Measuring Architecture Principles and Their Sets in Practice: Creating an Architecture Principle Measurement Instrument Challenged in a Case Study at the Dutch Tax Agency

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Abstract: Although architecture principles are important in the implementation of information systems requirements, empirical evidence of the effect of architecture principles is lacking. To find this empirical evidence, we need an instrument to measure architecture principles in the first place. This paper is the result of creating an architecture principle measurement instrument challenged in a case study. We describe both the measurement instrument and the related measurement method, including the test in a real-life case. Based on the outcome we extended the instrument with extra architecture principles characteristics and attributes. We also made some improvements on the measurement method as well.

1 INTRODUCTION

As we described in (Borgers and Harmsen, 2018), architecture principles play, in theory, a key role in guiding the design and the implementation of information system (IS) requirements. Examples of architecture principles are: A fact is stored only once, or Reuse, before Buy, before Make. But the question is: are architecture principles effective in practice, i.e. do they have a – hopefully positive – effect on the implementation of IS requirements?

To answer this overarching question of our research, we consider the use of architecture principles during the implementation of IS requirements. We measure both the architecture principles and the success of the implementation of the information system requirements, in order to determine a correlation. Our research is an investigation into the practical value of architecture principles: does the theoretical promise of architectures principles have a positive effect on the implementation of information system requirements in practice?

The current paper is the result of creating an architecture principle measurement instrument challenged in a case study. We have used the definition as well as the framework for defining and describing architecture principles introduced in (Borgers and Harmsen, 2018), to create a measurement instrument and method. With this instrument we