizational design defines the internal complexity concerning the design of the organization. The most important sub performance measures within organizational design are 'internal organizational structure', 'definition of roles' and 'operating markets/segments/countries'. Strategy defines the internal complexity concerning the definition and use of strategy, with the most important sub-performance measures 'changes in strategy' and 'annual budgeting process'. Products and services defines the internal complexity regarding the offering of products and services, with the most important measures 'launching new products/services' and 'diversity in customer

demands'. Processes defines the internal complexity of the processes defined within the organization, with the most important measures 'major project processes' and 'core business processes'. External defines the external complexity of the organization, with the most important measures 'number of competitors' and 'laws and regulations'. All the important measures are used to measure the business complexity of an organization, in order to test hypothesis 1 as stated above. In Figure 12 a summary of business complexity is given.

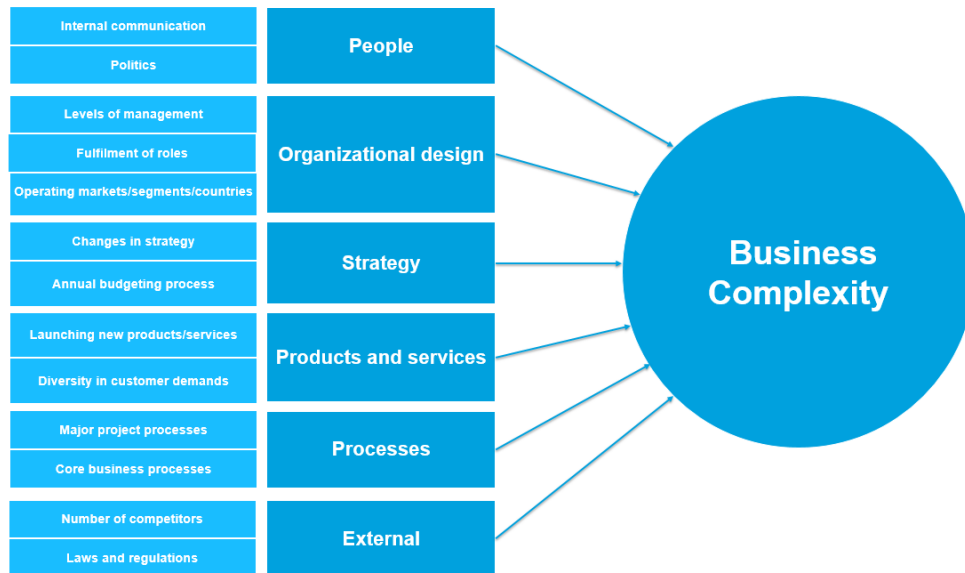


FIGURE 12: BUSINESS COMPLEXITY WITH ITS (SUB) PERFORMANCE MEASURES

## 5.2 ENTERPRISE ARCHITECTURE MATURITY

Enterprise architecture maturity is defined as “a discipline for proactively and holistically leading enterprise responses to disruptive forces by identifying and analysing the execution of change toward desired business vision and outcomes” (Gartner, 2012). Based on literature four categories are set up in order to measure the enterprise architecture maturity of an organization, namely EA foundation, EA development, EA realization and EA alignment. The two most important measures per level are used to measure enterprise architecture maturity of an organization. These measures are chosen after expert interviews.

As stated in section 4.4.1, the measures of EA Foundation are ‘Processes and Governance’ and ‘EA modelling standards’. The measures of EA Development are ‘EA principles, rules, standards and guidelines’ and ‘baseline, transition and target architecture’. The measures of EA Realization are ‘Compliance check and escalation’ and ‘business owners’. The measures of EA alignment are ‘Alignment with business strategy’ and ‘IT investments’. This is summarized in Figure 13.

Tamm *et al.* (2011) state that an important shortcoming within current literature is the lack of empirical evidence on the benefits of enterprise architecture, where they state benefits as: “outcomes that contribute directly to organizational performance”. Thus, expected is a positive influence of enterprise architecture on business performance.

**H2: The maturity of enterprise architecture of an organization influences business performance positively.**

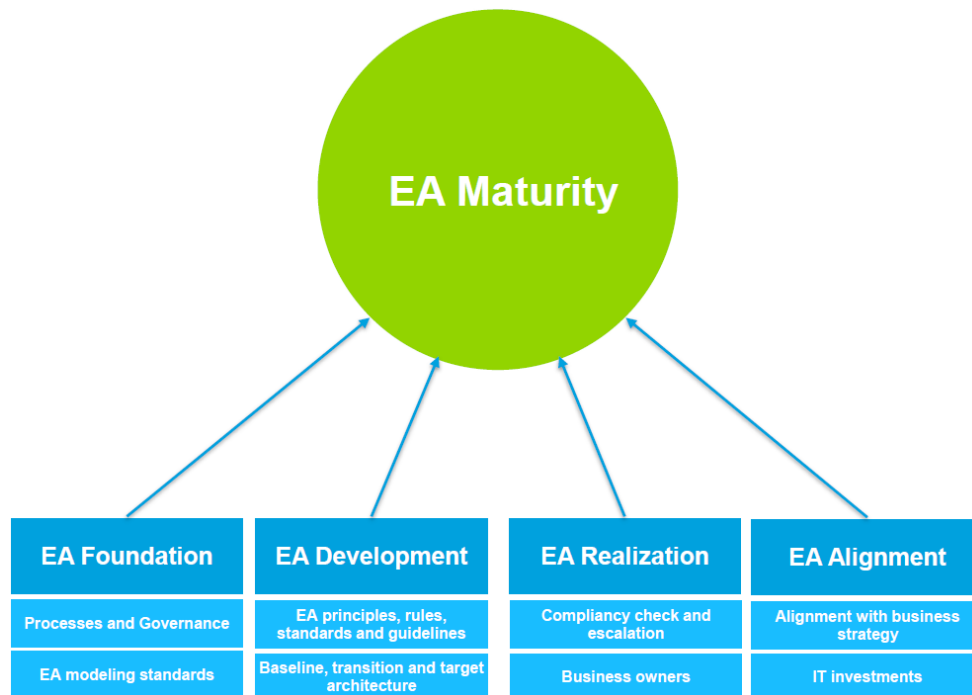


FIGURE 13: ENTERPRISE ARCHITECTURE MATURITY WITH ITS (SUB) PERFORMANCE MEASURES

### 5.3 BUSINESS PERFORMANCE

Business performance is defined as the benefits of a company; benefits are financial and non-financial. The business performance factors researched by literature review are IT costs, customer satisfaction, operational excellence, decision making, competitive performance and time to market. As stated in the literature review, all these benefits flow out of a higher level of enterprise architecture maturity.

As stated in the literature review, the most occurring benefit of a higher level of maturity is reduced IT costs. Based on this observation the following hypothesis is formulated in order to back this hypothesis with empirical evidence, what is missing within current literature.

**H3a: The maturity of enterprise architecture of an organization influences IT costs positively.**

Next to reduced IT costs, customer satisfaction is another important benefit of a high level of enterprise architecture maturity. Based on literature the following hypothesis is formulated.

**H3b: The maturity of enterprise architecture of an organization influences customer satisfaction positively.**

Another benefit is operational excellence. A high level of maturity positively influences operational excellence, according to several scientific papers. According to this, the following hypothesis is formulated.

**H3c: The maturity of enterprise architecture of an organization influence operational excellence positively.**

Decision making is also positively influenced by a higher level of maturity. Decisions can be made better and faster. Therefore the following hypothesis is formulated.

**H3d: The maturity of enterprise architecture of an organization influence decision making positively.**

Another measure of business performance is competitive performance. Market share is one of the important components. The assumption is, when a maturity level is higher, the chance of maintaining or raising market share is higher. The following hypothesis is formulated.

**H3e: The maturity of enterprise architecture of an organization influence competitive performance positively.**

The last performance measure is time to market. Because life cycles of products are reducing, time to market is getting more and more important. Based on literature, it is assumed that a high level of maturity has a positive influence on time to market.

**H3f: The maturity of enterprise architecture of an organization influence time to market positively.**

All above mentioned constructs and sub-constructs are summarized in Figure 14.

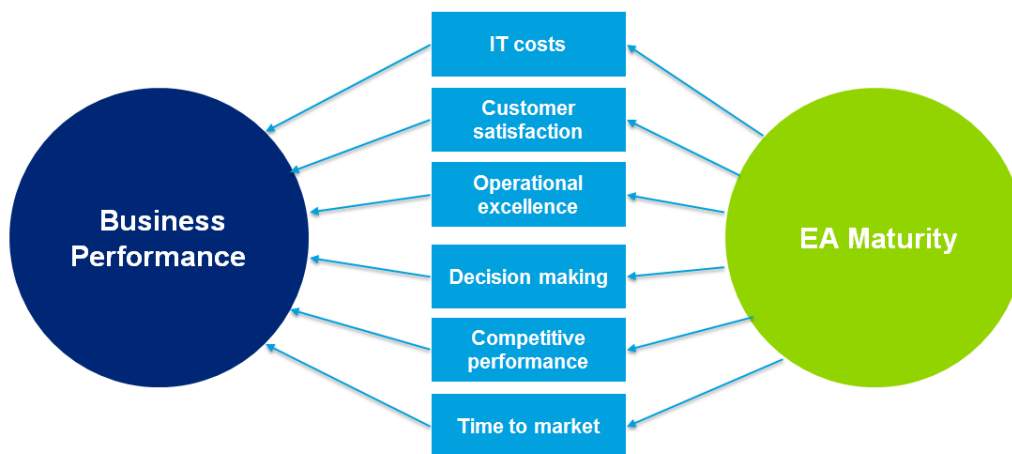


FIGURE 14: BUSINESS PERFORMANCE WITH ITS (SUB) PERFORMANCE MEASURES

## 5.4 OVERALL RESEARCH MODEL

Based on the discussed constructs and hypotheses the research model could be extended, as stated in Figure 15. This research model is the extended version of Figure 3 given on page 7. Also, the hypotheses are given. Based on this model, the questionnaire is set up.

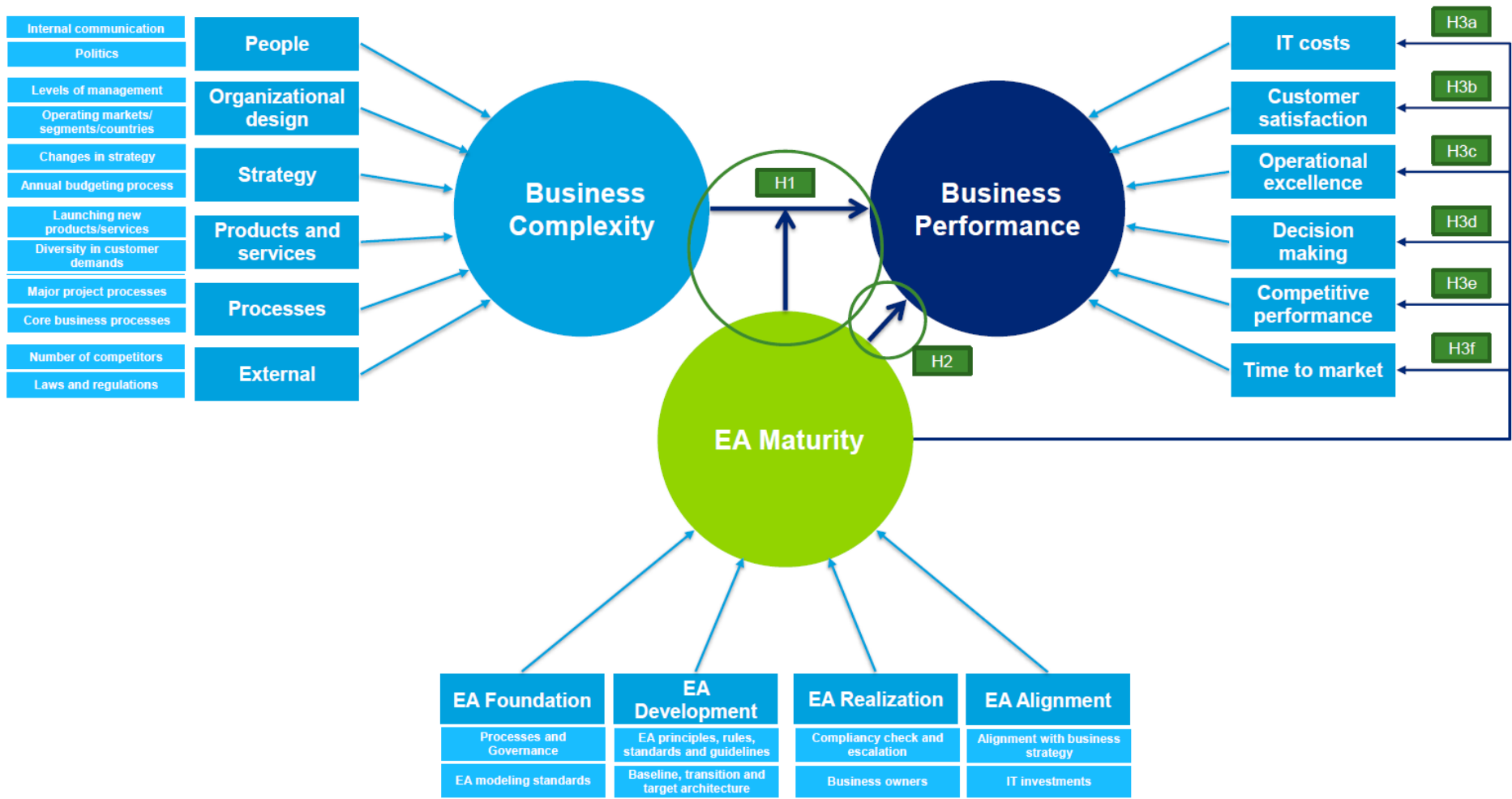


FIGURE 15: RESEARCH MODEL INCLUDING PERFORMANCE AND SUB PERFORMANCE MEASURES AND HYPOTHESES

## 6 FORMULATION OF THE QUESTIONNAIRE

The questionnaire is partly built on existing ones available in literature. Because not many questionnaires are available it is also based on experiences of my colleagues at Deloitte and my professors at the University of Twente. Because not many questionnaires are based on business complexity, it did not enable to make much use of existing questionnaires. This also holds for business performance factors. For the enterprise architecture maturity factors many different models exist, but these questions were more explicit than the questions in this questionnaire. Appendix A indicates which paper(s) are the basis for the specific statement for the initial questionnaire. The other statements were conducted based on the literature review and experts opinions.

Each statement is stated twice, what means that two measures of the same construct are stated in order to test internal consistency and construct validity.

Many papers in literature use a 5-point Likert scale in order to scale opinions. Also, Likert (1932) state that a survey of opinions needs more than three options to answer, because otherwise the statements did not appear consecutively answered. While this research is a research of opinions, the 5-point Likert scale is used.

To give the questionnaire a professional look, a Deloitte instrument was used. This tool is named SurveyWeb. SurveyWeb is a tool, which can be used to set up a questionnaire quickly and results could be monitored. Results of the questionnaire could be reported in Excel. Furthermore communication is encrypted by an SSL protocol. Thus this tool is save and easy to use, and has a professional look.

In order to get to a final questionnaire, the model of Hensley (1999) is used (Figure 16). After literature review and expert interviews a first questionnaire was developed. Subsequently the questionnaire was developed in SurveyWeb and pre-tested within Deloitte. After the pre-tests the final questionnaire is formulated.

In this chapter the process till the final questionnaire is given. In order to get the questionnaire to a high level the questionnaire is pretested thrice. This process is discussed in the section 6.1. The choices made and adaptations on the original questionnaire are given.

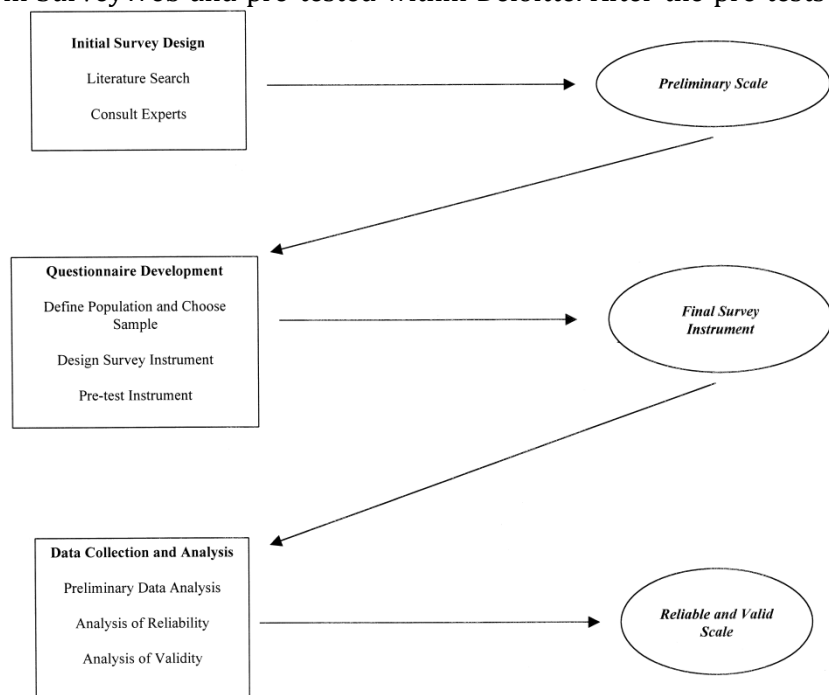


FIGURE 16: MODEL BY HENSLEY (1999) - STEPS TO TAKE IN ORDER TO GET AN RELIABLE QUESTIONNAIRE

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## 6.1 PRELIMINARY TEST OF THE QUESTIONNAIRE

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Before the questionnaire is sent out to the full sample a preliminary test is conducted, in order to see if the questionnaire works as expected and whether the questionnaire is reliable. Therefore the design of this empirical research is validated. According to Wieringa (2010), validity is an important issue regarding the design of empirical research. Validation is about the information to justify the design of this research. Reliability was measured by testing the internal validity by checking the Cronbach Alpha (Cronbach, 1951). Furthermore construct validity was measured by testing face validity and factor analysis.

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### 6.1.1 INTERNAL CONSISTENCY

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Whether responses to each question in the questionnaire correlates with other questions is defined as internal consistency (Saunders *et al.*, 2011). It measures the consistency of response of the sub performance measures as given. Each statement is stated twice per sub-construct and these statements should be consistently answered. There are many methods to calculate internal consistency, where Cronbach Alpha is the most common used variant. Therefore, Cronbach Alpha is used in this research.

According to Pallant (2007), the Cronbach's alpha score should be higher than 0.7. This is the sum of the score of the variable. Important note according the Cronbach alpha is that it is argued that a reliability of 0.50 to 0.60 would suffice in an early stage of research (Nunnally, 1967).

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### 6.1.2 CONSTRUCT VALIDITY

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Construct validity measures to what extent the questions actually measure what is intended to measure by the constructs used (Saunders *et al.*, 2011; Wieringa, 2010). When this is the case, it is possible to generalize data to concepts. In order to measure construct validity, face validity and factor analysis are used. These concepts are discussed below.

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#### 6.1.2.1 FACE VALIDITY

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Face validity is about the agreement that the statements logically reflect accurately what was intended to measure (Saunders *et al.*, 2011). Face validity is used to reflect on the questionnaire if something is wrong at first sight (Wierenga, 1990).

Face validity was measured with university teachers and people within Deloitte.

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#### 6.1.2.2 FACTOR ANALYSIS

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Factor analysis measures the common variance in a correlation between variables. Within this research statements are stated twice and these statements should correlate with each other. This is measured with factor analysis. According to Field (2009), values greater than 0.5 are acceptable, and values greater to 1.0 indicate a greater pattern of correlation.

## 6.2 HOW DID I GET FROM THE FIRST QUESTIONNAIRE TILL THE FINAL?

Although the questionnaire was discussed and examined by several experts, the pre-tests led to some interesting insights. Adaptations were made based on the feedback within the pre-tests. The questionnaires used for the pre-tests are given in Appendix B, C and D. The questionnaire was sent out to colleagues at Deloitte Consulting. These colleagues were asked to fill in the questionnaire with their client as example.

The validation of the pre-test results is given in Appendix E. The Cronbach Alpha of the statements as well as the factor analysis are stated in this appendix. When the Cronbach Alpha was too low ( $<0.70$ ), the statement was revised and retested. In the third pre-test, also minor changes in phrasing the statements while the Cronbach Alpha was already high enough, were tested. In Table 4 the number of statements each pre-test included is given. Each sub performance measure is stated twice in order to check the internal validity; in this table this is visible as x2.

TABLE 4: NUMBER OF STATEMENTS PRE-TESTED WITHIN EACH PRE-TEST, AND THE NUMBER OF STATEMENTS WITH A TOO LOW CRONBACH ALPHA

Pre-test	Number of statements	Number of statements with a too low Cronbach Alpha ( $<0.7$ )
<b>Pre-test 1</b>	52 (26x2)	16 (8x2)
<b>Retest (Pre-test 2)</b>	16 (8x2)	2 (1x2)
<b>Last pre-test</b>	8 (4x2)	4 (2x2)

As noticeable in the last pre-test, 2 statements had a Cronbach's alpha lower as 0.7, respectively 0.674 and 0.697. While Nunnally (1967) states that in an early stage of research a Cronbach Alpha between 0.5 and 0.6 is high enough in an early stage of research, these statements are also included in the final questionnaire.

Another notable result of this pre-test is that the factor analysis values and Cronbach's alpha values both gave the same constructs which are not acceptable. Furthermore face validity was accepted during the pre-tests.

The first and second pre-test questionnaires were sent to 38 people within my service line and respectively 14 and 18 persons reacted on my questionnaire. This is a response rate of respectively 37 % and 47 %, where not everyone within my service line had the knowledge to fill in the questionnaire. Within both pre-tests an e-mail including a link to the questionnaire was sent, as well as a reminder after a week. Furthermore people were asked to fill in the questionnaire personally. The third and last pre-test was done at the office, when many people were present. Everyone who was asked to fill in the small last questionnaire did this. Therefore the response rate in this case was 100%; everyone asked filled in the questionnaire.



## 6.3 THE FINAL QUESTIONNAIRE

The final questionnaire contains 3 constructs and 1 check. The three constructs within this questionnaire are: Business complexity, Enterprise architecture maturity and Business performance. The check consists of respondent information. As described each construct consists of several sub performance measures. After pre-testing the questionnaire the following number of statements including an example of a statement per construct is given. As stated above, each sub performance measure is stated twice in order to check the internal validity. Table 5 gives a summary of the final questionnaire. The final questionnaire is given in Appendix F.

TABLE 5: SUMMARY OF FINAL QUESTIONNAIRE

Construct	Number of statements	Example statement
Business complexity	26 (13x2)	Our business strategy changes frequently.
Enterprise architecture maturity	16 (8x2)	Currently, our business priorities are properly reflected in our IT solutions.
Business performance	12 (6x2)	Our market share is the highest in the industry.
Total	54 (27x2) statements	
Respondent information	9 questions	My function within my organization is:

All data for this research is collected via a questionnaire. Unfortunately there is no “hard” data available for all the constructs and statement. For business performance measures sometimes there is information available, but it is hard to allocate. There is no general approach for allocating for example IT costs for enterprise architecture; it is even ambiguous within organization what enterprise architecture is. Therefore there is chosen for a questionnaire and substantial effort is spend on making it as good as possible. This is also visible in the number of pre-tests.

### 6.3.1 HOW TO GET ENOUGH RESPONSE ON THE QUESTIONNAIRE?

In order to get enough response a plan was developed. This plan is divided in two parts. Persons were contacted via mail or LinkedIn to fill in my questionnaire.

First within Deloitte I have collected several contacts (+/- 50) from different organizations to fill in my questionnaire. These contacts have been contacted directly or via the concerned person. A standard mail was set up in order to get this contact. This mail is given in appendix G. These contacts of Enterprise architects or (lead) business architects were collected inside my department, but also outside of it. Next to contacts within Deloitte, other contacts are used for contacting organizations. Some people of projects done before are contacted. Furthermore my father (Jaap Roest) has contacts with people with a function suitable for filling in the questionnaire. An important note is that no one of Deloitte filled in the questionnaire, due to the fact that they helped me with the pre-test.

Also LinkedIn is used in order to get in contact with people. In an early stage of the research it proved to be vital to react on discussions on LinkedIn. Within LinkedIn-groups several discussions are interesting allied to the subject of this research. This is done in order to create goodwill, so that they want to fill in my questionnaire. Examples of LinkedIn-groups are ‘Enterprise Architecture’, ‘LAC – Landelijke Architectuur Congres’ and ‘NAF – Nederlands Architectuur Forum’. Within these groups I also posted my questionnaire and they also helped me to get enough responses.

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# PART 4 – RESULTS AND CONCLUSIONS

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Within this part the analysis and results of the data collected from the questionnaire given in part 3 are described. First, the data is cleaned in order to perform the analysis (7.1). The analysis of the data lead to the comparison with the stated hypotheses (section 7.2). These results are discussed in chapter 8 and then the general conclusions of this research, limitations, future work and the contributions of this research are described in chapter 9.

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## 7 ANALYSIS AND RESULTS

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This chapter presents the empirical data collected from the questionnaire. In section 7.1, the steps taken before data analysis was started are given. Followed by the data analysis where the data is combined with the theory (7.2). In order to analyze the data, SPSS Statistics is used. This is a well-known software package used for statistical analysis.

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### 7.1 ACTIONS BEFORE DATA ANALYSIS

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In order to analyze data some actions have to be performed; raw data needs to be cleaned. This is done in several steps, as depicted in Figure 17. These steps are described below.

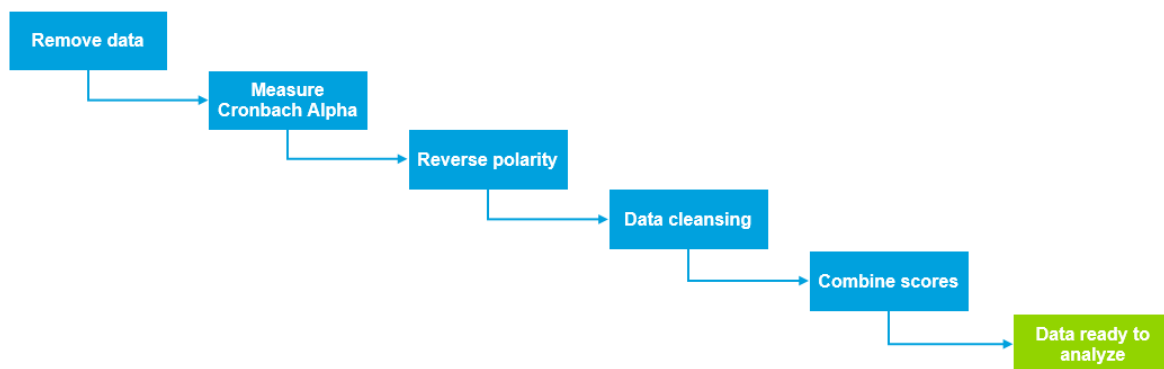


FIGURE 17: STEPS BEFORE DATA IS READY TO ANALYZE

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#### 7.1.1 REMOVING DATA

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Data which was not filled in completely is deleted from the raw data set. The raw data set included 56 data entries, from which 51 data entries were left after this execution. Also, data which has more than 20% of their answers ‘not applicable/I don’t know’ were left out, because this has a significance influence on the output. This holds for three inputs, which had an input ratio (without ‘not applicable/I don’t know’) of 74% and two of 57%. Eventually 48 data entries were usable for testing the hypotheses.

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#### 7.1.2 MEASURING CRONBACH'S ALPHA

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In order to measure the internal consistency of the raw data, Cronbach’s alpha needs to be measured. As stated in section 7.1.1 the Cronbach’s alpha needs to be higher than 0.7. Table 6 shows the Cronbach’s alpha of the statements which scored lower than 0.7. For a full list of Cronbach’s alpha values, see Appendix H. Noticeable in the list of all Cronbach’s alphas are the high values of consistency of enterprise architect maturity. This is due to the fact that a large fraction (32 persons) of the respondents has an architect role. This also explains the lower level

of Cronbach's alpha of the other two constructs, because architects do have knowledge about these constructs but it is not their daily work.

TABLE 6: (SUB) CATEGORIES WITH A CRONBACH'S ALPHA LOWER THAN 0.700

<b>Category/sub category</b>	<b>Statements</b>	<b>Cronbach's alpha</b>
<b><u>Business complexity</u></b>		
<i>Internal communication</i>	Within the organization a clear set of terminologies is present and in use by all employees.	0.592
	Internal communication within our organization is understandable for everyone within the organization.	
<i>Fulfillment of roles</i>	Roles are not explicitly defined and employees report to several managers.	0.547
	Employees are fulfilling multiple roles simultaneously.	
<i>Operating markets/segments/countries</i>	We are a multinational organization operating in multiple domains.	0.637
	Our organization serves a wide variations of markets/segments in different countries.	
<i>Launching new products</i>	The past five years our organization has launched more new products/services than our competitors.	0.476
	Compared to our competitors, our organization has a highly innovative product portfolio.	
<i>Diversity in customer demands</i>	The diversity of customer demands is high compared to other organizations (also within other segments).	0.695
	Our organization has to produce many different products/services to meet customer demands compared to other organizations.	
<i>Core business processes</i>	The core business process is well-established and easy to execute.	0.656
	The organization has a core business process, based on best practice that is formalized and utilized by all departments.	
<i>Number of competitors</i>	The number of competitors is high compared to the number of competitors in other markets.	0.450
	Competition is high within our market.	
<b><u>Business Performance</u></b>		
<i>Decision making</i>	Our decision making process is well-established and easy to understand.	0.676
	Our decision making process has been effective in the past.	

The Cronbach's alpha coefficient needs to be preferably 0.7, but 0.60 is the lower limit of acceptability (Hair, 2009). Other papers mention that a value between 0.60 and 0.70 is questionable.

Chosen is to delete the categories which had a Cronbach's alpha lower than 0.6. These categories are: Internal communication, Fulfillment of roles, Launching new products and number of competitors. The research model is therefore changed and the changed research model with the deleted items are given in Figure 18. Four categories are deleted at the left side of the model. The construct business complexity is therefore made up of 9 categories instead of 13 categories. While the other constructs are measures with 8 en 6 measures, 9 categories is enough to measure business complexity.

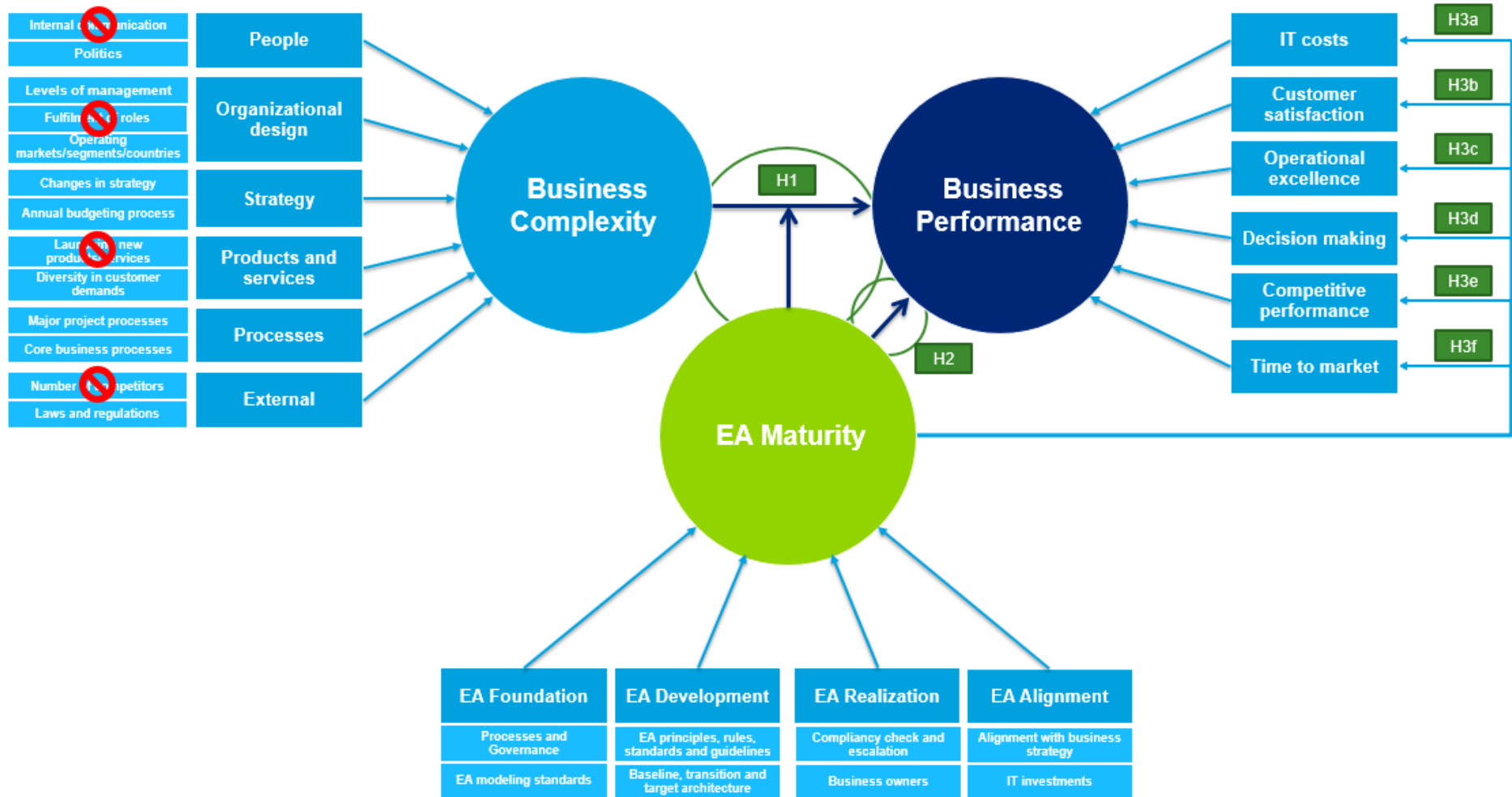


FIGURE 18: RESEARCH MODEL REVISED WITH DELETION OF CATEGORIES WITH A CRONBACH'SALPHA LOWER THAN 0.600

---

### 7.1.3 REVERSE THE POLARITY OF STATEMENTS

---

To get the correct interpretation of the data, some statements need to be reversed in polarity. As stated, each statement is stated twice, what results in two measures of the same sub construct. Furthermore combinations of statements are constructs within this research. Therefore, the answers on the statements for a construct have to be all negative or positive when 'strongly agree' is filled in. This can be easily done within SPSS. The result of this reversion of polarity influence the constructs as follows:

- A high score on complexity means that an organization is complex.
- A high score on EA maturity means that an organization is mature considering enterprise architecture
- A high score on Business performance means that an organization is performing well.

---

### 7.1.4 DATA CLEANSING

---

The previous steps are done to clean the raw data. Remaining are the answers of 'not applicable/I don't know'. This option was given because some statements were not applicable or people did not have the knowledge to answer some of the statements. Within scientific research several options are given in order to handle with these 'missing values'. The first option is too leave the 'not applicable/I don't know'-answers out of the data set and to calculate means without these values. The answers are after all filled in with a reason. Other options are the three basic methods presented by Roth and Switzer (1995): (a) mean substitution, (b) regression imputation, and (c) hot-deck imputation. Mean substitution is replacing missing values with the mean of the given question. Regression imputation and hot-deck imputation is replacing the missing value with a probable value. From the three basic methods the most commonly used method is mean substitution, according to Raaijmakers (1999). Therefore this basic method is also considered to use within this research. The options which are remaining are:

1. Leave the 'not-applicable/I don't know' out of the data set. The data will have gaps, but only small gaps since each person has filled in the questionnaire for at least 80% without 'not-applicable/I don't know'. Even 31 people filled in the questionnaire entirely and without 'not applicable/I don't know'-option filled in.
2. Fill the data gaps with mean substitution. This means that the missing value will be replaced by the mean of this specific item for all persons answered. The data set will not have gaps; the missing values are replaced by the mean.

Option 1 is chosen, because of the following three reasons. First, SPSS can leave out the missing values. Second, the constructs of business performance, e.g. IT costs and customer satisfaction are set up of two questions. It is not fair to reconstitute the 'not-applicable/I don't know'-option by the mean; this will have a great influence on the outcome of the research. Third, the mean does not necessarily have to correspond with the current situation. A better way to handle the missing values is to leave these out; often it is only a small part of the data that has to be left out this way.

---

### 7.1.5 COMBINE SCORES

---

In order to combine score for determining the score of a construct two choices can be made, namely: sum all scores or take the mean of all scores. Because there are missing values the sum of all scores is not an option, because this influences the overall score and therefore the outcome. Therefore is chosen to take the mean of all scores.

---

## 7.2 DATA ANALYSIS

---

Within this section the data and sample are given, as well as a short introduction about simple linear regression. Furthermore the actions taken to analyze the data are given and the outcome of this statistical analysis is described as well. This analysis is performed from which conclusions can be drawn whether the hypotheses given in chapter 6 can be confirmed or not. The following steps are done in order to give these conclusions, see Figure 19.

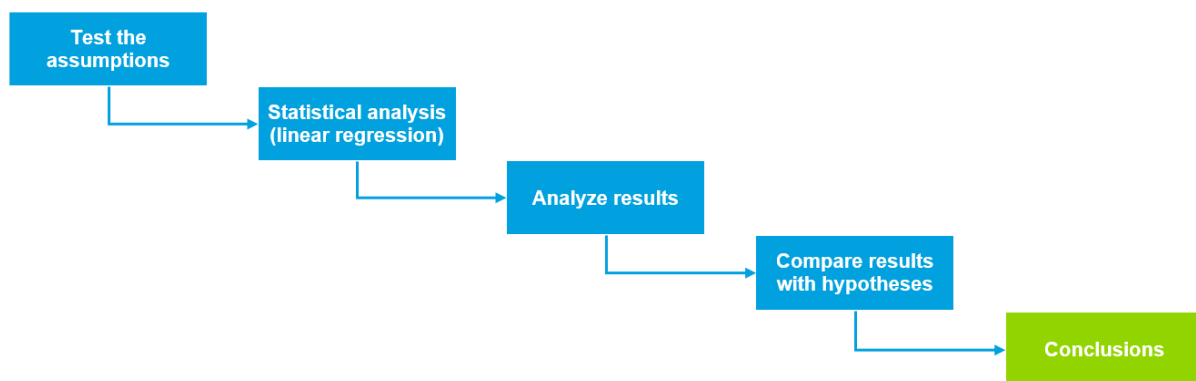


FIGURE 19: STEPS TO ANALYZE THE DATA

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### 7.2.1 DATA AND SAMPLE

---

The data gathered in this study is obtained through an international study across all industries and 3 countries. This is done in order to make this research generalizable (Saunders *et al.* 2009). Also, a represented number of responses are important in order to increase reliability and robustness of this study (Saunders *et al.*, 2009). In total 48 responses are taken into account within this research, from which 4 were filled in anonymously. The survey is conducted in the broadest form possible, as can be seen in section 6.3.1.

Since this study investigates the correlations between business complexity, enterprise architecture maturity and business performance, it is key that the respondents have knowledge of all those three constructs. Furthermore, since this study has its main focus on enterprise architecture maturity, and this is mostly specialized knowledge, the survey was administered to senior Information Technology management such as: Enterprise architects, Solution architects and IT architects. To propose this questionnaire to senior executives, it is highly probable that they have the same knowledge about the given constructs.

As stated in section 6.3.1, to acquire all the data several sources are used. First, colleagues at Deloitte worked for different companies and knew people to contact with the required knowledge. These people were contacted by mail to fill in the questionnaire, the mail is given in Appendix G. Second, several Linked-In groups were used to identify a relevant population for this study.

---

## 7.2.2 INTRODUCTION TO THE ANALYSIS THROUGH LINEAR REGRESSION

---

To test the hypotheses derived from the approach in Part 2 the data set as stated above needs to be analyzed. Many different statistical options are available. Within this research simple linear regression can be used. An introduction of linear regression is given.

Linear regression is an approach in statistics to model the relationship between a dependent variable and one or more independent variable. Simple linear regression includes one independent variable, the formula for this is as follows:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

*Where,  $y_i$  is the dependent variable,  $c$  is a constant,  $\beta_1 x_1$  is the regression coefficient of the first independent variable times the first independent variable and  $\varepsilon_i$  is prediction error*

---

When using more than one independent variable multiple linear regression can be used. The formula for multiple linear regression is as follows:

---

$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \dots + \varepsilon_i$$

*Where,  $y_i$  is the dependent variable,  $c$  is a constant,  $\beta_1 x_1$  is the regression coefficient of the first independent variable times the first independent variable,  $\beta_2 x_2$  is the regression coefficient of the second independent variable times the second independent variable and  $\varepsilon_i$  is prediction error*

---

In order to perform linear regression the constructs needs to fulfill four assumptions. These assumptions are given and measured within section 7.2.3.

---

## 7.2.3 ASSUMPTIONS FOR SIMPLE LINEAR REGRESSION

---

According to Field (2009) and Hair (2009) the four assumptions which have to be accepted in order to perform linear regression analyses are:

- Normality
- Linearity
- Homoscedasticity
- Independence

---

### 7.2.3.1 ASSUMPTIONS DESCRIBED

---

Normality is the “degree to which the distribution of the sample data corresponds to a normal distribution” (Hair, 2009). In order to measure normality a histogram of the standardized residuals is given. This histogram has to show a bell-shaped curve in order to accept the assumption normality (Field, 2009; Hair, 2009). Furthermore a P-P plot with the observed cumulative probability is put against expected cumulative probability. In order to accept the assumption normality, this P-P plot has to show a straight diagonal line.

Linearity means that: “the predict values fall in a straight line by having a constant unit change (slope) of the dependent variable for a constant unit change of the independent variable” (Hair, 2009). In other words, the relationship is modelled is linear. In order to measure linearity the standardized residuals versus standardized predicted values of the regression are plotted. When this graph includes a sort of curve, the assumption of linearity is not met (Field, 2009).

Homoscedasticity is the homogeneity of variance. This means that the variance should be the same through the data set (Field, 2009). In order to measure homoscedasticity the standardized residuals versus standardized predicted values of the regression have to be plotted. The variance of the standardized residuals should be relatively equal for the assumption to not be violated (Hair, 2009).

Independence is “the assumption that one data point does not influence another” (Field, 2009). In case of this research it means that whether the data from one individual is influenced by another. In order to determine independence, the Durbin-Watson value can be consulted. This test can be easily done within SPSS. The Durbin-Watson value needs to be between 1 and 3 (Field, 2009). A definite cause for concern is when the Durbin-Watson value is less than 1 or greater than 3 (Field, 2009).

Thus for each construct the following graphs are provided in order to measure the four assumptions as given above:

- Histogram
- P-P plot
- Standardized residuals versus standardized predicted values
- Table with Durbin-Watson value

These four assumptions are analyzed and the outcome of these measurements and graphs are given in appendix I.

When assumptions are not met, this obviously limits the generalizability of the findings.

---

#### 7.2.3.2 CONCLUSION OF THE MEASUREMENT OF THE ASSUMPTIONS

---

From the analysis of the above mentioned assumptions the following conclusion can be given. As stated in appendix I, only the models for competitive performance and time to market do violate the assumptions in order to perform simple linear regression. Thus, the model does not fit for linear regression analysis. This is shortly described during the analysis and comparison with the hypothesis (section 8.2.4).

The other models do fit for linear regression analysis and these models are appropriate.

---

#### 7.2.4 ANALYZE RESULTS AND COMPARE RESULTS WITH THE HYPOTHESES

---

After the assumptions are accepted the simple regression analysis is executed. The following parts within linear regression analysis are important.

First, the significance of the measurement is important. According to Field (2009) there is a significant effect when the probability of the effect is less than 0.05. When this probability is less than 0.05 there is not necessarily a significant effect, but the measurement is significant. Then, it is generally accepted that there is an effect in the population (Field, 2009) When the value is higher than 0.05 the hypothesis is rejected. It tells that the effect is not big enough; it is a chance finding and it will not tell the effect of it (Field, 2009). This value can be read in SPSS within the Coefficients-table; this is called the ‘Sig.’-value.

When the measurement is significant, the regression coefficient tells the strength and the direction of the effect. In SPSS this can be read in the ‘Model Summary’-table, the value of ‘R’ tell us the strength and the direction. A positive value suggests a positive direction, while the value itself suggests the strength. This value is a number between -1 and 1.



Third, the 'R square' value tells us the predictive or explanatory power. This coefficient of determination is a measure of the amount of variability of the dependent variable, which is explained by the independent variable (Field, 2009; Hair, 2009). This coefficient can vary between 0 and 1. The higher the value, the greater the explanatory power of the regression equation (Hair, 2009). A higher coefficient also suggest a better prediction of the dependent variable.

Fourth and last, within the Coefficients'-table the constant and the regression coefficient can be read. The constant is the value 'constant' in the regression formula. The regression coefficient is the coefficient that tells the strength and direction of the independent variable; each independent variable has its own coefficient. The formula for linear regression analysis is:

---


$$y_i = c + \beta_1x_1 + \beta_2x_2 + \dots + \varepsilon_i$$

*Where,  $y_i$  is the dependent variable,  $c$  is a constant,  $\beta_1x_1$  is the regression coefficient of the first independent variable times the first independent variable,  $\beta_2x_2$  is the regression coefficient of the second independent variable times the second independent variable and  $\varepsilon_i$  is prediction error*

---

All the above mentioned values are discussed per hypothesis, when the measurement is proved to be significant. The output of the results per hypothesis are given in Appendix J. An overview of the results is given in 7.2.4.9.

#### 7.2.4.1 H1: THE INFLUENCE OF BUSINESS COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION.

---

The first hypothesis is the most difficult hypothesis to measure. This hypothesis is the only one with two variables. Simple linear regression with two independent variables is used to analyse the relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

---


$$y_i = c + \beta_1x_1 + \beta_2x_2 + \varepsilon_i$$

*Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1x_1$  is business complexity and  $\beta_2x_2$  is enterprise architecture maturity.*

---

Based on the analysis the significance of this measurement is: 0.140. Therefore this measurement is not proved to be significant. As stated in Appendix J, the significance of enterprise architecture is 0.006 and the significance of business complexity is 0.140. This observation means that enterprise architecture has a greater influence on business performance than business complexity has, when taking all the business complexity measures into account.

This initial hypothesis is not accepted, because the measurement is proved to be non-significant. From the data it can be stated that the influence of enterprise architecture maturity is higher than the influence of business complexity on business performance.

#### 7.2.4.2 H2: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCES BUSINESS PERFORMANCE POSITIVELY.

---

This hypothesis is about the constructs enterprise architecture maturity and business performance. Simple linear regression with a single independent variable is used to analyse the relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

*Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is enterprise architecture maturity.*

---

Based on the analysis the significance of this measurement is: 0.000. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.504, which suggests a positive relationship between enterprise architecture maturity and business performance.

The R squared for this relationship is 0.254, which suggests an explanatory power of 25.4%. This value tells us that business performance can be explained for 25.4% by enterprise architecture maturity.

Based on the analysis the following formula regarding business performance and enterprise architecture maturity is described as:

---

$$BP = 1.596 + (0.437 * \text{level of EAM}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between enterprise architecture maturity and business performance and the measurement is significant.

#### 7.2.4.3 H3A: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION REDUCES IT COSTS.

---

This hypothesis is about the constructs enterprise architecture maturity and IT costs. Simple linear regression with a single independent variable is used to analyse the relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

*Where,  $y_i$  is IT costs,  $c$  is a constant,  $\beta_1 x_1$  is enterprise architecture maturity.*

---

Based on the analysis the significance of this measurement is: 0.001. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.460, which suggests a positive relationship between enterprise architecture maturity and IT costs.

The R squared for this relationship is 0.212, which suggests an explanatory power of 21.2%. This value tells us that IT costs can be explained for 21.2% by enterprise architecture maturity.

Based on the analysis the following formula regarding IT costs and enterprise architecture maturity is described as:

---

$$IT\ costs = 0.439 + (0.768 * \text{level of EAM}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between enterprise architecture maturity and IT costs and the measurement is significant.

#### 7.2.4.4 H3B: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCES CUSTOMER SATISFACTION POSITIVELY.

---

This hypothesis is about the constructs enterprise architecture maturity and customer satisfaction. Simple linear regression with a single independent variable is used to analyse the

relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

---

Where,  $y_i$  is customer satisfaction,  $c$  is a constant,  $\beta_1 x_1$  is enterprise architecture maturity.

---

Based on the analysis the significance of this measurement is: 0.016. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.347, which suggests a positive relationship between enterprise architecture maturity and customer satisfaction.

The R squared for this relationship is 0.121, which suggests an explanatory power of 12.1%. This value tells us that customer satisfaction can be explained for 12.1% by enterprise architecture maturity.

Based on the analysis the following formula regarding customer satisfaction and enterprise architecture maturity is described as:

---

$$\text{Customer satisfaction} = 2.304 + (0.415 * \text{level of EAM}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between enterprise architecture maturity and customer satisfaction and the measurement is significant.

#### 7.2.4.5 H3C: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE OPERATIONAL EXCELLENCE POSITIVELY.

---

This hypothesis is about the constructs enterprise architecture maturity and operational excellence. Simple linear regression with a single independent variable is used to analyse the relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

---

Where,  $y_i$  is operational excellence,  $c$  is a constant,  $\beta_1 x_1$  is enterprise architecture maturity.

---

Based on the analysis the significance of this measurement is: 0.045. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.290, which suggests a positive relationship between enterprise architecture maturity and operational excellence.

The R squared for this relationship is 0.084, which suggests an explanatory power of 8.4%. This value tells us that operational excellence can be explained for 8.4% by enterprise architecture maturity.

Based on the analysis the following formula regarding operational excellence and enterprise architecture maturity is described as:

---

$$\text{Operational excellence} = 1.636 + (0.360 * \text{level of EAM}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between enterprise architecture maturity and operational excellence and the measurement is significant.

#### 7.2.4.6 H3D: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE DECISION MAKING POSITIVELY.

This hypothesis is about the constructs enterprise architecture maturity and decision making. Simple linear regression with a single independent variable is used to analyse the relationship in order to accept or reject the above given hypothesis. The following formula is stated for this hypothesis:

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

*Where,  $y_i$  is decision making,  $c$  is a constant,  $\beta_1 x_1$  is enterprise architecture maturity.*

Based on the analysis the significance of this measurement is: 0.001. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.475, which suggests a positive relationship between enterprise architecture maturity and decision making.

The R squared for this relationship is 0.226, which suggests an explanatory power of 22.6%. This value tells us that decision making can be explained for 22.6% by enterprise architecture maturity.

Based on the analysis the following formula regarding decision making and enterprise architecture maturity is described as:

$$\text{Decision making} = 0.826 + (0.632 * \text{level of EAM}) + \varepsilon_i$$

This hypothesis is accepted, because the data suggests a positive relationship between enterprise architecture maturity and decision making and the measurement is significant.

#### 7.2.4.7 H3E: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE COMPETITIVE PERFORMANCE POSITIVELY.

Based on the test of the assumption to perform linear regression analysis it suggested that the assumptions are not met. This can also be seen in the output of linear regression analysis. The significance of this measurement is 0.963, what is far above the 0.05 to prove the measurement to be significant. Furthermore the regression coefficient is 0.007, which also not supports the hypothesis. Based on these measurements this hypothesis cannot be accepted.

#### 7.2.4.8 H3F: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE TIME TO MARKET POSITIVELY.

Based on the test of the assumption to perform linear regression analysis it suggested that the assumptions are not met. This can also be seen in the output of linear regression analysis. The significance of this measurement is 0.550, what is far above the 0.05 to prove the measurement to be significant. Furthermore the regression coefficient is 0.093, which also not supports the hypothesis. Based on these measurements this hypothesis cannot be accepted.

#### 7.2.4.9 OVERVIEW OF THE OUTCOME OF THE LINEAR REGRESSION ANALYSIS

The results of this linear regression analysis is summarized in Table 7. Figure 20 shows the research model given in Figure 15 with the hypotheses which are accepted with the regression coefficient and the hypotheses which are not accepted.

TABLE 7: OVERVIEW OF THE LINEAR REGRESSION ANALYSIS RESULTS

<i>Hypothesis</i>	<b>Significance</b>	<b>Regression coefficient</b>	<b>R square</b>	<b>Formula</b>
<i>H1: The influence of business complexity on business performance is moderated by the maturity of enterprise architecture of an organization.</i>	0,140			NONE
<i>H2: The maturity of enterprise architecture of an organization influences business performance positively.</i>	0,000	0,504	0,254	Business performance = 1,596 + (0,437 * level of EAM) + $\varepsilon_i$
<i>H3a: The maturity of enterprise architecture of an organization reduces IT costs.</i>	0,001	0,460	0,212	IT costs = 0,439 + (0,768 * level of EAM) + $\varepsilon_i$
<i>H3b: The maturity of enterprise architecture of an organization influences customer satisfaction positively.</i>	0,016	0,347	0,121	Customer satisfaction = 2,304 + (0,415 * level of EAM) + $\varepsilon_i$
<i>H3c: The maturity of enterprise architecture of an organization influence operational excellence positively.</i>	0,045	0,290	0,084	Operational excellence: 1,636 + (0,360 * level of EAM) + $\varepsilon_i$
<i>H3d: The maturity of enterprise architecture of an organization influence decision making positively.</i>	0,001	0,475	0,226	Decision making = 0,826 + (0,632 * level of EAM) + $\varepsilon_i$
<i>H3e: The maturity of enterprise architecture of an organization influence competitive performance positively.</i>	0,963	0,007		NONE
<i>H3f: The maturity of enterprise architecture of an organization influence time to market positively.</i>	0,550	0,093		NONE

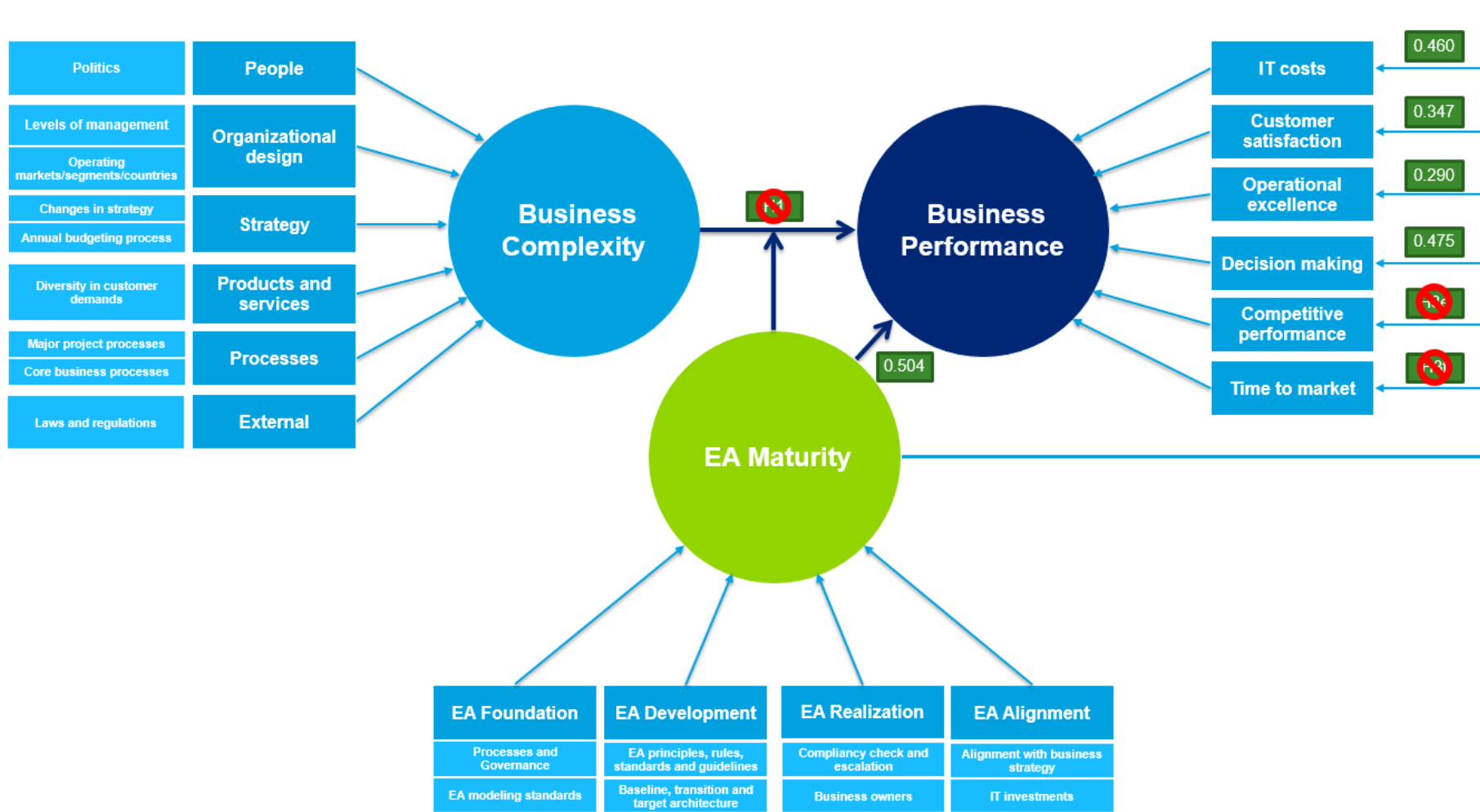


FIGURE 20: RESEARCHED MODEL WITH THE ACCEPTED AND REJECTED HYPOTHESIS

---

## 7.2.5 ANALYSIS OF PARTS OF THE CONSTRUCTS

---

Further inspection of the data lead to notable results for this research. The constructs of this research are conducted of several sub-constructs. Analysis of these sub-constructs lead to interesting insights for this research. These interesting insights are discussed below. First business complexity is described in more detail (7.2.5.1) followed by enterprise architecture maturity (7.2.5.2).

---

### 7.2.5.1 BUSINESS COMPLEXITY

---

As stated in section 7.2.4.1, there was no significant measurement of the relationship of business complexity on business performance with the moderating value of enterprise architecture. As stated in Jay and Collinson (2012) the influence of business complexity on business performance is confirmed. Within this research this is also confirmed. The following formula is stated for this:

---

$$y_i = c + \beta_1 x_1 + \varepsilon_i$$

*Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is business complexity.*

---

Based on the analysis the significance of this measurement is: 0.005. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.397, which suggests a positive relationship between business complexity and business performance.

The R squared for this relationship is 0.158, which suggests an explanatory power of 15.8%. This value tells us that business performance can be explained for 15.8% by business complexity.

Based on the analysis the following formula regarding business performance and enterprise architecture maturity is described as:

---

$$BP = 4.365 - (0.394 * \text{level of BC}) + \varepsilon_i$$

---

So also this research accepts the influence of business complexity on business performance, because the data suggests a positive relationship between business complexity and business performance.

While business complexity is built up of several sub-constructs, the influence of some sub-constructs are left out to gain a significant measurement. A way of categorizing these sub-constructs lead to three categories, namely:

- Strategic complexity, including people, organizational design and strategy.
- Operational complexity, including products and services and processes.
- External complexity, including external.

Within the new measurement business complexity consisted of strategic complexity. Based on the analysis the significance of this measurement is: 0.035. Therefore this measurement is proved to be significant. The following formula is stated for this:

---

$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i$$

*Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is strategic complexity and  $\beta_2 x_2$  is enterprise architecture maturity.*

---

The regression coefficient of this relationship is 0.570, which suggests a positive relationship between enterprise architecture maturity, strategic complexity and business performance.

The R squared for this relationship is 0.295, which suggests an explanatory power of 29.5%. This value tells us that business performance can be explained for 29.5% by enterprise architecture maturity and strategic complexity.

Based on the analysis the following formula regarding business performance, enterprise architecture maturity and strategic complexity is described as:

---

$$BP = 2.653 - (0.245 * \text{level of strategic complexity}) + (0.344 * \text{level of EAM}) + \varepsilon_i$$

---

So, there is a significant relationship when business complexity is only consisted of the sub-constructs people, organizational design and strategy. Also, in this relationship the influence of enterprise architecture maturity is greater than the influence of business complexity on business performance. This is in common with the initial hypothesis (H1), which was not significant.

The other categories (operational and external) or a combination of the three categories (strategic, operational and/or external) did not result in a significant measurement.

#### 7.2.5.2 ENTERPRISE ARCHITECTURE MATURITY

---

The interesting analysis that the strategic complexity of an organization in combination with enterprise architecture maturity has a significant influence on business performance, raises another questions, namely: Which enterprise architecture maturity category has the greatest influence in combination with strategic complexity on business performance?

Therefore the four sub-constructs of enterprise architecture maturity are analyzed in more detail. The influence of these four sub-constructs in combination with strategic complexity on business performance is measured. This is described below.

##### **EA Foundation**

The first enterprise architecture maturity category is EA Foundation. The following formula is stated for this:

---

$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i$$

---

*Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is strategic complexity and  $\beta_2 x_2$  is EA foundation.*

---

Based on the analysis the significance of this measurement is: 0.004. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.464, which suggests a positive relationship between strategic complexity, EA Foundation and business performance

The R squared for this relationship is 0.215, which suggests an explanatory power of 21.5%. This value tells us that business performance can be explained for 21.5% by strategic complexity and EA Foundation.

Based on the analysis the following formula regarding strategic complexity, EA Foundation and business performance is described as:



---


$$BP = 3.577 - (0.312 * \text{level of strategic complexity}) + (0.632 * \text{level of EA Foundation}) + \varepsilon_i$$


---

This hypothesis is accepted, because the data suggests a positive relationship between regarding strategic complexity, EA Foundation and business performance.

### **EA Development**

The second enterprise architecture maturity category is EA Development. The following formula is stated for this:

---


$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i$$


---

Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is strategic complexity and  $\beta_2 x_2$  is EA Development.

---

Based on the analysis the significance of this measurement is: 0.002. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.498, which suggests a positive relationship between strategic complexity, EA Development and business performance

The R squared for this relationship is 0.248, which suggests an explanatory power of 24.8%. This value tells us that business performance can be explained for 24.8% by strategic complexity and EA Development.

Based on the analysis the following formula regarding strategic complexity, EA Development and business performance is described as:

---


$$BP = 3.406 - (0.322 * \text{level of strategic complexity}) + (0.171 * \text{level of EA Development}) + \varepsilon_i$$


---

This hypothesis is accepted, because the data suggests a positive relationship between regarding strategic complexity, EA Development and business performance.

### **EA Realization**

The third enterprise architecture maturity category is EA Realization. The following formula is stated for this:

---


$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i$$


---

Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is strategic complexity and  $\beta_2 x_2$  is EA Realization.

---

Based on the analysis the significance of this measurement is: 0.000. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.538, which suggests a positive relationship between strategic complexity, EA Realization and business performance

The R squared for this relationship is 0.290, which suggests an explanatory power of 29.0%. This value tells us that business performance can be explained for 29.0% by strategic complexity and EA Realization.

Based on the analysis the following formula regarding strategic complexity, EA Realization and business performance is described as:

---

$$BP = 3.292 - (0.333 * \text{level of strategic complexity}) + (0.206 * \text{level of EA Realization}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between regarding strategic complexity, EA Realization and business performance.

### **EA Alignment**

The fourth and last enterprise architecture maturity category is EA Alignment. The following formula is stated for this:

---

$$y_i = c + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i$$

---

Where,  $y_i$  is business performance,  $c$  is a constant,  $\beta_1 x_1$  is strategic complexity and  $\beta_2 x_2$  is EA Alignment.

---

Based on the analysis the significance of this measurement is: 0.000. Therefore this measurement is proved to be significant.

The regression coefficient of this relationship is 0.628, which suggests a positive relationship between strategic complexity, EA Alignment and business performance

The R squared for this relationship is 0.395, which suggests an explanatory power of 39.5%. This value tells us that business performance can be explained for 39.5% by strategic complexity and EA Alignment.

Based on the analysis the following formula regarding strategic complexity, EA Alignment and business performance is described as:

---

$$BP = 2.355 - (0.196 * \text{level of strategic complexity}) + (0.397 * \text{level of EA Alignment}) + \varepsilon_i$$

---

This hypothesis is accepted, because the data suggests a positive relationship between regarding strategic complexity, EA Alignment and business performance.

### **7.2.5.3 OVERVIEW OF THE OUTCOME OF THE LINEAR REGRESSION**

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The results of the above mentioned statements with linear regression analysis is summarized in Table 8 and Figure 21.

TABLE 8: OVERVIEW OF THE LINEAR REGRESSION ANALYSIS RESULTS

<i>Statement</i>	<b>Significance</b>	<b>Regression coefficient</b>	<b>R square</b>	<b>Formula</b>
<i>The influence of strategic complexity on business performance is moderated by the maturity of enterprise architecture of an organization.</i>	0.000	0.570	0.295	Business performance = 2.653 – (0.245 * level of strategic complexity) + (0.344 * level of EAM) + $\varepsilon_i$
<i>Business complexity of an organization influences business performance negatively.</i>	0.005	0.397	0.158	Business performance = 4.365 – (0.394 * level of BC) + $\varepsilon_i$
<i>The influence of strategic complexity on business performance is moderated by EA Foundation.</i>	0.004	0.464	0,215	Business performance = 3.577 – (0.312 * level of strategic complexity) + (0.632 * level of EA Foundation) + $\varepsilon_i$
<i>The influence of strategic complexity on business performance is moderated by EA Development.</i>	0.002	0.498	0.248	Business performance = 3.406 – (0.322 * level of strategic complexity) + (0.171 * level of EA Development) + $\varepsilon_i$
<i>The influence of strategic complexity on business performance is moderated by EA Realization.</i>	0.000	0.538	0.290	Business performance = 3.292 – (0.333 * level of strategic complexity) + (0.206 * level of EA Realization) + $\varepsilon_i$
<i>The influence of strategic complexity on business performance is moderated by EA Alignment.</i>	0.000	0.628	0.395	Business performance = 2.355 – (0.196 * level of strategic complexity) + (0.397 * level of EA Alignment) + $\varepsilon_i$

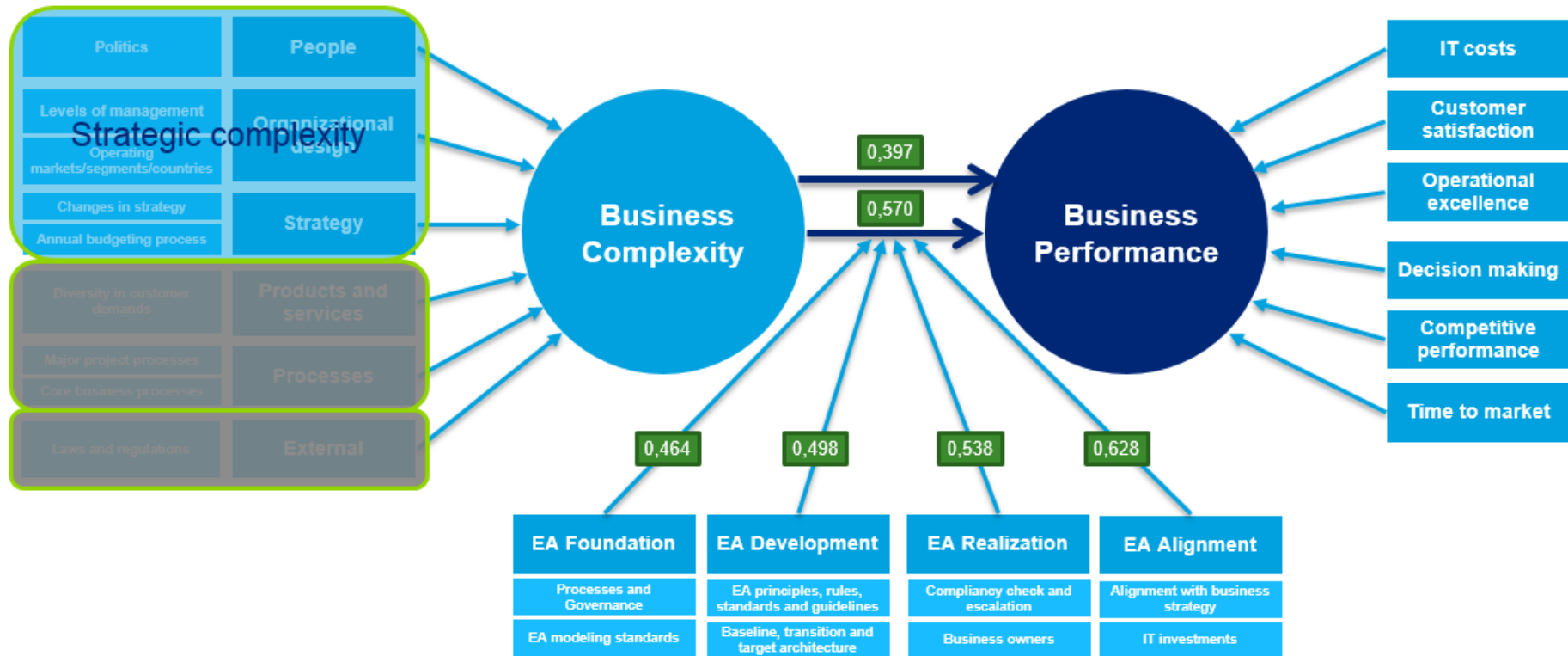


FIGURE 21: THE OVERALL MODEL RESEARCHED WITH THE RESULTS OF DEEPER ANALYSIS

## 8 DISCUSSION

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This chapter discusses the notable results of this research. Expert interviews and two round table sessions<sup>1</sup> are used to explain these results. The results are described regarding the three constructs of this research. In 8.1 business complexity is discussed. In 8.2 enterprise architecture maturity is discussed and finally in 8.3 business performance is discussed.

### 8.1 BUSINESS COMPLEXITY

---

The first hypothesis (H1) of this research is:

**The influence of business complexity on business performance is moderated by the maturity of enterprise architecture of an organization.**

This hypothesis was not accepted, because the measurement was not significant. According to this result, the in literature given influence of business complexity on business performance (Collinson and Jay, 2012) is also analyzed in this research. Within this research business complexity has a positive influence on business performance. Because enterprise architecture maturity has no significant influence on the relationship between business complexity and business performance further inspection on the sub-constructs of business complexity is done.

This further inspection resulted in a notable result, namely the components people, organizational design and strategy together do have a significant influence on business performance moderated by the maturity of enterprise architecture of an organization. These three components can be seen as the strategic components within business complexity and is therefore called strategic complexity within this research.

The other three components have no significant influence on business performance moderated by enterprise architecture maturity. Two of these components (people and processes) can be seen as the operational components of business complexity. These two components have no significant influence on business performance moderated by enterprise architecture maturity of an organization. This also holds for the last component (external), which can be seen as external complexity. Also a combination of two or all three categories of complexity (strategic, operational and external) did not lead to a significant influence.

Thus, because business complexity has a significant influence on business performance, the relationship business complexity on business performance is not significantly moderated by enterprise architecture maturity and the relationship strategic complexity is significantly moderated by enterprise architecture maturity, it is concluded that enterprise architecture maturity only has significant influence on the strategic complexity of an organization. This notable result raised to several people to interesting questions, for example: Why is only the strategic complexity influenced by enterprise architecture maturity? What is the reason that the enterprise architecture maturity does not significantly influences operational complexity?

Experts within and outside Deloitte were interviewed to gain an explanation for the results within this research. Several experts did look surprised at first sight on the result of strategic complexity,

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<sup>1</sup> Experts within this phase of my research were: 5 people within Deloitte, 17 people outside Deloitte from different large organizations within the Netherlands.

Furthermore two round table sessions are organized to gain validation of the results of the analysis. 14 of the 17 people mentioned above outside Deloitte were present during these round table sessions.

while they expected operational complexity as the one which is the most influenced by enterprise architecture. When enterprise architecture processes are designed and tools to describe processes are available, they expected that the further processes within the organization are also described in these tools. This could be the case, but whether these described processes are used in reality is the next question. It is expected that several organizations (also not mature organizations in enterprise architecture) have described their processes within tools or even in PowerPoint or Visio, but do not follow these described processes within their organization. The other explanation lies mainly in the size of the organization. When an organization is big, the several business units or departments are using the processes in their own way, also when the processes are described centrally and/or in a tool.

Based on experiences of experts the following is stated. The explanation for this result lies in the difference between business oriented enterprise architects and IT minded enterprise architects. The result that strategic complexity is only influenced by enterprise architecture is confirmed by the business oriented enterprise architects. A business oriented architect operating in an organization also hammers on business IT alignment, whether the enterprise architecture vision is in line with the business vision. When this is the case the organization is focusing on the sub-construct EA Alignment. When EA Alignment is on a high level, this has a direct contribution on business strategy, which influences the strategic complexity. This also implies that the enterprise architect has to operate in a high level within the organization, only then business IT alignment can be achieved. When operating in a high level, this counters political sparring within an organization. This is one of the measures within the model researched. An IT minded enterprise architect hammers on the sub-constructs EA Foundation and EA Development. For example he focusses on the current architecture, the future architecture and how to transform the IT-organization. It is imaginable that an IT minded enterprise architect does not focus on the business strategy, while the business minded architect can have several people below him which do focus on the IT aspects of enterprise architecture. Thus, this could be an explanation that only the strategic complexity is influenced by enterprise architecture maturity.

## 8.2 ENTERPRISE ARCHITECTURE MATURITY

---

The second hypothesis of this research is:

**The maturity of enterprise architecture of an organization influences business performance positively.**

This hypothesis is confirmed within this research. Within literature many different business performance factors are mentioned, which can be improved by a high level of enterprise architecture maturity. A combination of these factors from literature is used to define business performance, so this result was expected.

Furthermore not only the influence of the different sub-constructs of business complexity were investigated, but also the influence of the single sub-constructs of enterprise architecture maturity are investigated in the relationship with strategic complexity on business performance. These enterprise architecture maturity sub-constructs are: EA Foundation, EA Development, EA Realization and EA Alignment.

The influence of all four sub-constructs as a moderating factor in the relationship strategic complexity on business performance is confirmed within this research, but the strength of these influences differ for each sub-construct as can be found in the analysis in section 7.2.5.2. EA Foundation has the weakest influence as moderating variable within the relationship strategic complexity on business performance. The influence of EA Development and EA Realization is a bit stronger and are almost equal. The strongest moderating influence on the relationship strategic complexity on business performance has EA alignment. The values of these moderating variables are stated in Figure 22.

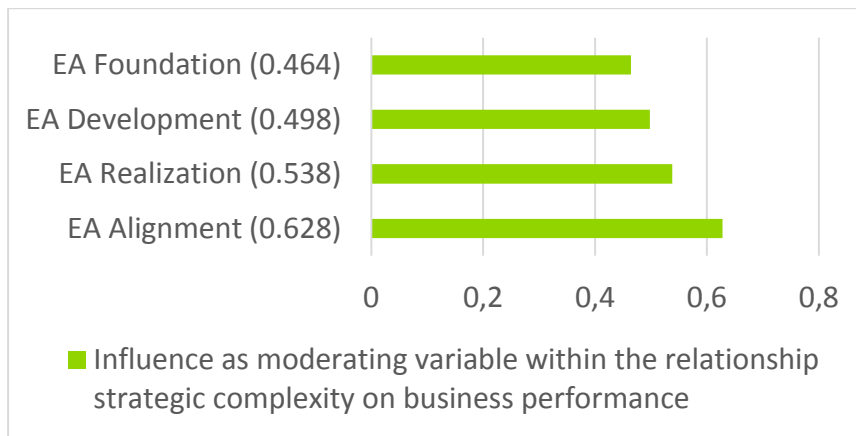


FIGURE 22: THE INFLUENCE OF THE ENTERPRISE ARCHITECTURE SUB-CONSTRUCTS AS MODERATING VARIABLE WITHIN THE RELATIONSHIP STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE.

These results are in line with the explanation as given in section 8.1. It is stated that EA Alignment has the highest influence on strategic complexity. The other three sub-constructs can be achieved whether or not focusing on the business strategy.

### 8.3 BUSINESS PERFORMANCE

The last construct is business performance. Six hypotheses were set up about the sub-constructs of business performance. Four of these six qualitatively researched relations were confirmed by this research, while two are not accepted. The four accepted relationships were between enterprise architecture maturity and:

- Reduced IT costs
- Customer satisfaction
- Operational excellence
- Decision making

The two not accepted qualitatively researched relationships are between enterprise architecture maturity and:

- Competitive performance
- Time to market

In advance it was expected that all six relationships were accepted by the data, because literature states these advantages with a high level of maturity. Therefore the two not accepted relationships are notable results within this research. All these relationships, whether accepted or not were discussed in expert interviews and in the round table sessions. The remarkable results of these sessions are discussed below.

According to expert interviews, people were not surprised of the result that enterprise architecture does not influence competitive performance significantly. Competitive performance has many different moderating factors to explain competitive performance and enterprise architecture maturity is only one of the many.

Experts were surprised on the result that time to market was not influenced by enterprise architecture. After discussion, the following arguments were found for this result. If you are flexible as an organization it does not imply that products and services can be brought to the market quickly. This is also dependent on the effectiveness of the marketing department for example. Short time to market for (new) products can result in ad hoc decision making lacking architecture governance. Also, when a product has to be brought to the market quickly, compromise is used and this solution leads to more IT complexity.

Another suggestion from experts was to use “hard” data, for example profit, instead of reduced IT costs as a performance measure. At the beginning of this project this was also in the line of approach, but this proved not to be realistic in the time available.



## 9 CONCLUSIONS

This chapter describes the conclusions of this research, drawn upon the analysis of the data done as described in the previous chapters. The main research question is answered within this chapter. The main research question is:

### **What is the relationship between enterprise architecture, business complexity and business performance?**

In order to answer this main research question, the sub-research questions as stated in section 3.1 are set up. These are described shortly in this chapter, this is done in section 9.1. As any other research, this research also has certain limitations. These limitations can lead to suggestions for further research; this is described in section 9.2. Section 9.3 states the contributions to both literature and practice of this research.

### 9.1 RESEARCH QUESTIONS

This research is based on three constructs, namely enterprise architecture, business complexity and business performance. These three constructs are described below. First, the components of these constructs are discussed; this answers research questions 1, 4 and 7. Second, how these constructs are measured in this research is discussed; this answers research questions 2, 5 and 8. Furthermore the conclusions of the analysis of the data is given, which is the actual outcome of this research; this answers research questions 3, 6 and 9.

#### 9.1.1 COMPONENTS OF THE CONSTRUCTS

This section gives the components of the constructs within this research. It gives the answer on research questions 1, 4 and 7. These questions are:

1. What business complexity factors are used to categorize organizations?
4. What components does an enterprise architecture maturity model contain?
7. What business performance factors are used to categorize organizations, which are related to enterprise architecture?

Much is written about business complexity and business complexity factors. Within this research the categorization of Collinson and Jay (2012) is used as the basis. They categorize business complexity in (also called sub-constructs of business complexity):

- Products and services
- People
- Organizational design
- Strategy
- Processes
- External

These categories have several sub-categories, which are thoroughly investigated and given in section 4.3.

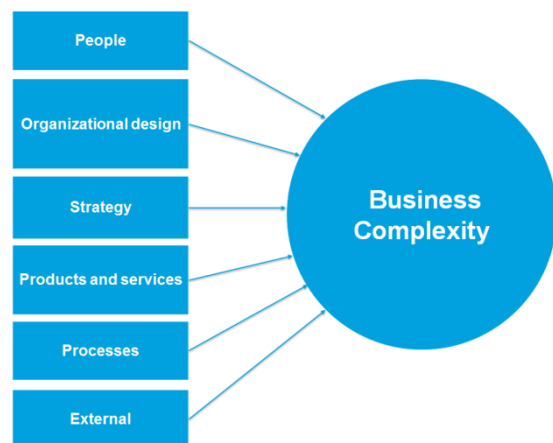


FIGURE 23: BUSINESS COMPLEXITY FACTORS

Due to the presence of several enterprise architecture maturity models an understandable enterprise architecture maturity model is defined. This enterprise architecture maturity model consists of four categories (also called sub-constructs), namely:

- EA Foundation
- EA Development
- EA Realization
- EA Alignment

Within section 4.4 the understandable enterprise architecture model with its components is described in detail. Figure 6 includes the developed understandable model.

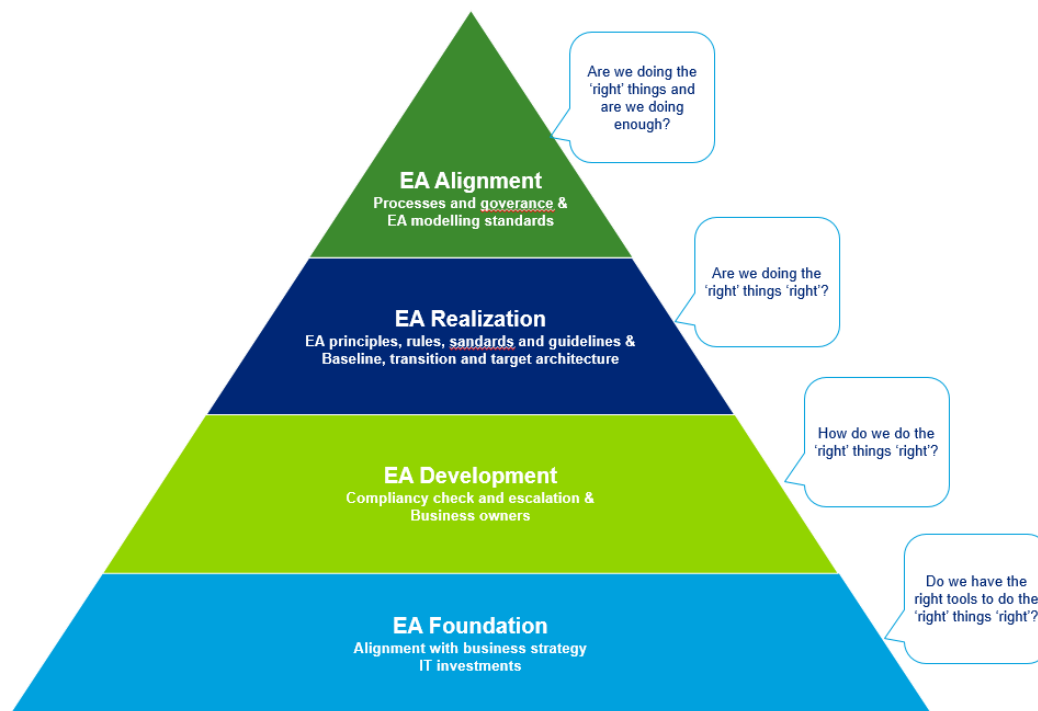


FIGURE 6: UNDERSTANDABLE ENTERPRISE ARCHITECTURE MODEL

Business performance factors can be stated as the benefits of a company; benefits are financial and non-financial. The performance factors as stated in this research are factors when enterprise architecture is present within an organization. The business performance factors (also called sub-constructs of business performance) used in this research are:

- IT costs
- Customer satisfaction
- Operational excellence
- Decision making
- Competitive performance
- Time to market

Based on the literature research hypotheses were set up, these hypotheses are stated in chapter 5. These hypotheses are tested within this research. The model used for this research is given in Figure 15. Also the hypotheses are included in this figure.

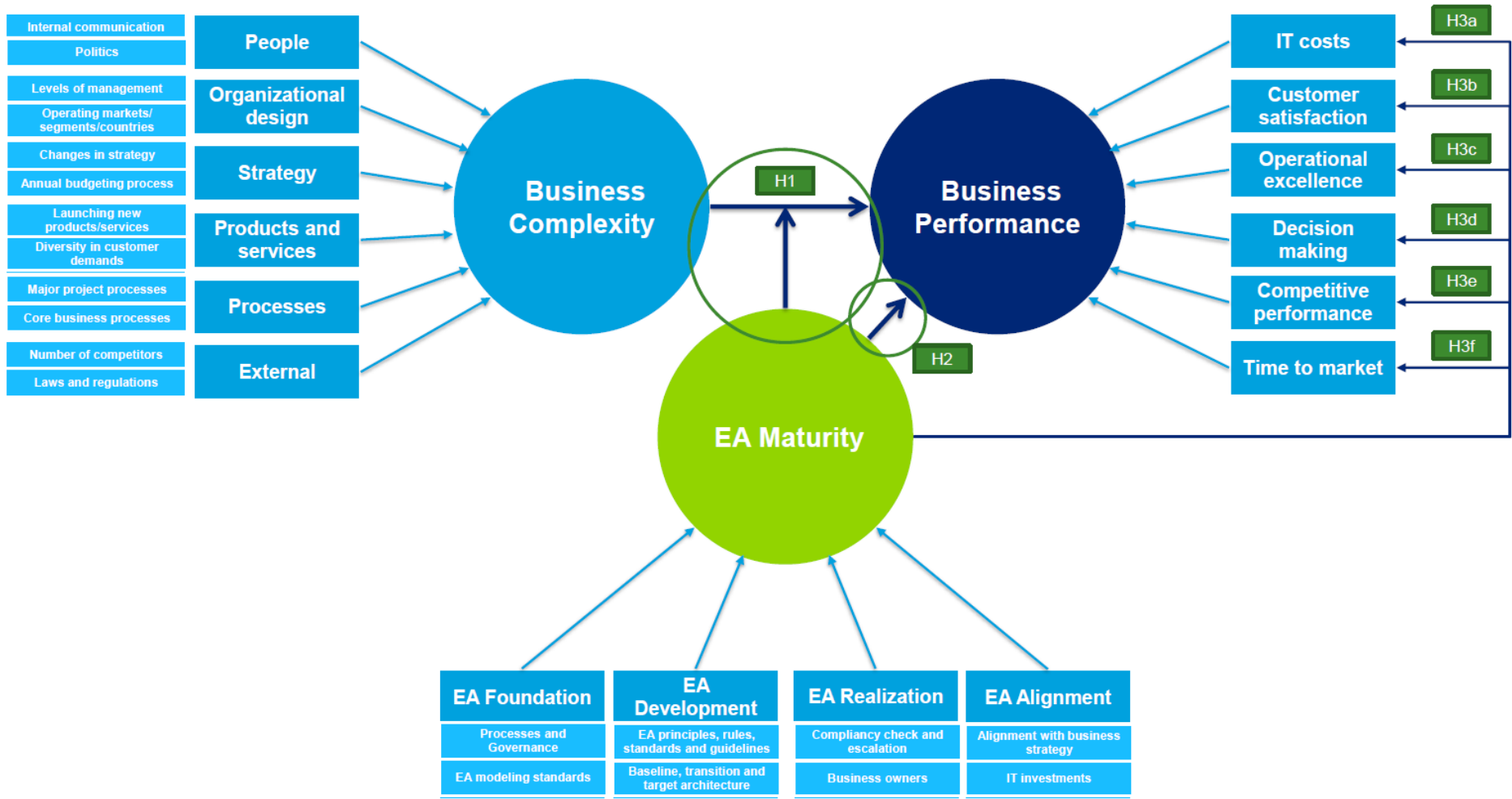


FIGURE 15: RESEARCH MODEL INCLUDING PERFORMANCE AND SUB PERFORMANCE MEASURES AND HYPOTHESES

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## 9.1.2 MEASUREMENT OF THE CONSTRUCTS

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This section gives the way the constructs are measured within this research. It gives answers on research questions 2, 5 and 8. These questions are:

2. How can business complexity of an organization be measured?
5. How can the enterprise architecture maturity of an organization be measured?
8. How can business performance of an organization be measured?

In order to measure the constructs and hypotheses, a questionnaire is built. This questionnaire consists of statements based on the literature reviewed and expert interviews. Each statement is stated twice, what means that two measures of the same (sub-) construct are stated in order to test internal consistency and construct validity. The 5-point Likert scale is used to rate the statements. For a professional look of the questionnaire, the Deloitte-tool SurveyWeb is used to spread the questionnaire. Before spreading out the questionnaire, the questionnaire is pre-tested thrice within Deloitte.

In order to measure business complexity of an organization literature research is used as the basis for developing the statements. These statements are based on the given sub-constructs of products and service, people, organizational design, strategy, processes and external as given in Figure 15.

In order to measure enterprise architecture maturity of an organization literature research and the understandable enterprise architecture maturity model (Figure 6) is used as the basis for developing the statements. These statements are based on the given sub-constructs EA Foundation, EA Development, EA Realization and EA Alignment as given in Figure 15.

In order to measure business performance of an organization literature research is used. Statements are built on existing questionnaires available in literature. These statements are based on the given constructs IT costs, customer satisfaction, operational excellence, decision making, competitive performance and time to market. Also these sub-constructs are given in Figure 15.

The final questionnaire can be found in Appendix F.

Furthermore a plan was made to gain enough responses. Contacts from colleagues and my father are used, as well as LinkedIn was used to spread the questionnaire. This plan is given in section 6.3.1.

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### 9.1.3 CONCLUSIONS OF THE ANALYSIS

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This section describes the conclusions of the analysis and the whole research. It gives answers on the research questions 3, 6 and 9. These questions are:

3. What influence has the enterprise architecture maturity on the organizational characteristics and organizational performance?
6. What influence has the enterprise architecture maturity on business performance?
9. What influence has business complexity and enterprise architecture maturity on business performance?

Based on the analysis of the data collected by the questionnaire, several relationships are investigated and influences are accepted or not. The results of the analysis and this research are:

- The influence of business complexity on business performance is NOT moderated by the maturity of enterprise architecture.
- The maturity of enterprise architecture influences positively:
  - Business performance as a whole.
  - And some of the individual business performance sub-constructs, namely:
    - Customer satisfaction
    - Operational excellence
    - Decision making
    - And it reduces IT costs
- The maturity of enterprise architecture does NOT have an significant influence on:
  - Competitive performance
  - Time to market
- Business complexity influences business performance positively.
- The influence of strategic complexity on business performance is moderated by the maturity of enterprise architecture.
- The influence of operational complexity on business performance is NOT moderated by the maturity of enterprise architecture.
- The influence of external complexity on business performance is NOT moderated by the maturity of enterprise architecture.
- EA Alignment has the STRONGEST moderating influence within the relationship strategic complexity on business performance.
- EA Foundation has the WEAKEST moderating influence within the relationship strategic complexity on business performance

Based on the analysis of the data collected by the questionnaire, the positive influence of enterprise architecture on business performance is quantitatively grounded within this research.

There is a positive significant influence of enterprise architecture maturity on business performance. Also, the influence of strategic complexity on business performance moderated by enterprise architecture maturity proved to be significant. This outcome suggests that the influence of the strategic function of an organization on business performance is moderated by enterprise architecture maturity. This analysis also suggests the influence of enterprise architecture maturity proved to be stronger than the influence of business complexity on business performance. Based on the analysis Table 9 is designed. This table confirms our gut feeling, and is supported within this research. This table gives the answer stated in section 5.1, namely: When the business complexity is high, the EA maturity needs to be high in order to reach a high business performance? According to this research EA maturity needs to be high in order to reach high business performance. It also shows that having low business complexity has a positive influence on business performance. Best performance can be reached when business complexity is low, and enterprise architecture maturity is high.

TABLE 9: THE INFLUENCE OF THE LEVEL OF BUSINESS COPMLEXITY AND ENTERPRISE ARCHITECTURE MATURITY ON BUSINESS PERFORMANCE

Business performance		Strategic complexity	
		Low	High
Enterprise architecture maturity	Low	Low/Medium	Low
	High	High	Medium/high

Other results of this research are regarding the influence of enterprise architecture maturity on the single sub-constructs of business performance. The positive influence of enterprise architecture maturity on reduced IT costs, customer satisfaction, operational excellence and decision making proved to be all significant. This does not hold for the influence of enterprise architecture maturity on competitive performance and time to market. Based on these conclusions Figure 24 states the outcome of the hypotheses of this research. All correlations are given with a correlation coefficient. The results of deeper analysis is given in Figure 25.

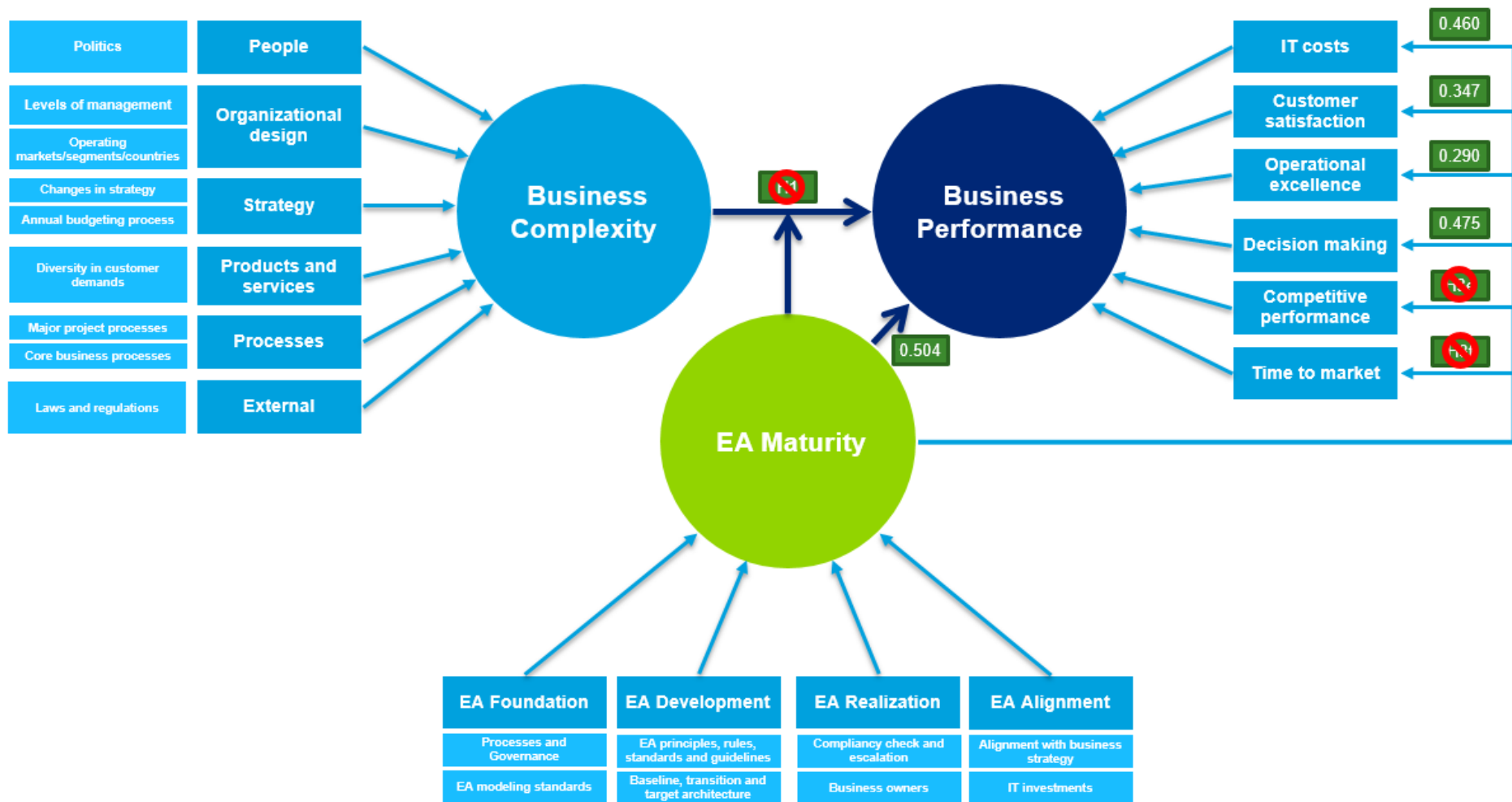


FIGURE 24: THE OVERALL MODEL RESEARCHED WITH THE RESULTS OF ALL HYPOTHESES

Further analysis suggests which EA maturity category has the strongest influence in order to gain a higher business performance. From the analysis EA Alignment proved to be the strongest moderating factor within the relationship strategic complexity on business performance. From expert interviews this is a non-surprising outcome of this research, although EA Alignment has to be reached by the enterprise architecture department. As stated above, the EA pyramid suggest that substantial effort needs to be done within the three other categories in order to have effect within EA Alignment.

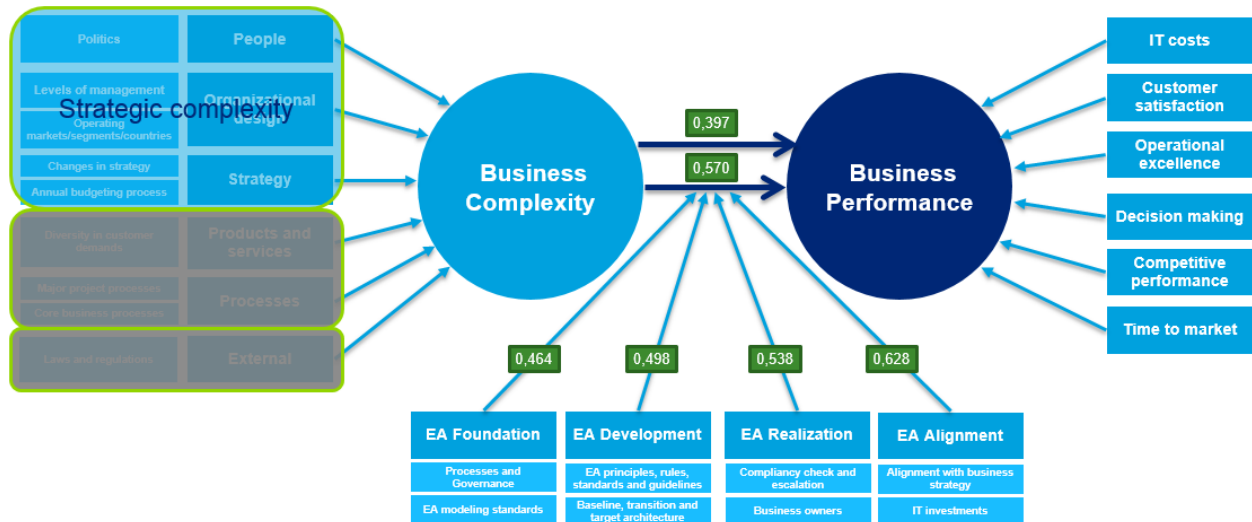


FIGURE 25: THE OVERALL MODEL RESEARCHED WITH THE RESULTS OF DEEPER ANALYSIS



## 9.2 LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

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This research has three important limitations. The first limitation lies in the participants of this research. The participants of my research are senior IT managers within organizations, with a high probability of the knowledge of all three constructs. Interesting could be to let business people fill in this questionnaire and to look whether the outcome of this research is equal. Besides this is a limitation, this also implies a suggestion for further research. The business side of an organization probably have a different view on the business aspects than the senior IT managers within organizations.

Also letting the specialist of each constructs within the organization fill in the questionnaire could give an interesting insight. Whether this is realistic is doubtful; it suggests that three people of one organization or even one business unit has to fill in the questionnaire.

The second important limitation is the fact that the research model as given in Figure 15 on page 34 is limited. It includes only 26 components, while it can be extended to over 100 components. This is a consciously choice, due to time limitations it was not realistic to measure 100 components of each organization. Using 26 component can have an influence on the outcome of this research, but this influence has been decreased to the minimum by choosing the most important categories with the highest impact. For further research the advice is to involve more business complexity factors, more enterprise architecture maturity factors and more business performance factors in order to get a complete picture of an organization. This holds in special for the business performance factors. In this research these factors are the most underexposed. Although the model researched is a good representation of the current state of organizations, this can be extended by asking more information about organizations on all of the three constructs.

The ignorance of difference in industry between organizations is the third important limitation of this research. For example, organizations from different industries define different KPI's. Thus, according to this research for different industries different performance measures have to be defined for business performance. Although this was not realistic in the time available, this is a suggestion for further research. The goal of this research was to make a first step in quantitatively proving the value of enterprise architecture and this goal is reached.

Finally, there is a suggestion for further research. Within the research of Collinson and Jay (2012) a tipping point is described between business complexity and profit. This research does not see a tipping point between business complexity and business performance. Further research could focus on the business performance factors more thoroughly in order to investigate this relationship in more detail.

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## 9.3 CONTRIBUTIONS

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This research has both academic and practical relevance. Therefore contributions of this research is divided in two parts. First contribution to literature is discussed followed by the contribution to practice.

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### 9.3.1 CONTRIBUTION TO LITERATURE

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The contribution to literature lies in the conclusions of this research. The constructs and sub-constructs are based on literature and are therefore not a contribution, but the quantitatively researched correlations are. As stated in Tamm *et al.* (2011) empirical evidence for the qualitative researched relationships is missing. They even state that further empirical enquiry is essential. This is where this research plays a role; it acquires empirical evidence to back qualitative researched relationships. The quantified researched relationship within this research which are accepted and which are as stated in the conclusions are:

- The relationship of enterprise architecture maturity on business performance.
- The relationship of enterprise architecture maturity on IT costs.
- The relationship of enterprise architecture maturity on customer satisfaction.
- The relationship of enterprise architecture maturity on operational excellence.
- The relationship of enterprise architecture maturity on decision making.

The relationships mentioned within qualitative research, but which are not accepted within this research are:

- The relationship of enterprise architecture maturity on competitive performance.
- The relationship of enterprise architecture maturity on time to market.

Furthermore this research contributes to literature because relationships not earlier mentioned are quantitatively researched. This is the main objective of this research and resulted in the following conclusions:

- The influence of business complexity on business performance is not moderated by the maturity of enterprise architecture.
- The influence of strategic complexity on business performance is moderated by the maturity of enterprise architecture.
- The influence of operational complexity on business performance is not moderated by the maturity of enterprise architecture.
- The influence of external complexity on business performance is not moderated by the maturity of enterprise architecture.

Also the influence of the different enterprise architecture categories is investigated. This resulted in:

- EA Alignment has the strongest moderating influence within the relationship strategic complexity on business performance.
- EA Foundation has the weakest moderating influence within the relationship strategic complexity on business performance

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### 9.3.2 CONTRIBUTION TO PRACTICE

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The contribution to literature lies in the researched relationships and the model researched after the literature review.

The relationships as researched are a first step to prove the added value of enterprise architecture. As stated in section 2.3, organizations are struggling with the business value of enterprise architecture. Although this could be extended as stated in the section 'Limitations and further research', people within Deloitte indicate that this research is a nice first step in proving the value of enterprise architecture to organizations. They indicate that the model researched could be used within current assignments.

Furthermore the model researched after the literature review in combination with the outcome of this research is a contribution to practice. For example, to measure business performance factors, underlying factors are investigated and these factors can be used in practice. The outcome of this research helps Deloitte in allocating the component where to put energy in reaching business value for their customers.

Also the outcome that EA alignment has the strongest influence on the relationship between business complexity and business performance is a contribution to practice, while this also suggest where to put energy in reaching a higher business performance.

The contribution to practice of this research does not only lie in the suggestion why organizations should invest in enterprise architecture, but also suggest where to put energy in order to reach higher business performance.

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## APPENDICES

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The first appendix is given on the next page.

## APPENDIX A: STATEMENTS WITH SOURCES

Statements	Source	
<b>Business complexity</b>		
People	1 People are communicating simply within the organization.	Ashkenas (2010) and Collinson and Jay (2012)
	2 Internal communication within our organization is understandable for everyone.	
	1 Within meetings politics play an important role within our organization, sometimes exceeding rational decisions.	Collinson and Jay (2012), expert interviews
	2 I have to deal with too much politics within meetings.	
Organizational design	1 Our organization has too many layers from the CEO to the shop floor considering the size of our organization.	Daft (1992) and Glenn and Malott (2006)
	2 The span of control is too wide, considering the size of our company.	
	1 We are a multinational company operating in multiple domains.	Daft (1992) and Collinson and Jay (2012)
	2 Our organization serves a wide variations of markets/segments in different countries.	
Strategy	1 Our business strategy changes frequently.	Ashkenas (2010) and Collinson and Jay (2012)
	2 Over the past five years we have changed our corporate strategy multiple times.	
	1 The annual budgeting process is clear and simple to understand.	Collinson and Jay (2012)
	2 The budgeting process is centrally controlled and simple to understand.	
Products and services	1 The past five years our organization has launched more new products/services comparing to our competitors.	Ashkenas (2010) and Collinson and Jay (2012)
	2 Compared to our competitors, our organization has a highly innovative product roadmap.	
	1 The diversity of customer demands is high comparing to other organizations.	Morin (1985), Prahalad and Ramaswamy (2000) and Collinson and Jay (2012)
	2 Our organization has to produce many different products/services to meet customer demands compared to other organizations.	
Processes	1 The organization has a project methodology that dictates how a project progresses from idea to project to implementation.	Vermoonen (2010), Ashkenas (2010) and Collinson and Jay (2012)

	2 The organization's project methodology is well-established and applied to every project.	
	1 The core business process is well-established and easy to execute.	Vermoolen (2010), Ashkenas (2010) and Collinson and Jay (2012)
	2 The organization has a core business process, based on best practice, which is formalized and utilized by all departments.	
External	1 The number of competitors is high comparing to other markets.	Glenn and Malott (2006) and Collinson and Jay (2012)
	2 We operate in a highly competitive market.	
	1 In our day to day business we have to take into account complex laws and regulations.	Glenn and Malott (2006) and expert interviews
	2 Regulatory constraints have a big impact on our operation.	
<b>EA maturity</b>		
EA Foundation	1 There is a clear governance structure and process for the creation and implementation of our architectures.	EAMM, E2AMM, EACMM, SAAM, EAMFF and DEAMM
	2 EA processes and governance are well-established and in use throughout the organization.	
	1 Our architects use best practice EA modeling standards for design of the baseline, transition and target architecture.	EAMM, EAMFF and DEAMM
	2 EA Modeling standards are in place for the creation of the business and technology architectures.	
EA Development	1 Our EA principles, rules, standards and guidelines are defined following best practices, but specifically tailored for organization	EAMM, EACMM, and DEAMM
	2 My organization has a clear set of EA principles, rules, standards and guidelines to improve decision making, planning and design.	
	1 Within our organization the baseline, transition, target architecture for both business and technology are present.	EAMM, E2AMM, EACMM and DEAMM
	2 Business blueprints, technology blueprints and a roadmap for transition are in place.	
EA Realization	1 There is a process for compliancy check and escalation during implementation of the target architecture during projects.	Vermoolen (2010), EAMM, E2AMM and EAMFF
	2 The firm has a well-established, timely architectural exception and compliancy check process.	

	<ol style="list-style-type: none"> <li>1 For every process and system one business owner is assigned.</li> <li>2 Business blueprints, technology blueprints and a roadmap for transition are in place.</li> </ol>	E2AMM and DEAMM
EA Alignment	<ol style="list-style-type: none"> <li>1 Our enterprise architecture activities are explicitly linked to our business strategies and/or drivers.</li> <li>2 The organization has a full-time enterprise architecture team (or individual) ensuring alignment between IT and business priorities.</li> </ol>	Vermoolen (2010), E2AMM, EACMM and SAAM
	<ol style="list-style-type: none"> <li>1 Our enterprise architects influence the IT investment and acquisition strategy by delivering a clear target architecture and roadmap.</li> <li>2 Our IT investments and acquisition strategy is partly based on the view of our enterprise architects.</li> </ol>	EAMM, E2AMM, EACMM and DEAMM

### Business performance factors

IT costs	<ol style="list-style-type: none"> <li>1 Our relative IT maintenance costs and IT innovation costs are decreased over the past years.</li> <li>2 The past five years, a relative decrease of operational expenditures is observable.</li> </ol>	Schmidt and Buxmann (2010), Morganwalp and Sage (2004) and Ross <i>et al.</i> (2006)
Customer satisfaction	<ol style="list-style-type: none"> <li>1 A poll of our customers would indicate that they are generally satisfied with our organization.</li> <li>2 Our customers are pleased with the products and services we provide them.</li> </ol>	Bontis (1997), Bozarth <i>et al.</i> (2009), Ross <i>et al.</i> (2006) and Butler (2000)
Operational excellence	<ol style="list-style-type: none"> <li>1 We are leading in operational excellence, because it is one of our main drivers.</li> <li>2 Our organization excels in operational excellence, comparing to our competitors.</li> </ol>	Tamm <i>et al.</i> (2011), Schmidt and Buxmann (2010) and Ross <i>et al.</i> (2006)
Decision making	<ol style="list-style-type: none"> <li>1 Our decision making process is well-established and easy to understand.</li> <li>2 Our decision making process has been effective in the past.</li> </ol>	Tamm <i>et al.</i> (2011), Ross <i>et al.</i> (2006) and Child (1975)
Competitive performance	<ol style="list-style-type: none"> <li>1 Our market share is the highest in the industry.</li> <li>2 The sales of our organization are high as a percentage of sales in the served market.</li> </ol>	Bontis (1997), Anderson and Zeithaml (1984), Bozarth <i>et al.</i> (2008) and Perreault and McCarthy (2002)
Time to market	<ol style="list-style-type: none"> <li>1 The time-to-market is relatively short comparing to our competitors.</li> <li>2 Compared to our competitors, the time from idea generation to product launching is relatively short.</li> </ol>	Afonso <i>et al.</i> (2008), Zachman (2001), Lilien and Yoon (1990) and Zirger and Harley (1996)

## APPENDIX B: QUESTIONNAIRE READY FOR PRE-TEST

### Welcome page

Welcome to this questionnaire about 'Enterprise Architecture Maturity' by Jacco Roest.

Dear participant,

“Enterprise architecture, so what?” is the phrase, which shortly describes the actual research question. Nowadays organizations deal with a complex environment where it is hard to manage the whole organization and to take the correct actions. Enterprise architecture is an indispensable instrument in controlling this complexity, as well as controlling its processes and systems. Enterprise architecture is getting more popular, but what is the value of it? Can enterprise architecture tackle (partly) complexity of organizations? And what is the influence of enterprise architecture on business performance? Within my research I want to answer the above mentioned questions. To gain answers on this questions your participation is needed.

Therefore, your participation in this research study is really appreciated. It should take you less than 15 minutes to complete this survey. Completion is very important for my research study and the design of my study.

While answering this questionnaire, please make sure that you take your role in your organization. I am using your response as a representation for the firm’s overall status. Please make sure to complete all items in the questionnaire. Please make sure that your response is a correct representation; All information you provide will be handled strictly confidential and will be treated anonymous.

This questionnaire contains 50 questions. All questions will be on a likert scale (1 to 5).

The results will also be available to you, if you want to follow this research. Again, thank you for participating in this research and if you have any questions please contact me directly at jroest@deloitte.nl.

With kind regards,  
Jacco Roest  
Graduate intern Deloitte

### Questionnaire - Complexity factors

The questions on this page are about complexity.

#### Complexity factors statements, likert-scale

1.1	People are communicating clearly within the organization.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.2	Within meetings politics play an important role within our organization, sometimes ignoring rational arguments.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.3	The organization has a complex internal organizational structure.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.4	We are a multinational organization operating in multiple domains.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.5	Our business strategy changes frequently.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.6	The annual budgeting process is clear and simple to understand.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.7	The past five years our organization has launched more new products/services than our competitors.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.8	The diversity of customer demands is high compared to other organizations (also within other segments).	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
1.9	The organization has a project methodology that dictates how a project progresses from idea to project to implementation.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree

1.10 The core business process is well-established and easy to execute.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.11 The number of competitors is high compared to the number of competitors in other markets.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.12 In our day to day business we have to take into account complex laws and regulations.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.13 Internal communication within our organization is understandable for everyone within the organization.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.14 I have to deal with too much politics within meetings.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.15 The organization has too many layers from the CEO to the shop floor and/or the span of control is too wide.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.16 Our organization serves a wide variation of markets/segments in different countries.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.17 Over the past five years we have changed our corporate strategy multiple times.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.18 The budgeting process is centrally controlled and simple to understand.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.19 Compared to our competitors, our organization has a highly innovative product portfolio.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.20 Our organization has to produce many different products/services to meet customer demands compared to other organizations.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.21 The organization's project methodology is well-established and applied to every project.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.22 The organization has a core business process, based on best practice, which is formalized and utilized by all departments.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.23 We operate in a highly competitive market.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.24 Regulatory constraints have a big impact on our operation.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree

## Questionnaire 'Enterprise Architecture Maturity'

### Enterprise architecture maturity measures

2.1 There is a clear governance structure and process for the creation and implementation of our architectures.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
2.2 Our architects use best practice EA modeling standards for design of the baseline, transition and target architecture.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
2.3 Our EA principles, rules, standards and guidelines are defined following best practices, but specifically tailored for organization.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
2.4 Within our organization the baseline, transition, target architecture for both business and technology are present.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
2.5 There is a process for compliancy check and escalation during implementation of the target architecture during projects.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree

2.6	For every process and system one business owner is assigned.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.7	Our enterprise architecture activities are explicitly linked to our business strategies and/or drivers.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.8	Our enterprise architects influence the IT investment and acquisition strategy by delivering a clear target architecture and roadmap.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.9	EA processes and governance are well-established and in use throughout the organization.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.10	EA Modelling standards are in place for the creation of the business and technology architectures.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.11	My organization has a clear set of EA principles, rules, standards and guidelines to improve decision making, planning and design.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.12	Business blueprints, technology blueprints and a roadmap for transition are in place.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.13	The firm has a well-established, timely architectural exception and compliancy check process.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.14	Within our organization a business owner is allocated to a specific part of the architecture.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.15	The organization has a full-time enterprise architecture team (or individual) ensuring alignment between IT and business priorities.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
2.16	Our IT investments and acquisition strategy is partly based on the view of our enterprise architects.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree

## Questionnaire - Business performance

### Business performance measures

3.1	Our relative IT maintenance costs and IT innovation costs have decreased over the past years.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.2	A poll of our customers would indicate that they are generally satisfied with our organization.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.3	We are leading in operational excellence.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.4	Our decision making process is well-established and easy to understand.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.5	Our market share is the highest in the industry.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.6	The time-to-market is relatively short compared to that of our competitors.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.7	The past five years, a relative decrease of operational expenditures is observable.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.8	Our customers are pleased with the products and services we provide them.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree
3.9	Our organization scores well in operational excellence, compared to our competitors.	Strongly disagree	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Strongly agree



3.10 Our decision making process has been effective in the past.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
3.11 The sales of our organization is high as a percentage of sales in the served market.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
3.12 Compared to our competitors, the time from idea generation to product launching is relatively short.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree

## Personal information

### Contact information

4.1 My name is:	<input type="text"/>
4.2 The company I work for is:	<input type="text"/>
4.3 My function within my organization is:	<input type="text"/>
4.4 The industry of my organization is:	<ul style="list-style-type: none"> <li><b>Consumer Business</b></li> <li>Manufacture, Energy &amp; Resources</li> <li>Financial Services Industry</li> <li>Public Sector</li> <li>Real Estate</li> <li>Technology, Media &amp; telecommunications</li> </ul>
4.5 My email adress is:	<input type="text"/>

### Information about the research

4.6 Check if you want to receive survey results by e-mail.	<input type="checkbox"/>
4.7 Check if I can contact you for a short interview.	<input type="checkbox"/>
How long did it take to fill in the questionnaire? Any remarks?	<input type="text"/>

## Thank you!

Thank you for taking my survey. Your response is highly valuable to me.

## APPENDIX C: PRE-TEST 2

### Questionnaire retest pre-test

1.1 People are communicating clearly within the organization.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.2 The number of competitors is high compared to the number of competitors in other markets.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.3 There is a clear governance structure and process for the creation and implementation of our architectures.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.4 Within our organization the current, transition, and target architectures for both business and technology are present.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.5 Each process and system in our organization has a business owner.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.6 Our enterprise architecture activities are explicitly aligned with our business strategies and/or drivers.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.7 Our enterprise architects influence the IT investment and acquisition strategy.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.8 Our market share is the highest in the industry.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.9 The communication within the organization is understandable for everyone.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.10 Competition is high within our market.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.11 The architecture governance structure and process is well-established and used throughout our organization.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.12 Our organization has a transition roadmap, in order to achieve the target architecture.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.13 In our organization a business owner is responsible for a specific part of the architecture.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.14 In our organization the IT is aligned with the business priorities.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.15 Our IT investments and acquisition strategy are based on the view of our enterprise architects.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree
1.16 Our organization has a high sales percentage in the served market.	Strongly disagree <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Strongly agree

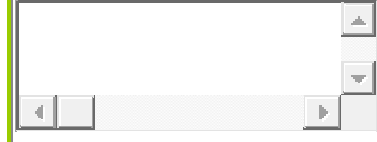
### Personal information

#### Contact information

My name is:

The company I filled this questionnaire in for is:

Any remarks?



APPENDIX D: FINAL PRE-TEST

Statement	Likert scale
Roles are not explicitly defined and employees report to several managers.	Strongly disagree 0 0 0 0 0 Strongly agree
Within the organization a clear set of terminologies is present and in use by all employees.	Strongly disagree 0 0 0 0 0 Strongly agree
Our current IT supports our current business strategies and/or drivers.	Strongly disagree 0 0 0 0 0 Strongly agree
Due to an increase of IT efficiency and/or IT productivity our organization reduced IT costs	Strongly disagree 0 0 0 0 0 Strongly agree
Employees are fulfilling multiple roles simultaneously.	Strongly disagree 0 0 0 0 0 Strongly agree
Internal communication within our organization is understandable for everyone within the organization.	Strongly disagree 0 0 0 0 0 Strongly agree
Currently, our business priorities are properly reflected in our IT solutions.	Strongly disagree 0 0 0 0 0 Strongly agree
Our IT costs have been significantly reduced due to more efficient IT operations.	Strongly disagree 0 0 0 0 0 Strongly agree

APPENDIX E: FACTOR ANALYSIS AND CRONBACH ALPHA OF ALL PRE-TESTS

FIRST PRETEST (14 PERSONS)

FACTOR ANALYSIS

Business complexity

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	
Double-click to activate	A1	1,000	-,486	-,682	,357	,095	,245	,697	,395	-,091	-,195	,535	,000
	A2	-,486	1,000	,781	,149	,244	-,469	-,026	-,431	-,055	-,092	-,113	,311
	A3	-,682	,781	1,000	-,049	,307	-,423	-,347	-,539	,049	,014	-,266	,303
	A4	,357	,149	-,049	1,000	-,215	,004	,611	,414	,052	-,288	-,120	,154
	A5	,095	,244	,307	-,215	1,000	,040	,084	-,242	,227	,424	,723	,134
	A6	,245	-,469	-,423	,004	,040	1,000	,368	,541	,006	,184	,127	-,220
	A7	,697	-,026	-,347	,611	,084	,368	1,000	,588	-,024	-,034	,378	,027
	A8	,395	-,431	-,539	,414	-,242	,541	,588	1,000	,229	,185	,135	,097
	A9	-,091	-,055	,049	,052	,227	,006	-,024	,229	1,000	,338	-,028	,290
	A10	-,195	-,092	,014	-,288	,424	,184	-,034	,185	,338	1,000	,446	-,132
	A11	,535	-,113	-,266	-,120	,723	,127	,378	,135	-,028	,446	1,000	,108
	A12	,000	,311	,303	,154	,134	-,220	,027	,097	,290	-,132	,108	1,000
	A13	,405	-,585	-,776	,092	-,457	,547	,346	,512	-,056	-,045	-,083	-,462
	A14	-,517	,833	,621	,141	,235	-,241	,061	-,163	,214	,105	-,053	,340
	A15	-,618	,683	,719	-,024	,126	-,319	-,417	-,538	-,148	-,142	-,260	,349
	A16	,230	-,058	-,067	,788	-,119	,201	,448	,510	,113	,192	-,042	,025
	A17	,000	,333	,311	-,264	,612	-,309	-,165	-,622	,239	-,180	,174	,022
	A18	,000	-,263	-,307	-,067	-,269	,758	,113	,374	,112	-,197	-,277	-,086
	A19	,593	-,471	-,569	,075	,203	,769	,644	,643	,114	,207	,404	-,267
	A20	,183	,041	-,036	,681	,030	,436	,503	,638	,171	,102	,056	,145
	A21	-,275	-,112	-,027	-,200	,180	,103	-,276	,116	,893	,469	-,056	,137
	A22	-,402	,084	,064	-,284	,340	,035	-,320	-,127	,516	,699	,104	-,304
	A23	,155	-,142	-,245	,282	,169	,167	,417	,538	,428	,683	,392	-,159
	A24	-,084	,308	,131	-,051	,018	-,446	-,126	-,053	,165	-,243	,082	,759

A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
405	-.517	-.618	.230	.000	.000	.593	.183	-.275	-.402	.155	-.084
-.585	.833	.683	-.058	.333	-.263	-.471	.041	-.112	.084	-.142	.308
-.776	.621	.719	-.067	.311	-.307	-.569	-.036	-.027	.064	-.245	.131
.092	.141	-.024	.788	-.264	-.067	.075	.681	-.200	-.284	.282	-.051
-.457	.235	.126	-.119	.612	-.269	.203	.030	.180	.340	.169	.018
.547	-.241	-.319	.201	-.309	.758	.769	.436	.103	.035	.167	-.446
.346	.061	-.417	.448	-.165	.113	.644	.503	-.276	-.320	.417	-.126
.512	-.163	-.538	.510	-.622	.374	.643	.638	.116	-.127	.538	-.053
-.056	.214	-.148	.113	.239	.112	.114	.171	.893	.516	.428	.165
-.045	.105	-.142	.192	-.180	-.197	.207	.102	.469	.699	.683	-.243
-.083	-.053	-.260	-.042	.174	-.277	.404	.056	-.056	.104	.392	.082
-.462	.340	.349	.025	.022	-.086	-.267	.145	.137	-.304	-.159	.759
1,000	-.385	-.441	.089	-.349	.548	.523	.014	.085	.016	.191	-.415
-.385	1,000	.624	-.102	.184	-.058	-.367	.072	.181	.218	.175	.372
-.441	.624	1,000	-.147	.239	-.165	-.711	-.211	-.016	.049	-.427	.304
.089	-.102	-.147	1,000	-.459	-.110	.228	.785	-.024	.026	.432	-.321
-.349	.184	.239	-.459	1,000	-.211	-.105	-.412	.196	.220	-.360	.189
.548	-.058	-.165	-.110	-.211	1,000	.487	.279	.227	-.011	-.078	-.227
.523	-.367	-.711	.228	-.105	.487	1,000	.453	.044	.019	.344	-.407
.014	.072	-.211	.785	-.412	.279	.453	1,000	.010	-.011	.437	-.211
.085	.181	-.016	-.024	.196	.227	.044	.010	1,000	.749	.356	.088
.016	.218	.049	.026	.220	-.011	.019	-.011	.749	1,000	.449	-.232
.191	.175	-.427	.432	-.360	-.078	.344	.437	.356	.449	1,000	-.252
-.415	.372	.304	-.321	.189	-.227	-.407	-.211	.088	-.232	-.252	1,000

## Enterprise Architecture Maturity

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16
Correlation B1	1,000	,692	,670	-,060	-,187	-,583	-,128	,261	,505	,543	,655	-,842	-,053	-,261	-,090	-,043
B2	,692	1,000	,815	,310	,246	-,640	,123	,472	,506	,623	,677	-,527	,368	,145	,276	,424
B3	,670	,815	1,000	,239	-,070	-,371	,206	,172	,775	,833	,806	-,486	,051	,283	,139	,206
B4	-,060	,310	,239	1,000	,752	,152	,793	,715	,041	,252	,161	,396	,517	,715	,371	,498
B5	-,187	,246	-,070	,752	1,000	,061	,609	,730	-,150	,000	-,146	,300	,666	,531	,429	,609
B6	-,583	-,640	-,371	,152	,061	1,000	,371	-,135	-,282	-,244	-,564	,632	-,144	,399	,048	-,020
B7	-,128	,123	,206	,793	,609	,371	1,000	,533	,284	,452	,171	,398	,528	,776	,480	,512
B8	,261	,472	,172	,715	,730	-,135	,533	1,000	-,017	,174	,108	-,017	,557	,366	,125	,412
B9	,505	,506	,775	,041	-,150	-,282	,284	-,017	1,000	,930	,813	-,436	,122	,102	,179	,147
B10	,543	,623	,833	,252	,000	-,244	,452	,174	,930	1,000	,804	-,372	,223	,302	,400	,379
B11	,655	,677	,806	,161	-,146	-,564	,171	,108	,813	,804	1,000	-,386	,226	,108	,087	,171
B12	-,842	-,527	-,486	,396	,300	,632	,398	-,017	-,436	-,372	-,386	1,000	,236	,540	,179	,215
B13	-,053	,368	,051	,517	,666	,144	,528	,557	,122	,223	,226	,236	1,000	,330	,389	,702
B14	-,261	,145	,283	,715	,531	,399	,776	,366	,102	,302	,108	,540	,330	1,000	,382	,533
B15	-,090	,276	,139	,371	,429	,048	,480	,125	,179	,400	,087	,179	,389	,382	1,000	,726
B16	-,043	,424	,206	,498	,609	-,020	,512	,412	,147	,379	,171	,215	,702	,533	,726	1,000

## Business performance

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Correlation C1	1,000	-,161	,142	,262	-,036	,036	,626	-,039	-,051	,384	,286	,218
C2	-,161	1,000	,357	,309	,138	-,061	-,205	,611	,466	,000	,176	,133
C3	,142	,357	1,000	,699	,359	,757	,123	,355	,548	,378	,704	,821
C4	,262	,309	,699	1,000	,194	,748	,058	,211	,642	,798	,714	,844
C5	-,036	,138	,359	,194	1,000	,378	,247	,033	,407	,263	,245	,273
C6	,036	-,061	,757	,748	,378	1,000	,086	,154	,442	,656	,636	,918
C7	,626	-,205	,123	,058	,247	,086	1,000	-,310	-,121	,304	,151	,077
C8	-,039	,611	,355	,211	,033	,154	-,310	1,000	,244	,142	,212	,269
C9	-,051	,466	,548	,642	,407	,442	-,121	,244	1,000	,462	,620	,629
C10	,384	,000	,378	,798	,263	,656	,304	,142	,462	1,000	,522	,680
C11	,286	,176	,704	,714	,245	,636	,151	,212	,620	,522	1,000	,732
C12	,218	,133	,821	,844	,273	,918	,077	,269	,629	,680	,732	1,000

CRONBACH ALPHA (14 PERSONS)

BUSINESS COMPLEXITY

**People**

1	<b>People are communicating clearly within the organization.</b>	<b>0,575</b>
2	<b>Internal communication within our organization is understandable for everyone within the organization.</b>	

1	Within meetings politics play an important role within our organization, sometimes ignoring rational arguments.	0,905
2	I have to deal with too much politics within meetings.	

**Organizational design**

1	The organization has a complex internal organizational structure.	0,834
2	The organization has too many layers from the CEO to the shop floor and/or the span of control is too wide.	

1	We are a multinational organization operating in multiple domains.	0,881
2	Our organization serves a wide variations of markets/segments in different countries.	

**Strategy**

1	Our business strategy changes frequently.	0,759
2	Over the past five years we have changed our corporate strategy multiple times.	

1	The annual budgetting process is clear and simple to understand.	0,851
2	The budgetting process is centrally controlled and simple to understand.	

**Products and services**

1	The past five years our organization has launched more new products/services than our competitors.	0,782
2	Compared to our competitors, our organization has a highly innovative product portfolio.	

1	The diversity of customer demands is high compared to other organizations (also other segments).	0,774
2	Our organization has to produce many different products/services to meet customer demands compared to other organizations.	



## Processes

1	The organization has a project methodology that dictates how a project progresses from idea to project to implementation.	0,944
2	The organization's project methodology is well-established and applied to every project	

1	The core business process is well-established and easy to execute.	0,822
2	The organization has a core business process, based on best practice, that is formalized and utilized by all departments.	

## External

1	<b>The number of competitors is high compared to the number of competitors in other markets.</b>	<b>0,542</b>
2	<b>We operate in a highly competitive market.</b>	

1	In our day to day business we have to take into account complex laws and regulations.	0,861
2	Regulatory constraints have a big impact on our operation.	

ENTERPRISE ARCHITECTURE MATURITY

**EA Foundation**

1	<b>There is a clear governance structure and process for the creation and implementation of our architectures.</b>	0,660
2	<b>EA processes and governance are well-established and in use throughout the organization.</b>	

1	Our architects use best practice EA modeling standards for design of the baseline, transition and target architecture.	0,768
2	EA modelling standards are in place for the creation of the business and technology architectures.	

**EA Development**

1	Our EA principles, rules, standards and guidelines are defined following best practices, but specifically tailored for organization.	0,892
2	My organization has a clear set of EA principles, rules, standards and guidelines to improve decision making, planning and design.	

1	<b>Within our organization the baseline, transition, target architecture for both business and technology are present.</b>	0,566
2	<b>Business blueprints, technology blueprints and a roadmap for transition are in place.</b>	

**EA Realization**

1	There is a process for compliancy check and escalation during implementation of the target architecture during projects.	0,795
2	The firm has a well-established, timely architectural exception and compliancy check process.	

1	<b>For every process and system one business owner is assigned.</b>	0,569
2	<b>Within our organization a business owner is allocated to a specific part of the architecture.</b>	

**EA Alignment**

1	<b>Our enterprise architecture activities are explicitly linked to our business strategies and/or drivers.</b>	0,623
2	<b>The organization has a full-time enterprise architecture team (or individual) ensuring alignment between IT and business priorities.</b>	

1	<b>Our enterprise architects influence the IT investment and acquisition strategy by delivering a clear target architecture and roadmap.</b>	0,579
2	<b>Our IT investments and acquisition strategy is partly based on the view of our enterprise architects.</b>	

## BUSINESS PERFORMANCE FACTORS

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### IT costs

1	Our relative IT maintenance costs and IT innovation costs have decreased over the past years.	0,769
2	The past five years, a relative decrease of operational expenditures is observable.	

### Customer satisfaction

1	A poll of our customers would indicate that they are generally satisfied with our organization.	0,750
2	Our customers are pleased with the products and services we provide them.	

### Operational excellence

1	We are leading in operational excellence.	0,708
2	Our organization scores well in operational excellence, compared to our competitors.	

### Decision making

1	Our decision making process is well-established and easy to understand.	0,875
2	Our decision making process has been effective in the past.	

### Competitive performance

<b>1</b>	<b>Our market share is the highest in the industry.</b>	<b>0,391</b>
<b>2</b>	<b>The sales of our organization is high as a percentage of sales in the served market.</b>	

### Time-to-market

1	The time-to-market is relatively short compared to that of our competitors.	0,952
2	Compared to our competitors, the time from idea generation to product launching is relatively short.	

SECOND PRE-TEST (18 PERSONS)

FACTOR ANALYSIS

	V1	V2	V3	V4	V5	V6	V7	V8	V1.1	V2.1	V3.1	V4.1	V5.1	V6.1	V7.1	V8.1
Correlation V1	1,000	-,137	,229	,419	,404	,246	-,157	,550	,580	-,139	,213	,218	,292	,171	,152	,367
V2	-,137	1,000	-,253	-,371	-,329	-,271	-,521	-,083	-,087	,850	-,427	-,509	-,538	-,456	-,191	-,473
V3	,229	-,253	1,000	,425	-,186	,325	,248	,434	,402	-,432	,560	,576	-,104	,417	,401	,248
V4	,419	-,371	,425	1,000	,297	,315	,423	,211	,423	-,398	,518	,845	,478	,271	,489	,363
V5	,404	-,329	-,186	,297	1,000	,130	-,131	,245	,161	-,350	,020	,334	,573	,234	,101	,437
V6	,246	-,271	,325	,315	,130	1,000	,000	-,149	,112	-,383	,384	,365	,286	,348	,176	-,243
V7	-,157	-,521	,248	,423	-,131	,000	1,000	,000	,050	-,289	,369	,540	,152	,356	,577	,227
V8	,550	-,083	,434	,211	,245	-,149	,000	1,000	,685	-,185	,194	,245	-,088	,269	,220	,715
V1.1	,580	,087	,402	,423	,161	,112	,050	,685	1,000	-,195	,272	,378	-,149	,415	,290	,452
V2.1	-,139	,850	-,432	-,398	-,350	-,383	-,289	-,185	-,195	1,000	-,500	-,537	-,458	-,485	-,361	-,385
V3.1	,213	-,427	,560	,518	,020	,384	,369	,194	,272	-,500	1,000	,390	,297	,428	,213	,246
V4.1	,218	-,509	,576	,845	,334	,365	,540	,245	,378	-,537	,390	1,000	,387	,442	,592	,378
V5.1	,292	-,538	-,104	,478	,573	,286	,152	-,088	-,149	-,458	,297	,387	1,000	,007	,058	,152
V6.1	,171	-,456	,417	,271	,234	,348	,356	,269	,415	-,485	,428	,442	,007	1,000	,445	,415
V7.1	,152	-,191	,401	,489	,101	,176	,577	,220	,290	-,361	,213	,592	,058	,445	1,000	,105
V8.1	,367	-,473	,248	,363	,437	-,243	,227	,715	,452	-,385	,246	,378	,152	,415	,105	1,000

## BUSINESS COMPLEXITY

### People

1	People are communicating clearly within the organization.	0,734
2	The communication within the organization is understandable for everyone.	

### External

1	The number of competitors is high compared to the number of competitors in other markets.	0,919
2	Competition is high within our market.	

## ENTERPRISE ARCHITECTURE MATURITY

### EA Foundation

1	There is a clear governance structure and process for the creation and implementation of our architectures.	0,708
2	The architecture governance structure and process is well-established and used throughout our organization.	

### EA Development

1	Within our organization the current, transition, and target architectures for both business and technology are present.	0,913
2	Our organization has a transition roadmap, in order to achieve the target architecture.	

### EA Realization

1	Each process and system in our organization has a business owner.	0,724
2	In our organization a business owner is responsible for a specific part of the architecture.	

### EA Alignment

1	<b>Our enterprise architecture activities are explicitly aligned with our business strategies and/or drivers.</b>	<b>0,516</b>
2	<b>In our organization the IT is aligned with the business priorities.</b>	

1	Our enterprise architects influence the IT investment and acquisition strategy.	0,727
2	Our IT investments and acquisition strategy are based on the view of our enterprise architects.	

## BUSINESS PERFORMANCE FACTORS

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### Competitive performance

1	Our market share is the highest in the industry.	0,833
2	Our organization has a high sales percentage in the served market.	

LAST PRE-TEST (11 PERSONS)

		V1	V2	V3	V4	V1.1	V2.1	V3.1	V4.1
Correlation	V1	1,000	-,836	-,445	-,574	,564	-,582	-,578	-,480
	V2	-,836	1,000	,500	,650	-,396	,728	,519	,601
	V3	-,445	,500	1,000	,725	-,399	,659	,542	,715
	V4	-,574	,650	,725	1,000	-,605	,750	,620	,935
	V1.1	,564	-,396	-,399	-,605	1,000	-,263	-,028	-,671
	V2.1	-,582	,728	,659	,750	-,263	1,000	,741	,632
	V3.1	-,578	,519	,542	,620	-,028	,741	1,000	,465
	V4.1	-,480	,601	,715	,935	-,671	,632	,465	1,000

BUSINESS COMPLEXITY

People

1	Within the organization a clear set of terminologies is present and in use by all employees.	0,674
2	Internal communication within our organization is understandable for everyone within the organization.	

Organizational design

1	Roles are not explicitly defined and employees report to several managers.	0,843
2	Employees are fulfilling multiple roles simultaneously.	

ENTERPRISE ARCHITECTURE MATURITY

EA Alignment

1	Our current IT supports our current business strategies and/or drivers.	0,697
2	Currently, our business priorities are properly reflected in our IT solutions.	

BUSINESS PERFORMANCE FACTORS

IT costs

1	Due to an increase of IT efficiency and/or IT productivity our organization reduced IT costs	0,967
2	Our IT costs have been significantly reduced due to more efficient IT operations.	

## APPENDIX F: FINAL QUESTIONNAIRE (ONLINE)

### Questionnaire - Complexity factors

The following questions are about complexity. Complexity within organizations has influence on organizational performance. The complexity factors used can be seen as organizational characteristics, because every organization has their own complexities and this characterizes the organization. An example of a complexity factor is creating products/service; imaginable is that when an organization creates more products/service the organization is more complex.

#### Complexity measures

1.1	Within the organization a clear set of terminologies is present and in use by all employees.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.2	Within meetings politics play an important role within our organization, sometimes ignoring rational arguments.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.3	The organization has a complex internal organizational structure.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.4	Roles are not explicitly defined and employees report to several managers.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.5	We are a multinational organization operating in multiple domains.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.6	Our business strategy changes frequently.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.7	The annual budgeting process is clear and simple to understand.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.8	The past five years our organization has launched more new products/services than our competitors.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know



1.9 The diversity of customer demands is high compared to other organizations (also within other segments).	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.10 The organization has a project methodology that dictates how a project progresses from idea to project to implementation.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.11 The core business process is well-established and easy to execute.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.12 The number of competitors is high compared to the number of competitors in other markets.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.13 In our day to day business we have to take into account complex laws and regulations.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.14 Internal communication within our organization is understandable for everyone within the organization.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.15 I have to deal with too much politics within meetings.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.16 The organization has too many layers from the CEO to the shop floor and/or the span of control is too wide.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.17 Employees are fulfilling multiple roles simultaneously.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.18 Our organization serves a wide variations of markets/segments in different countries.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
1.19 Over the past five years we have changed our corporate strategy multiple times.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know

1.20 The budgeting process is centrally controlled and simple to understand.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.21 Compared to our competitors, our organization has a highly innovative product portfolio.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.22 Our organization has to produce many different products/services to meet customer demands compared to other organizations.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.23 The organization's project methodology is well-established and applied to every project.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.24 The organization has a core business process, based on best practice, that is formalized and utilized by all departments.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.25 Competition is high within our market.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
1.26 Regulatory constraints have a big impact on our operations.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know

## Questionnaire - Enterprise Architecture Maturity

The following questions are about enterprise architecture maturity. Enterprise architecture maturity has influence on some business performance factors. In order to measure the enterprise architecture maturity the following questions are set up. An example of enterprise architecture maturity is whether business and IT within an organization are aligned.

### Enterprise architecture maturity measures

2.1	There is a clear governance structure and process for the creation and implementation of our architectures.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.2	Our architects use best practice EA modeling standards for design of the baseline, transition and target architecture.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.3	Our EA principles, rules, standards and guidelines are defined following best practices, but specifically tailored for organization.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.4	Within our organization the current, transition, and target architectures for both business and technology are present.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.5	There is a process for compliancy check and escalation during implementation of the target architecture during projects.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.6	Each process and system in our organization has a business owner.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.7	Our current IT supports our current business strategies and/or drivers.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.8	Our enterprise architects influence the IT investment and acquisition strategy.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
2.9	The architecture governance structure and process is well-established and used throughout our organization.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know

2.10 EA Modeling standards are in place for the creation of the business and technology architectures.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.11 My organization has a clear set of EA principles, rules, standards and guidelines to improve decision making, planning and design.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.12 Our organization has a transition roadmap, in order to achieve the target architecture.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.13 The firm has a well-established, timely architectural exception and compliancy check process.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.14 In our organization a business owner is responsible for a specific applications or processes.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.15 Currently, our business priorities are properly reflected in our IT solutions.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
2.16 Our IT investments and acquisition strategy are based on the priorities set by our enterprise architects.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know

## Questionnaire - Business performance

The following questions are about business performance. An example is time-to-market. When the time-to-market of your organization is shorter than a competitor, your organization is performing better.

### Business performance measures

3.1	Due to an increase of IT efficiency and/or IT productivity our organization reduced IT costs.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.2	A poll of our customers would indicate that they are generally satisfied with our organization.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.3	We are leading in operational excellence.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.4	Our decision making process is well-established and easy to understand.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.5	Our market share is the highest in the industry.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.6	The time-to-market is relatively short compared to that of our competitors.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.7	Our IT costs have been significantly reduced due to more efficient IT operations.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.8	Our customers are pleased with the products and services we provide them.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.9	Our organization scores well in operational excellence, compared to our competitors.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know
3.10	Our decision making process has been effective in the past.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/ don't know

3.11 Our organization is the biggest supplier of product and/or services in the served market.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know
3.12 Compared to our competitors, the time from idea generation to product launching is relatively short.	<input type="radio"/>	Strongly disagree	<input type="radio"/>	Disagree	<input type="radio"/>	Neutral	<input type="radio"/>	Agree	<input type="radio"/>	Strongly agree	<input type="radio"/>	Not applicable/I don't know

## APPENDIX G: STANDARD MAIL FOR CONTACTS VIA DELOITTE IN ORDER TO FILL IN MY QUESTIONNAIRE

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Via XXX heb ik uw naam doorgekregen voor het volgende. Op dit moment ben ik bezig met mijn afstudeeronderzoek bij Deloitte Consulting en ik wil u vragen om mij te helpen bij dit onderzoek. Bent u altijd al benieuwd naar welke organisatiefactoren bepalend zijn voor enterprise architectuur volwassenheid en business performance? Ik ben bezig met een afstudeeronderzoek die de correlatie tussen (1) organisatiefactoren en (2) enterprise architectuur volwassenheid en de daaropvolgende link naar (3) business performance moet bepalen. Omdat u kennis heeft van deze drie aspecten binnen uw organisatie, zou ik uw hulp goed kunnen gebruiken bij dit onderzoek. Graag wil ik u bij dezen uitnodigen om de volgende questionnaire in te vullen (dit kost maximaal 10/15 minuten). De link naar de questionnaire is: <https://invisionweb.deloitte.nl/survey?sid=18529800>

Uw resultaten worden afgezet tegen tientallen andere organisaties, natuurlijk volledig anoniem. Op basis hiervan heeft u inzicht in uw huidige situatie ten opzichte van andere ondervraagden en kunt u de volgende vraag beantwoorden: Is het voor uw organisatie verstandig om meer energie te steken in enterprise architectuur? De resultaten van dit onderzoek zullen u inzicht geven waar u het beste energie in kan steken, waarbij dit voor de business de meeste waarde oplevert.

De resultaten worden aan het eind van het onderzoek natuurlijk aan u aangeboden.

Bij voorbaat dank voor het invullen van de questionnaire!

Met vriendelijke groet,

### Jacco Roest

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Please consider the environment before printing.

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### And the following reminder:

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Wanneer je mijn questionnaire al anoniem hebt ingevuld, kun je deze e-mail als niet verzonden beschouwen.

Helaas heb je mijn vragenlijst nog niet ingevuld, daarom bij deze een reminder. Op dit moment heb ik nog niet genoeg reacties om af te studeren, daarom wil ik je bij deze herinneren en vragen om mijn questionnaire in te vullen. Jouw hulp wordt erg gewaardeerd.

Niet alleen voor mij is het interessant om de vragenlijst in te vullen, maar zoals gezegd in de vorige mail is het ook van waarde voor jouw en je organisatie wat het resultaat van mijn onderzoek is. De volgende vraag kan dan beantwoord worden: Is het voor uw organisatie verstandig om meer energie te steken in enterprise architectuur?

Het kost maar 10/15 minuten om de questionnaire in te vullen en zoals gezegd wordt dit erg gewaardeerd. Jouw resultaten zullen uiteraard volledig anoniem behandeld worden. De link naar de questionnaire is: <https://invisionweb.deloitte.nl/survey?sid=18529800>

Bij voorbaat dank voor het invullen van de questionnaire!

Met vriendelijke groet,

Jacco

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**APPENDIX H: CRONBACH'S ALPHA OF ALL CONSTRUCTS WITHIN THE FINAL QUESTIONNAIRE**

<b>Category/sub category</b>	<b>Statements</b>	<b>Cronbach'sAlpha</b>
<b><u>Business complexity</u></b>		
<i>Internal communication</i>	Within the organization a clear set of terminologies is present and in use by all employees.	0,592
	Internal communication within our organization is understandable for everyone within the organization.	
<i>Politics</i>	Within meetings politics play an important role within our organization, sometimes ignoring rational arguments.	0,766
	I have to deal with too much politics within meetings.	
<i>Levels of management</i>	The organization has a complex internal organizational structure.	0,782
	The organization has too many layers from the CEO to the shop floor and/or the span of control is too wide.	
<i>Fulfillment of roles</i>	Roles are not explicitly defined and employees report to several managers.	0,547
	Employees are fulfilling multiple roles simultaneously.	
<i>Operating markets/segments/countries</i>	We are a multinational organization operating in multiple domains.	0,637
	Our organization serves a wide variations of markets/segments in different countries.	
<i>Changes in strategy</i>	Our business strategy changes frequently.	0,824
	Over the past five years we have changed our corporate strategy multiple times.	
<i>Annual budgeting process</i>	The annual budgeting process is clear and simple to understand.	0,810
	The budgeting process is centrally controlled and simple to understand.	
<i>Launching new products</i>	The past five years our organization has launched more new products/services than our competitors.	0,476
	Compared to our competitors, our organization has a highly innovative product portfolio.	
<i>Diversity in customer demands</i>	The diversity of customer demands is high compared to other organizations (also within other segments).	0,695
	Our organization has to produce many different products/services to meet customer demands compared to other organizations.	
<i>Major project processes</i>	The organization has a project methodology that dictates how a project progresses from idea to project to implementation.	0,792

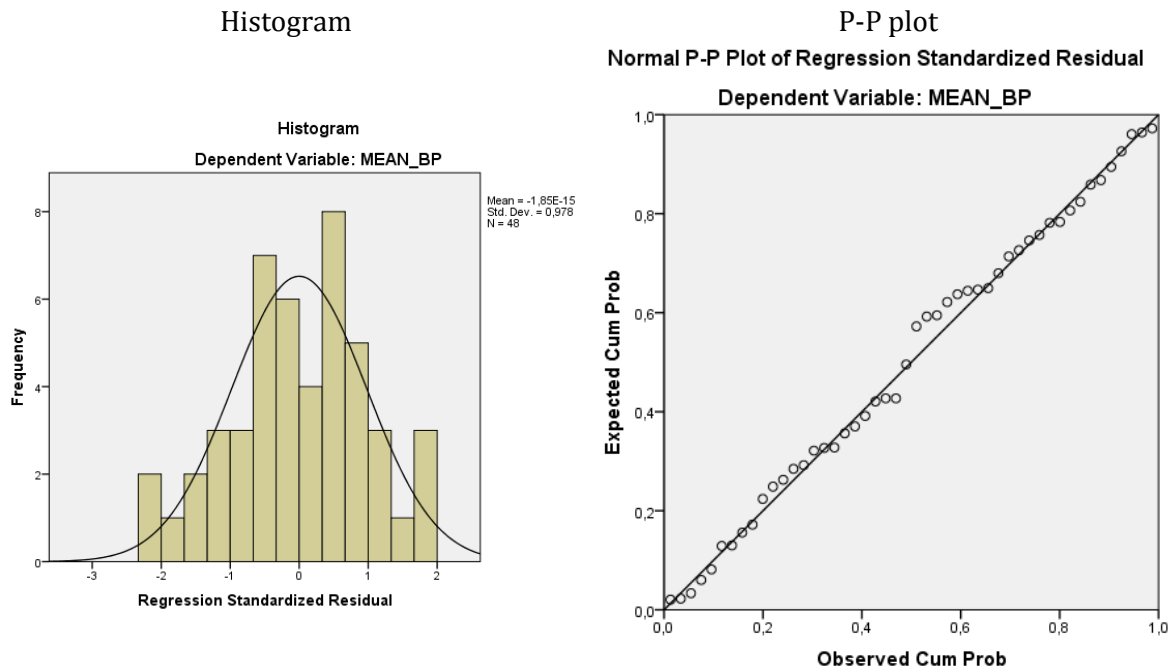
	The organization's project methodology is well-established and applied to every project.	
<i>Core business processes</i>	The core business process is well-established and easy to execute.	0,656
	The organization has a core business process, based on best practice that is formalized and utilized by all departments.	
<i>Number of competitors</i>	The number of competitors is high compared to the number of competitors in other markets.	0,450
	Competition is high within our market.	
<i>Laws and regulations</i>	In our day to day business we have to take into account complex laws and regulations.	0,942
	Regulatory constraints have a big impact on our operations.	
<b><u>Enterprise Architecture Maturity</u></b>		
<i>Processes and governance</i>	There is a clear governance structure and process for the creation and implementation of our architectures.	0,876
	The architecture governance structure and process is well-established and used throughout our organization.	
<i>EA modeling standards</i>	Our architects use best practice EA modeling standards for design of the baseline, transition and target architecture.	0,866
	EA Modeling standards are in place for the creation of the business and technology architectures.	
<i>EA principles, rules, standards and guidelines</i>	Our EA principles, rules, standards and guidelines are defined following best practices, but specifically tailored for organization.	0,798
	My organization has a clear set of EA principles, rules, standards and guidelines to improve decision making, planning and design.	
<i>Baseline, transition and target architecture</i>	Within our organization the current, transition, and target architectures for both business and technology are present.	0,799
	Our organization has a transition roadmap, in order to achieve the target architecture.	
<i>Compliance check and escalation</i>	There is a process for compliance check and escalation during implementation of the target architecture during projects.	0,809
	The firm has a well-established, timely architectural exception and compliance check process.	
<i>Business owners</i>	Each process and system in our organization has a business owner.	0,852
	In our organization a business owner is responsible for a specific applications or processes.	
<i>Alignment with business strategy</i>	Our current IT supports our current business strategies and/or drivers.	0,727
	Currently, our business priorities are properly reflected in our IT solutions.	

<i>IT investments</i>	Our enterprise architects influence the IT investment and acquisition strategy.	0,700
	Our IT investments and acquisition strategy are based on the priorities set by our enterprise architects.	
<b>Business Performance</b>		
<i>IT costs</i>	Due to an increase of IT efficiency and/or IT productivity our organization reduced IT costs.	0,755
	Our IT costs have been significantly reduced due to more efficient IT operations.	
<i>Customer satisfaction</i>	A poll of our customers would indicate that they are generally satisfied with our organization.	0,839
	Our customers are pleased with the products and services we provide them.	
<i>Operational excellence</i>	We are leading in operational excellence.	0,786
	Our organization scores well in operational excellence, compared to our competitors.	
<i>Decision making</i>	Our decision making process is well-established and easy to understand.	0,676
	Our decision making process has been effective in the past.	
<i>Competitive performance</i>	Our market share is the highest in the industry.	0,857
	Our organization is the biggest supplier of product and/or services in the served market.	
<i>Time to market</i>	The time-to-market is relatively short compared to that of our competitors.	0,864
	Compared to our competitors, the time from idea generation to product launching is relatively short	

## APPENDIX I: TESTING ASSUMPTIONS FOR LINEAR REGRESSION

H1: THE INFLUENCE OF BUSINESS COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION.

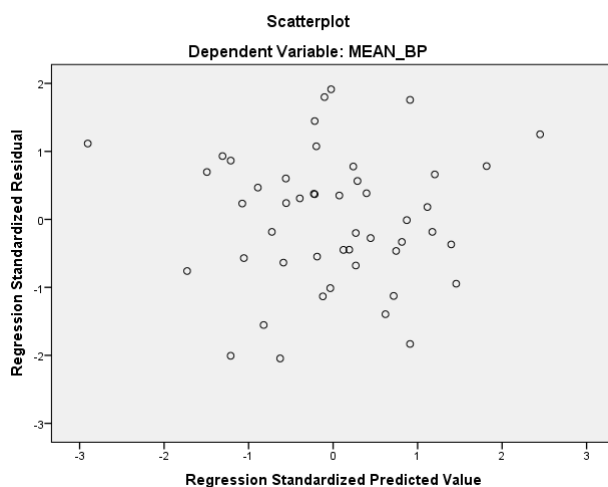
### NORMALITY



As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

### LINEARITY AND HOMOSCEDASTICITY

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,570 <sup>a</sup>	,325	,295	,46424	1,822

a. Predictors: (Constant), MEAN\_BC\_PeopleOrgDesStrategy, MEAN\_EA

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

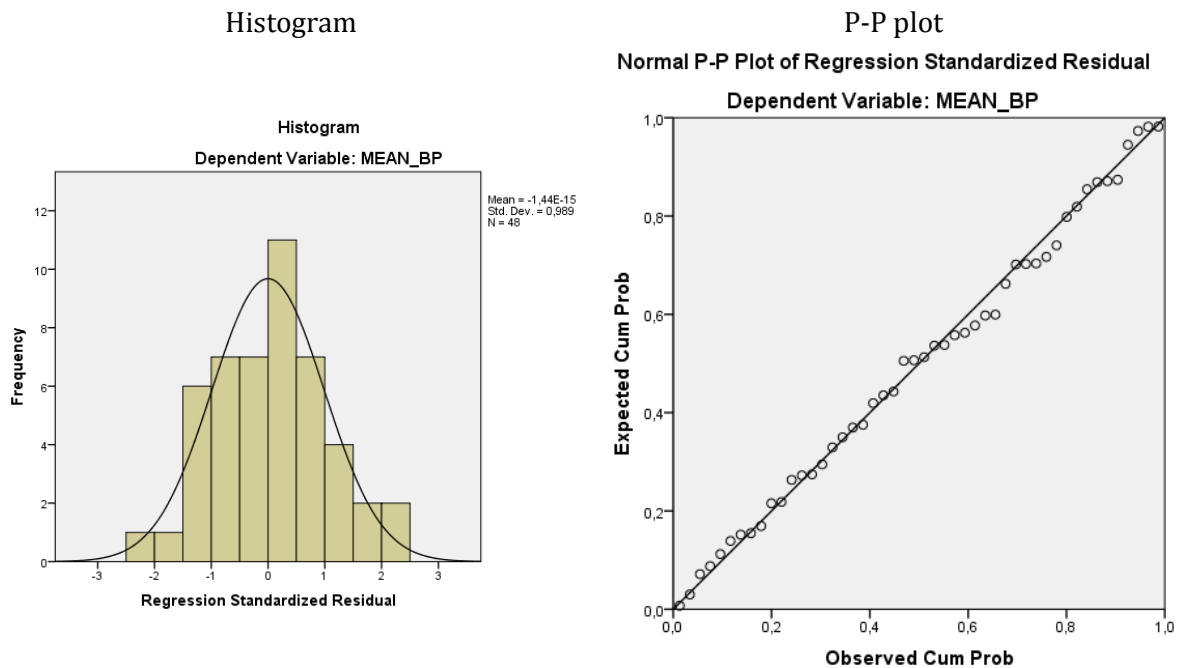
---

## H2: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCES BUSINESS PERFORMANCE POSITIVELY.

---

### NORMALITY

---

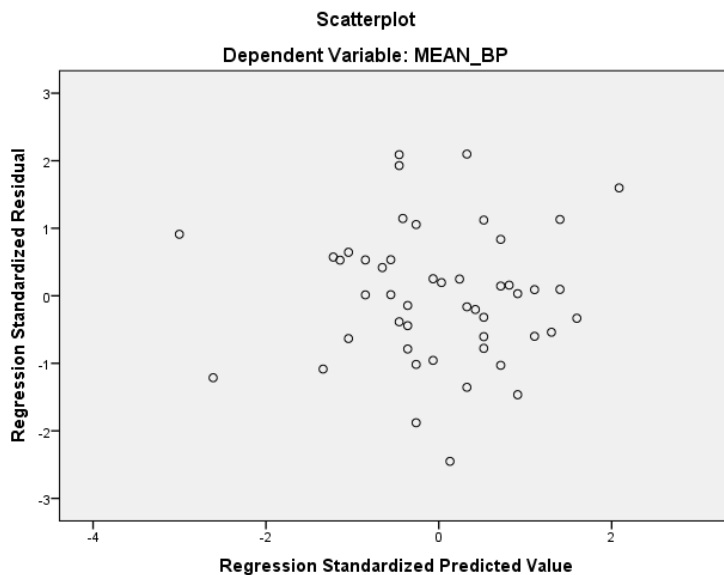


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,504 <sup>a</sup>	,254	,238	,48258	1,761

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

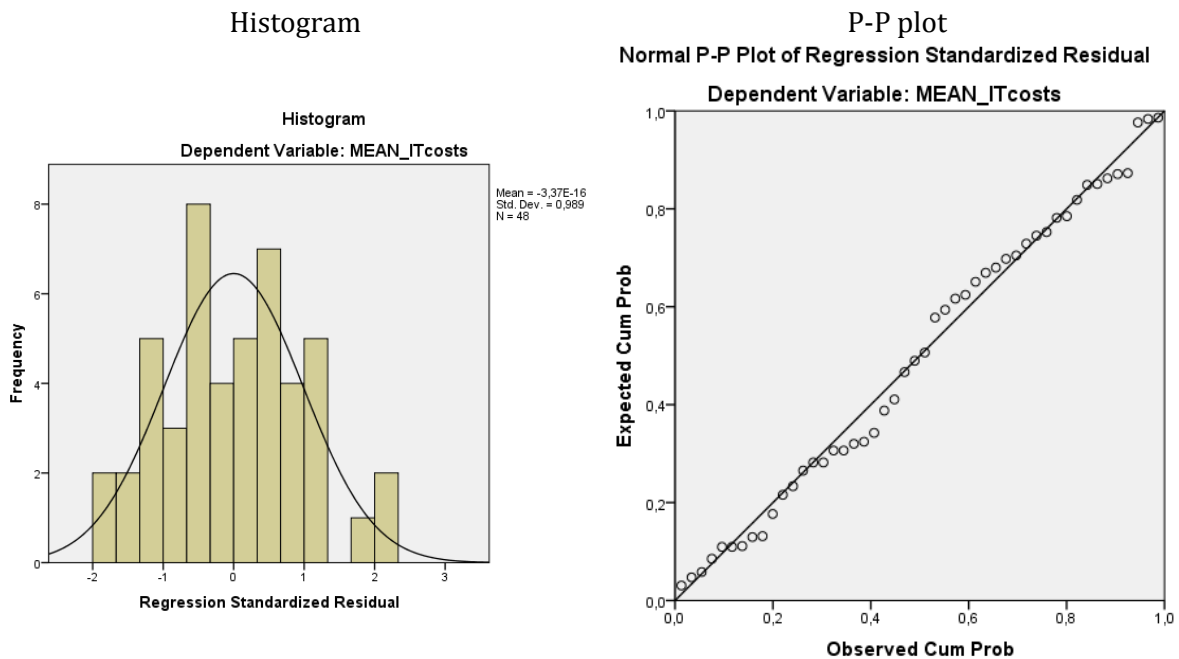
---

### H3A: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION REDUCES IT COSTS.

---

#### NORMALITY

---

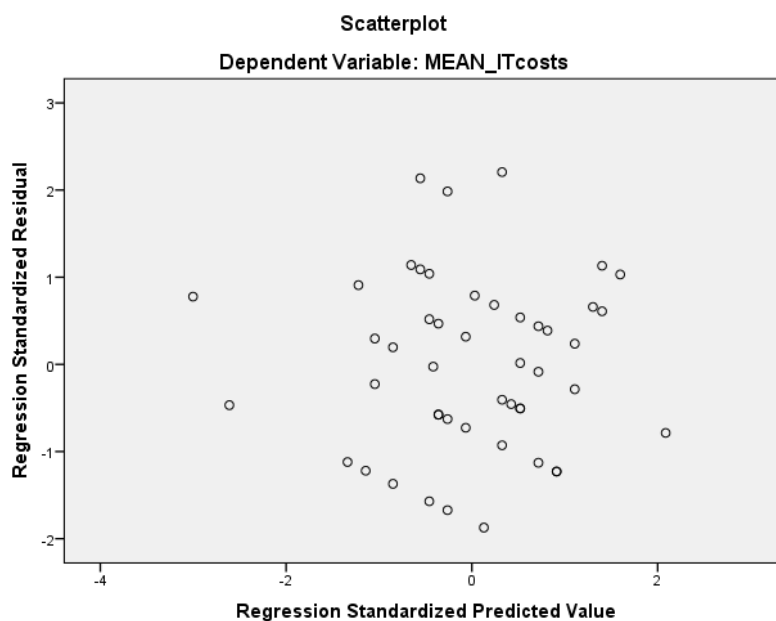


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

#### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.



## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,460 <sup>a</sup>	,212	,195	,95734	2,743

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_ITcosts

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

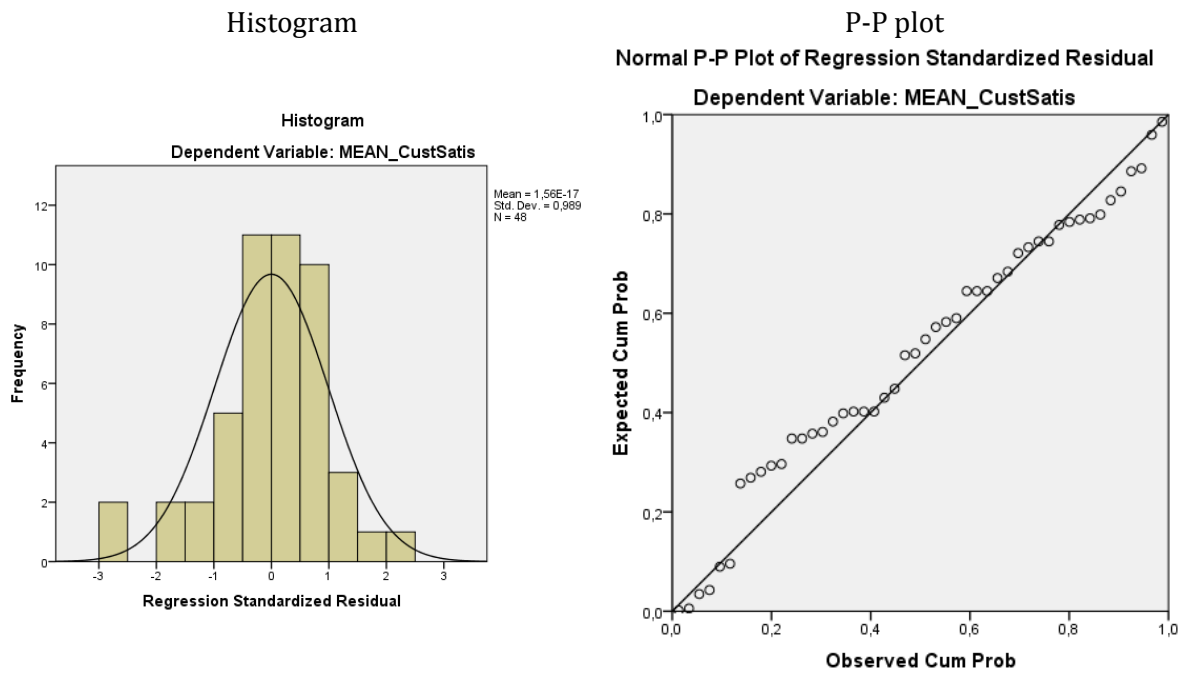
---

### H3B: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCES CUSTOMER SATISFACTION POSITIVELY.

---

#### NORMALITY

---

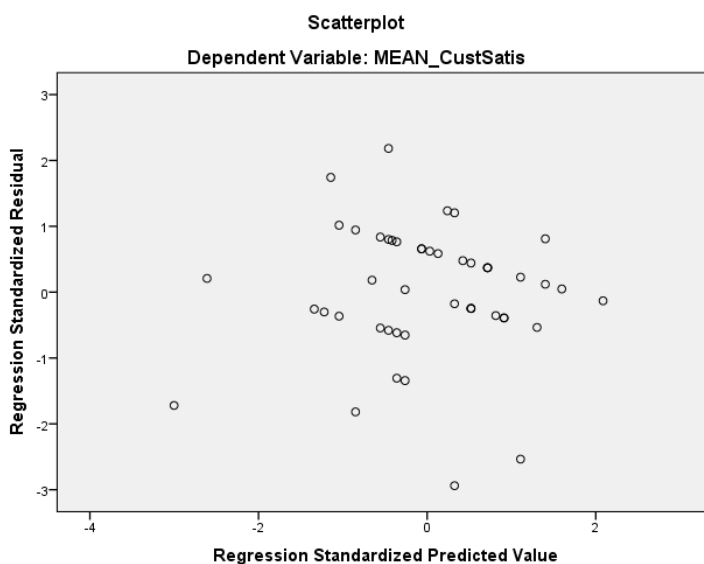


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

#### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,347 <sup>a</sup>	,121	,101	,72398	2,036

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_CustSatis

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

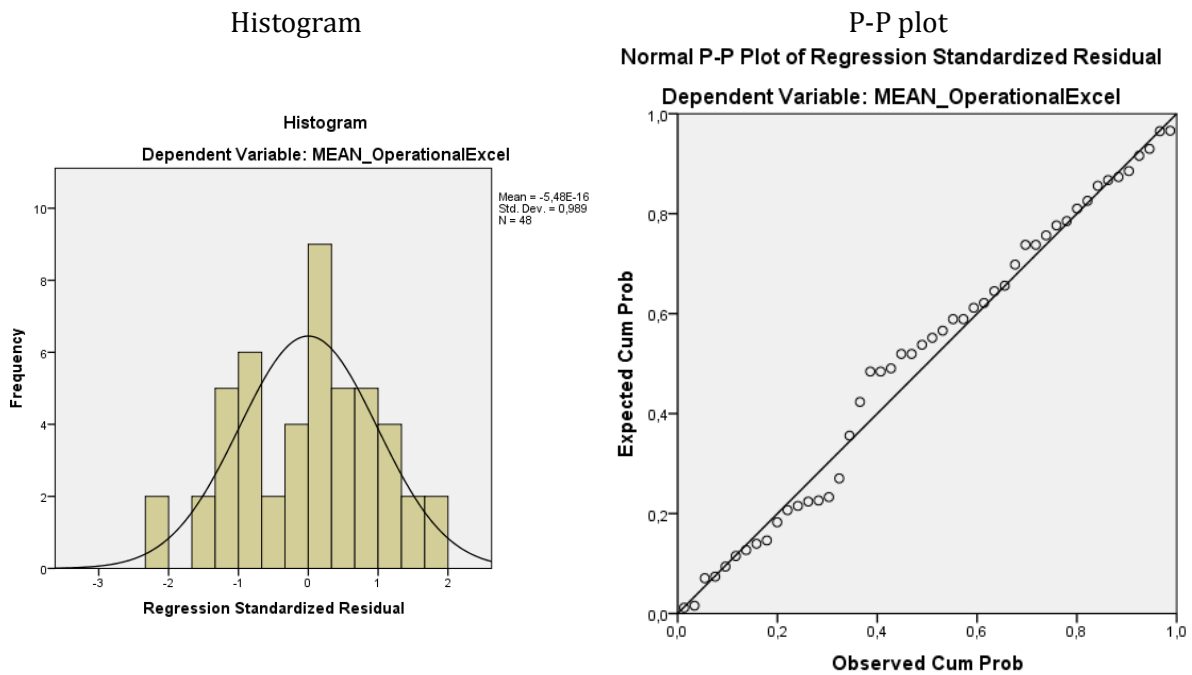
---

### H3C: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE OPERATIONAL EXCELLENCE POSITIVELY.

---

#### NORMALITY

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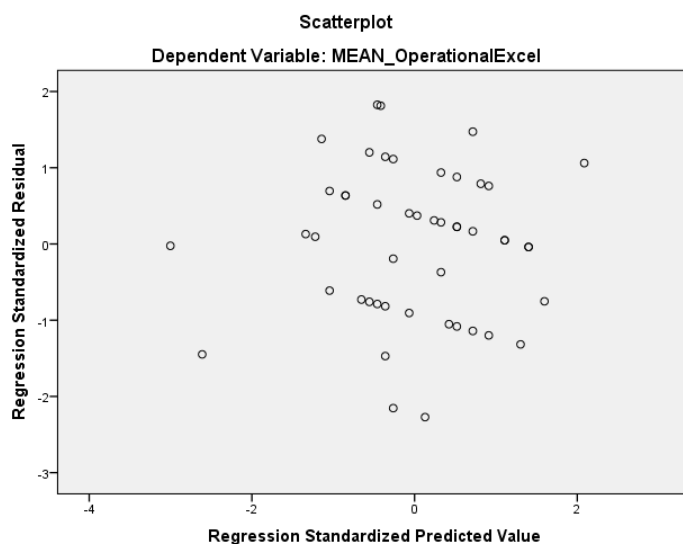


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

#### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,290 <sup>a</sup>	,084	,064	,76520	1,700

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_OperationalExcel

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

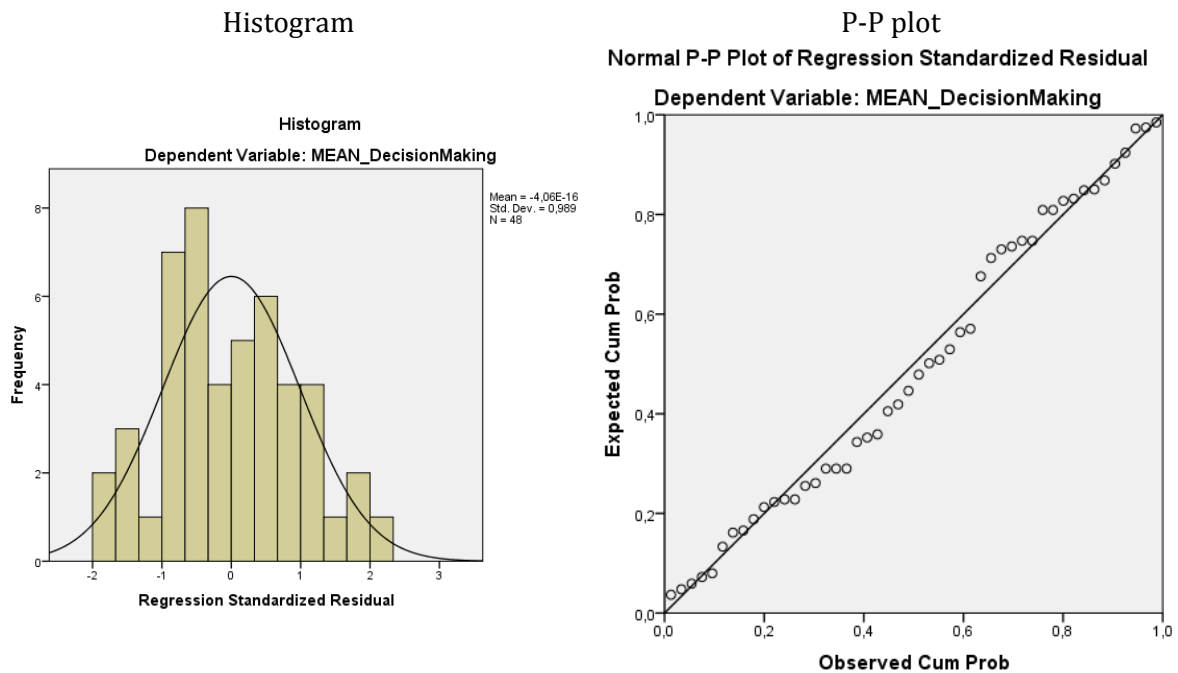
---

### H3D: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE DECISION MAKING POSITIVELY.

---

#### NORMALITY

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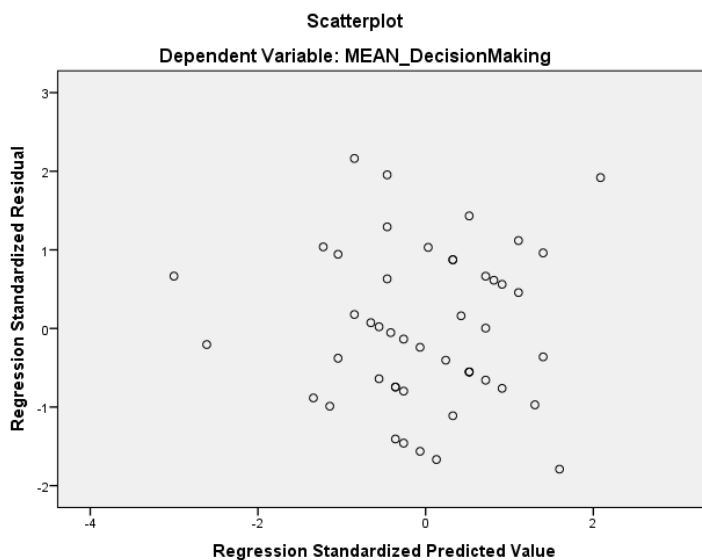


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

#### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,475 <sup>a</sup>	,226	,209	,75566	2,047

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_DecisionMaking

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

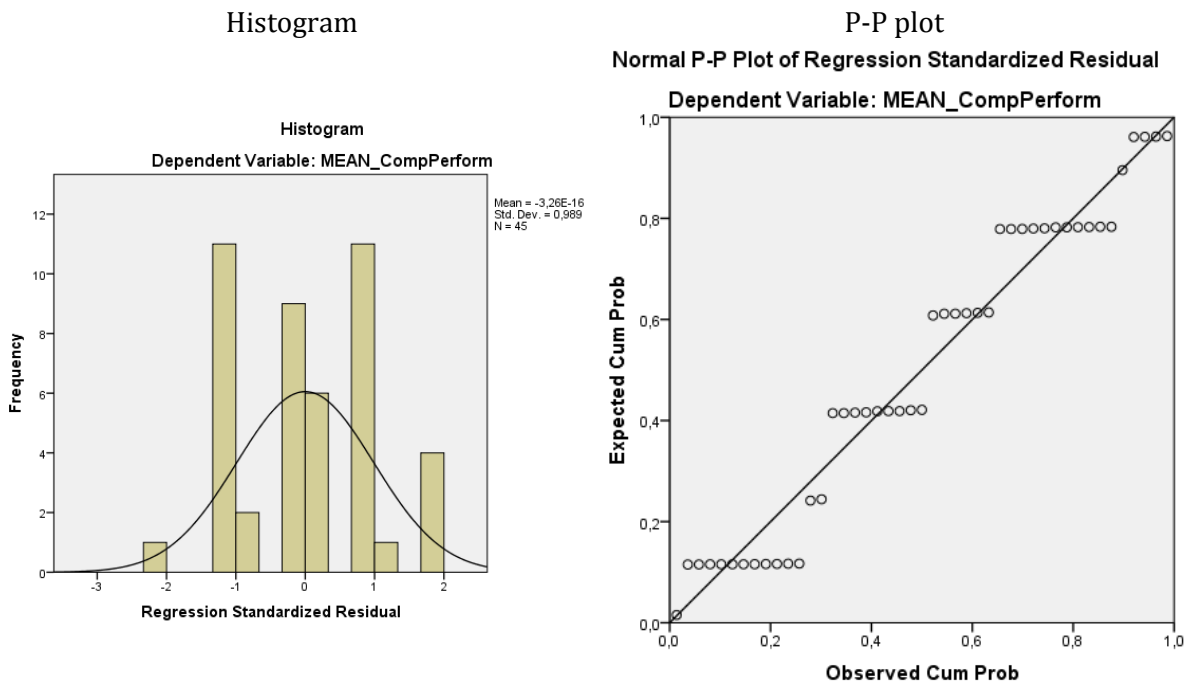
## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

H3E: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCE COMPETITIVE PERFORMANCE POSITIVELY.

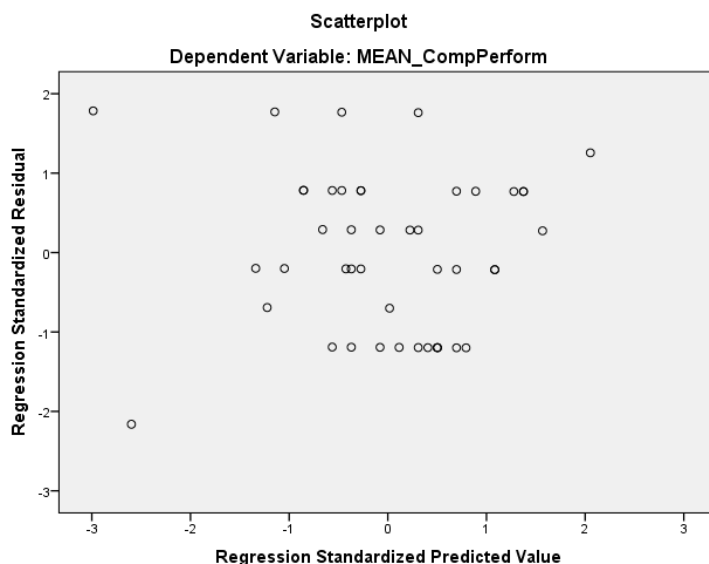
NORMALITY



As can be seen in the histogram and P-P plot given figures, the sample does violate the assumption of normality. The histogram does not show a bell-shaped curve and the P-P plot does not show a straight line.

LINEARITY AND HOMOSCEDASTICITY

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.



## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,007 <sup>a</sup>	,000	-,023	1,01434	2,055

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_CompPerform

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is cannot be seen as appropriate.

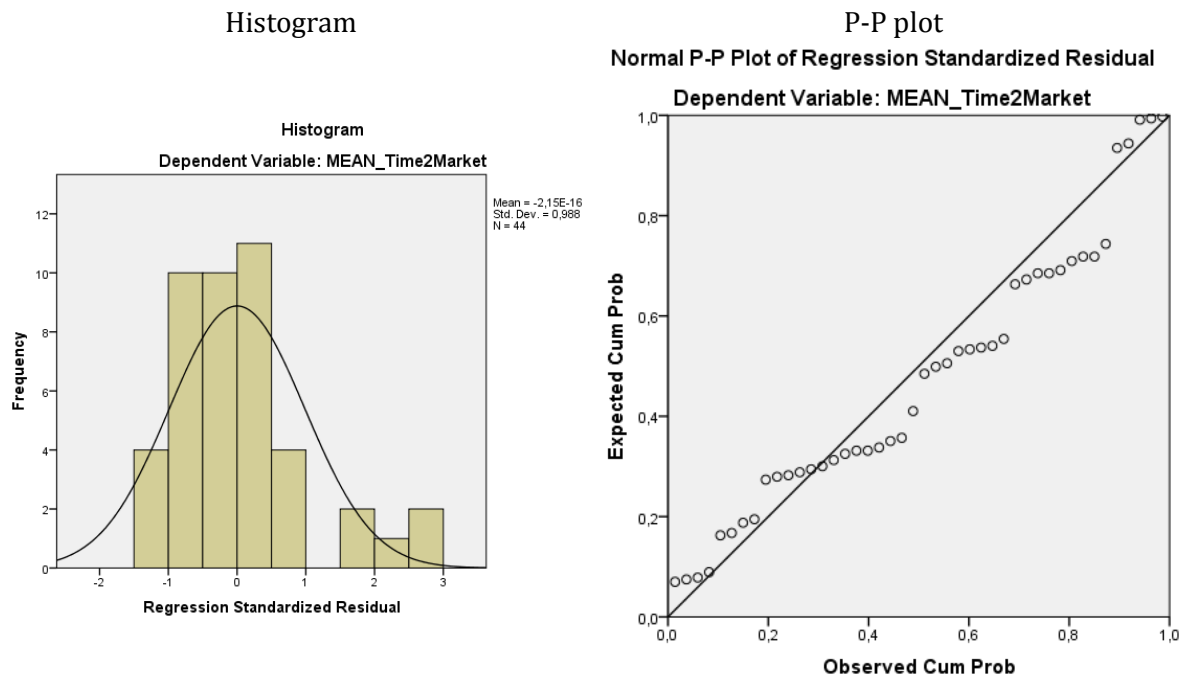
---

### H3F: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCE TIME TO MARKET POSITIVELY.

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#### NORMALITY

---

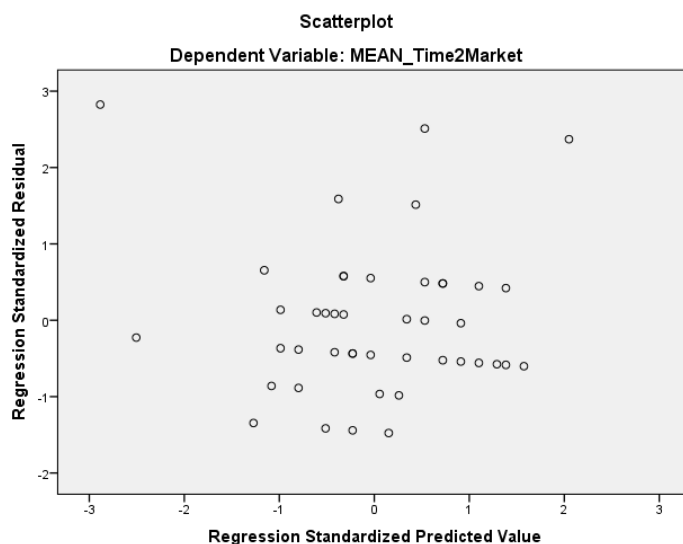


As can be seen in the histogram and P-P plot given figures, the sample does violate the assumption of normality. The histogram does not show a bell-shaped curve and the P-P plot does not show a straight line.

#### LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,093 <sup>a</sup>	,009	-,015	,99463	1,502

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_Time2Market

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION

---

Judging from the assumptions (without linearity) overall the model is cannot be seen as appropriate.

## APPENDIX J: RESULTS OF LINEAR REGRESSION

**H1: THE INFLUENCE OF BUSINESS COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION.**

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,538 <sup>a</sup>	,290	,258	,47614

a. Predictors: (Constant), MEAN\_EA, MEAN\_BC

### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,533	,707		3,585	,001
	MEAN_BC	-,214	,142	-,212	-1,501	,140
	MEAN_EA	,353	,122	,408	2,892	,006

a. Dependent Variable: MEAN\_BP

**H2: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION INFLUENCES BUSINESS PERFORMANCE POSITIVELY.**

### Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,504 <sup>a</sup>	,254	,238	,48258	1,761

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_BP

### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,596	,336		4,754	,000
	MEAN_EA	,437	,110	,504	3,961	,000

a. Dependent Variable: MEAN\_BP

H3A: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
REDUCES IT COSTS.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,460 <sup>a</sup>	,212	,195	,95734	2,743

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_ITcosts

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,439	,666		,659	,513
	MEAN_EA	,768	,219	,460	3,515	,001

a. Dependent Variable: MEAN\_ITcosts

H3B: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCES CUSTOMER SATISFACTION POSITIVELY.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,347 <sup>a</sup>	,121	,101	,72398	2,036

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_CustSatis

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,304	,504		4,575	,000
	MEAN_EA	,415	,165	,347	2,511	,016

a. Dependent Variable: MEAN\_CustSatis

H3C: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCE OPERATIONAL EXCELLENCE POSITIVELY.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,290 <sup>a</sup>	,084	,064	,76520	1,700

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_OperationalExcel

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,636	,532		3,073	,004
	MEAN_EA	,360	,175	,290	2,059	,045

a. Dependent Variable: MEAN\_OperationalExcel

H3D: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCE DECISION MAKING POSITIVELY.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,475 <sup>a</sup>	,226	,209	,75566	2,047

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_DecisionMaking

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,826	,526		1,571	,123
	MEAN_EA	,632	,173	,475	3,660	,001

a. Dependent Variable: MEAN\_DecisionMaking

H3E: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCE COMPETITIVE PERFORMANCE POSITIVELY.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,007 <sup>a</sup>	,000	-,023	1,01434	2,055

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_CompPerform

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,178	,725		4,386	,000
	MEAN_EA	,011	,237	,007	,046	,963

a. Dependent Variable: MEAN\_CompPerform

H3F: THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION  
INFLUENCE TIME TO MARKET POSITIVELY.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,093 <sup>a</sup>	,009	-,015	,99463	1,502

a. Predictors: (Constant), MEAN\_EA

b. Dependent Variable: MEAN\_Time2Market

**Coefficients<sup>a</sup>**

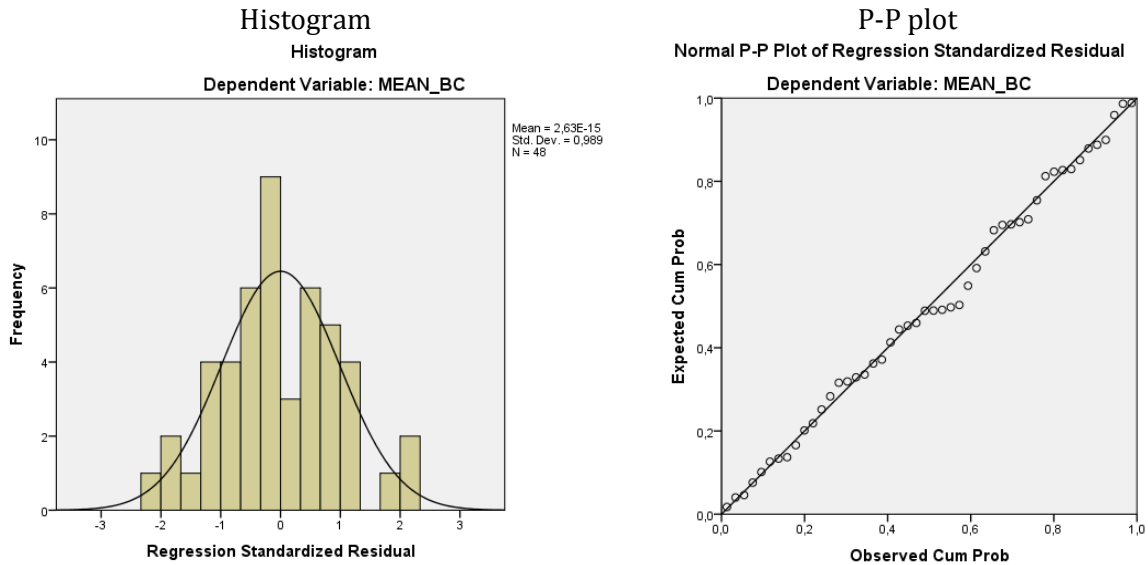
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,043	,699		2,925	,006
	MEAN_EA	,139	,230	,093	,603	,550

a. Dependent Variable: MEAN\_Time2Market

## APPENDIX K: TESTING ASSUMPTIONS FOR LINEAR REGRESSION (DEEPER ANALYSIS)

### BUSINESS COMPLEXITY OF AN ORGANIZATION INFLUENCES BUSINESS PERFORMANCE NEGATIVELY

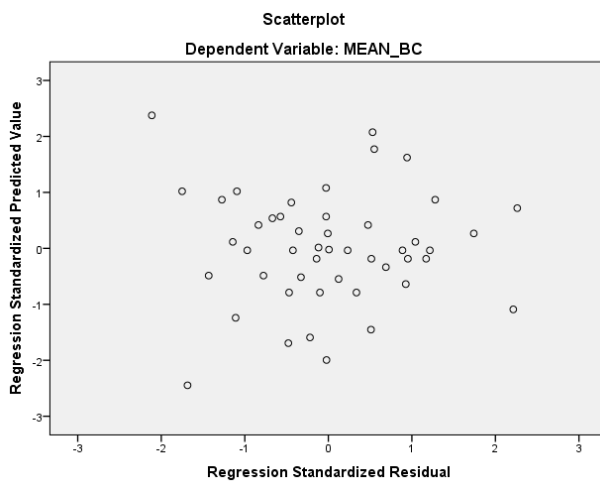
#### NORMALITY



As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

#### LINEARITY AND HOMOSCEDASTICITY

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.



## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,397 <sup>a</sup>	,158	,140	,50838	1,408

a. Predictors: (Constant), MEAN\_BP

b. Dependent Variable: MEAN\_BC

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

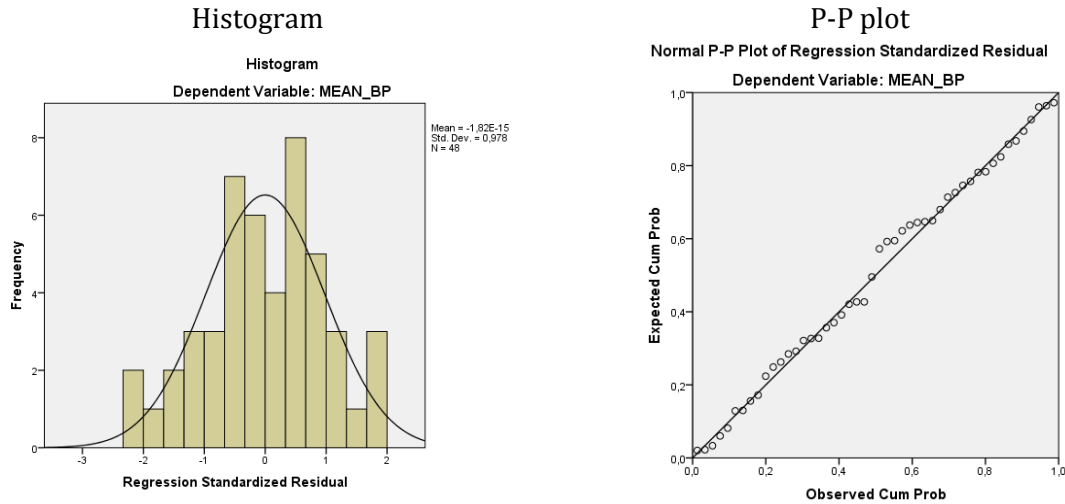
---

# THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION.

---

## NORMALITY

---

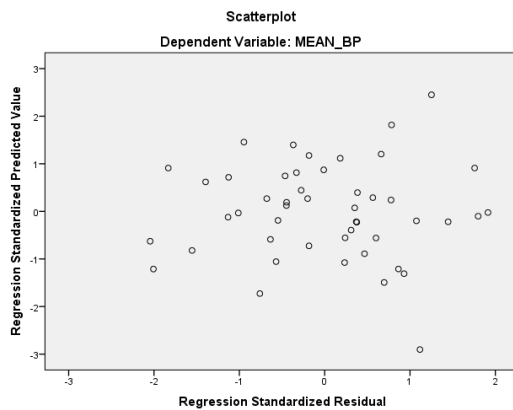


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

## LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,570 <sup>a</sup>	,325	,295	,46424	1,822

a. Predictors: (Constant), MEAN\_EA, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

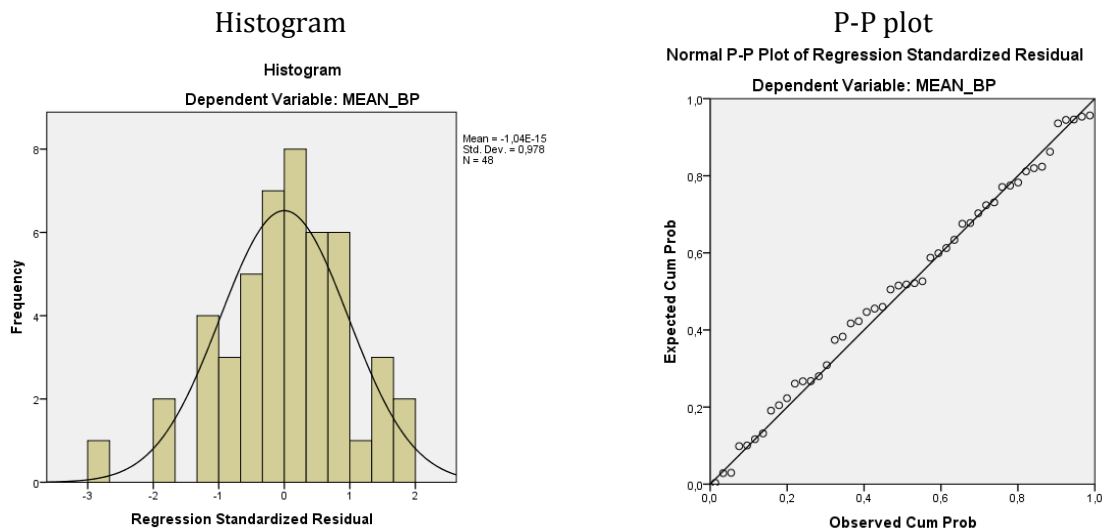
---

# THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY EA FOUNDATION

---

## NORMALITY

---

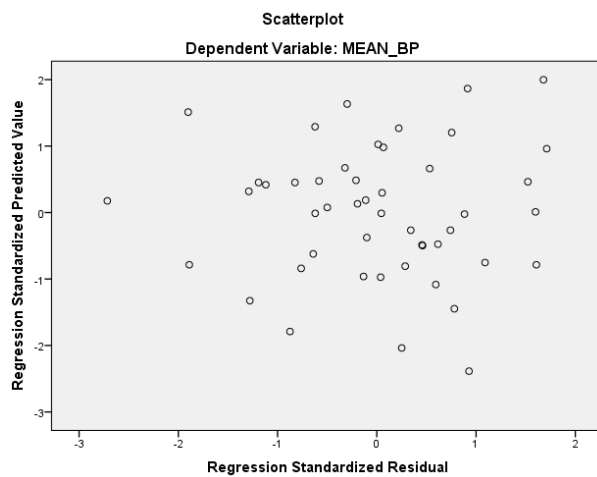


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

## LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,464 <sup>a</sup>	,215	,180	,50053	2,107

a. Predictors: (Constant), EA\_Foundation, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

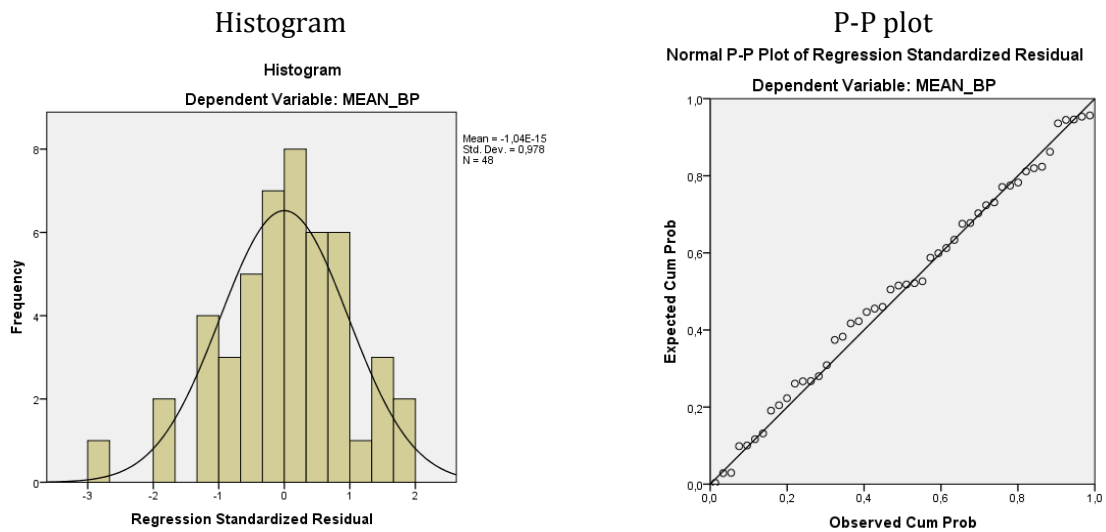
---

# THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY EA DEVELOPMENT

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## NORMALITY

---

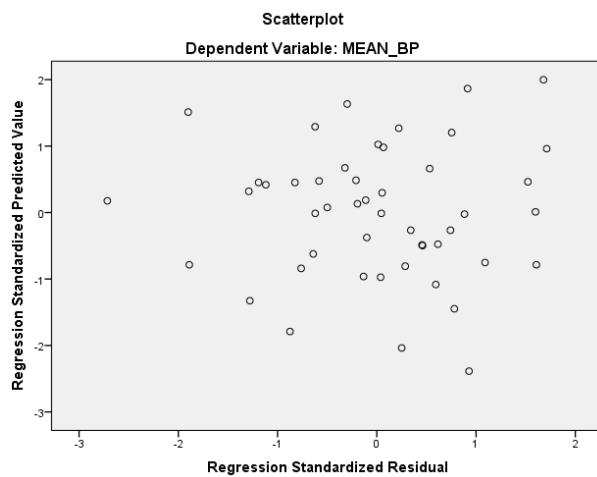


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

## LINEARITY AND HOMOSCEDASTICITY

---

Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

---

Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,498 <sup>a</sup>	,248	,215	,48989	1,956

a. Predictors: (Constant), EA\_Development, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

---

Judging from the assumptions (without linearity) overall the model is seen as appropriate.

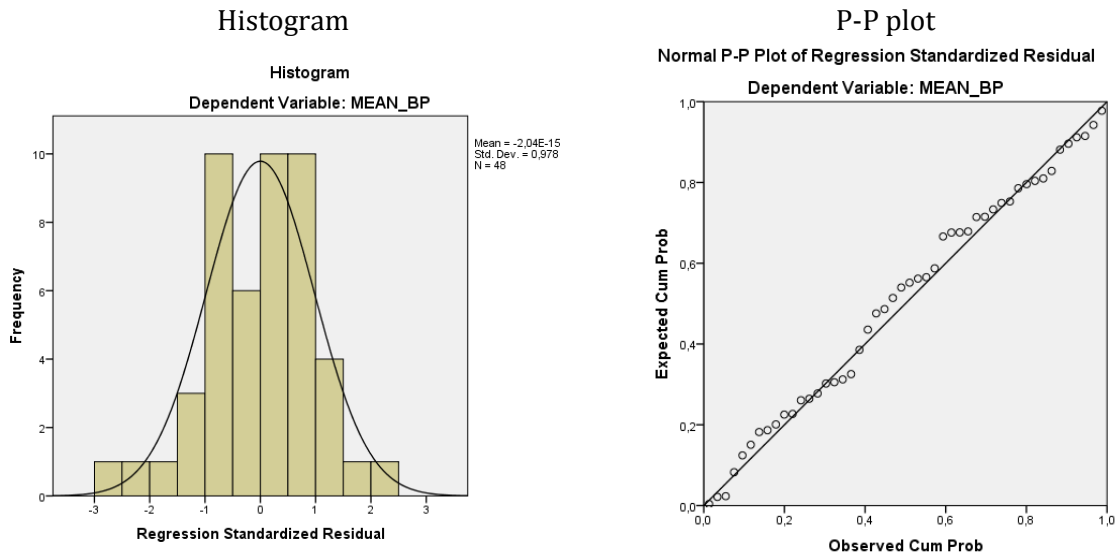
---

# THE INFLUENCE STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY EA REALIZATION

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## NORMALITY

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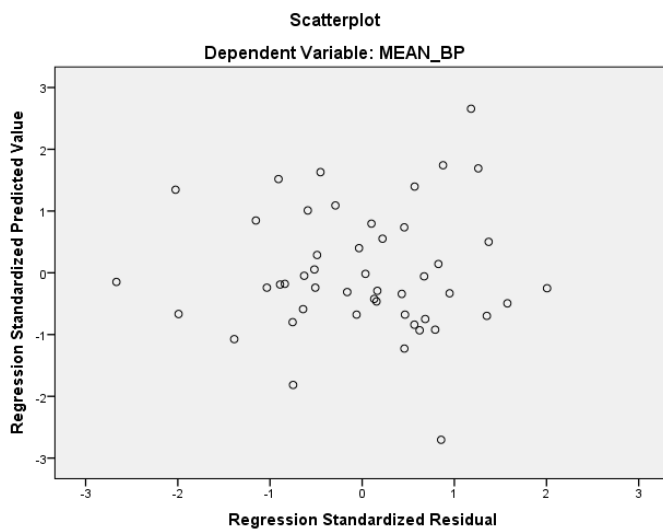


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

## LINEARITY AND HOMOSCEDASTICITY

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Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.



## INDEPENDENCE

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Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,538 <sup>a</sup>	,290	,258	,47619	1,972

a. Predictors: (Constant), EA\_Realization, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

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Judging from the assumptions (without linearity) overall the model is seen as appropriate.

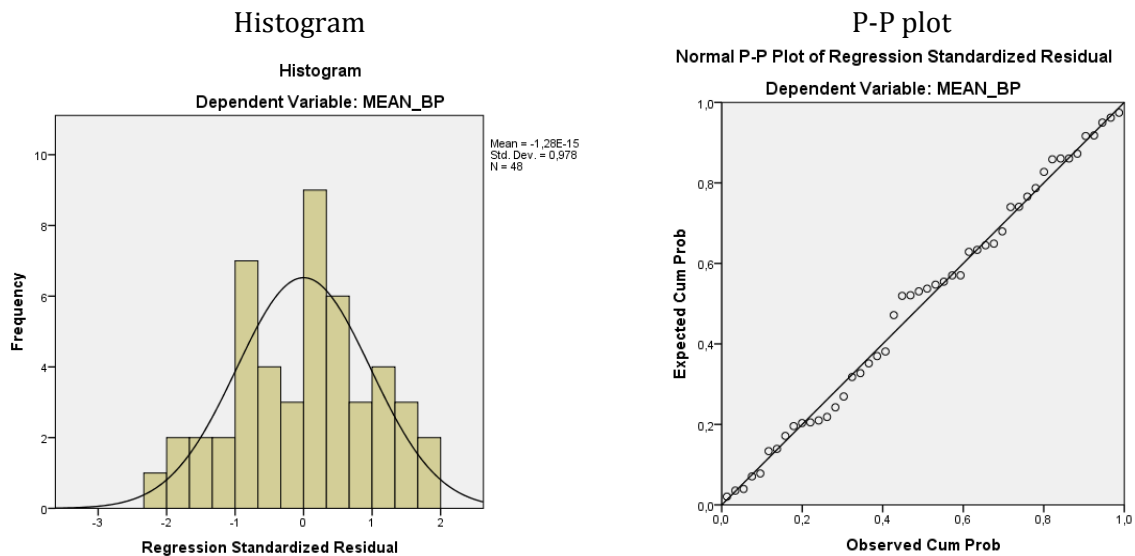
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# THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY EA ALIGNMENT

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## NORMALITY

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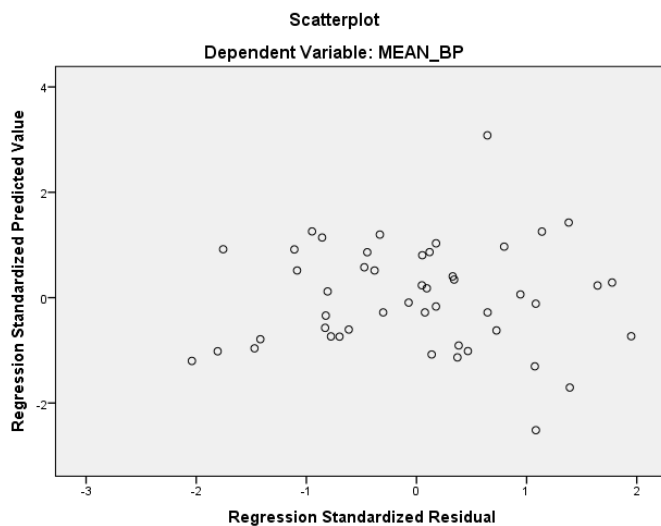


As can be seen in the histogram and P-P plot given figures, the sample does not violate the assumption of normality. The histogram shows a bell-shaped curve and the P-P plot shows an almost straight line.

## LINEARITY AND HOMOSCEDASTICITY

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Standardized residuals versus standardized predicted values



As can be seen from the above given scatterplot, the variance of the standardized residuals is relatively equal and does not show a sort of curve, what suggests that linearity and homoscedasticity can be assumed.

## INDEPENDENCE

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Table with Durbin-Watson value

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,628 <sup>a</sup>	,395	,368	,43966	1,763

a. Predictors: (Constant), EA\_Alignment, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

The Durbin-Watson value is between 1 and 3, what suggests independence can be assumed within this construct.

## CONCLUSION OF THE ASSUMPTIONS

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Judging from the assumptions (without linearity) overall the model is seen as appropriate.

APPENDIX L: RESULTS OF LINEAR REGRESSION (DEEPER ANALYSIS)

BUSINESS COMPLEXITY OF AN ORGANIZATION INFLUENCES BUSINESS PERFORMANCE NEGATIVELY

Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,397 <sup>a</sup>	,158	,140	,50838	1,408

a. Predictors: (Constant), MEAN\_BP

b. Dependent Variable: MEAN\_BC

Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4,365	,395		11,037	,000
	MEAN_BP	-,394	,134	-,397	-2,937	,005

a. Dependent Variable: MEAN\_BC

THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS MODERATED BY THE MATURITY OF ENTERPRISE ARCHITECTURE OF AN ORGANIZATION.

Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,570 <sup>a</sup>	,325	,295	,46424	1,822

a. Predictors: (Constant), MEAN\_BC\_PeopleOrgDesStrategy, MEAN\_EA

b. Dependent Variable: MEAN\_BP

Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,653	,584		4,540	,000
	MEAN_EA	,344	,114	,397	3,008	,004
	MEAN_BC_PeopleOrgDesStrategy	-,245	,113	-,287	-2,170	,035

a. Dependent Variable: MEAN\_BP

THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS  
MODERATED BY EA FOUNDATION

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,464 <sup>a</sup>	,215	,180	,50053	2,107

a. Predictors: (Constant), EA\_Foundation, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3,093	2	1,546	6,172	,004 <sup>b</sup>
	Residual	11,274	45	,251		
	Total	14,367	47			

a. Dependent Variable: MEAN\_BP

b. Predictors: (Constant), EA\_Foundation, MEAN\_BC\_PeopleOrgDesStrategy

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,577	,552		6,478	,000
	MEAN_BC_PeopleOrgDesStrategy	-,312	,124	-,364	-2,522	,015
	EA_Foundation	,113	,093	,176	1,221	,228

a. Dependent Variable: MEAN\_BP

THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS  
MODERATED BY EA DEVELOPMENT

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,498 <sup>a</sup>	,248	,215	,48989	1,956

a. Predictors: (Constant), EA\_Development, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3,567	2	1,784	7,432	,002 <sup>b</sup>
	Residual	10,799	45	,240		
	Total	14,367	47			

a. Dependent Variable: MEAN\_BP

b. Predictors: (Constant), EA\_Development, MEAN\_BC\_PeopleOrgDesStrategy

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,406	,508		6,704	,000
	MEAN_BC_PeopleOrgDesStrategy	-,322	,114	-,376	-2,831	,007
	EA_Development	,171	,091	,250	1,880	,067

a. Dependent Variable: MEAN\_BP

THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS  
MODERATED BY EA REALIZATION

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,538 <sup>a</sup>	,290	,258	,47619	1,972

a. Predictors: (Constant), EA\_Realization, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,162	2	2,081	9,178	,000 <sup>b</sup>
	Residual	10,204	45	,227		
	Total	14,367	47			

a. Dependent Variable: MEAN\_BP

b. Predictors: (Constant), EA\_Realization, MEAN\_BC\_PeopleOrgDesStrategy

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,292	,469		7,023	,000
	MEAN_BC_PeopleOrgDesStrategy	-,333	,109	-,389	-3,060	,004
	EA_Realization	,206	,081	,320	2,523	,015

a. Dependent Variable: MEAN\_BP

THE INFLUENCE OF STRATEGIC COMPLEXITY ON BUSINESS PERFORMANCE IS  
MODERATED BY EA ALIGNMENT

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,628 <sup>a</sup>	,395	,368	,43966	1,763

a. Predictors: (Constant), EA\_Alignment, MEAN\_BC\_PeopleOrgDesStrategy

b. Dependent Variable: MEAN\_BP

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5,668	2	2,834	14,662	,000 <sup>b</sup>
	Residual	8,698	45	,193		
	Total	14,367	47			

a. Dependent Variable: MEAN\_BP

b. Predictors: (Constant), EA\_Alignment, MEAN\_BC\_PeopleOrgDesStrategy

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,355	,547		4,307	,000
	MEAN_BC_PeopleOrgDesStrategy	-,196	,109	-,229	-1,796	,079
	EA_Alignment	,397	,102	,498	3,906	,000

a. Dependent Variable: MEAN\_BP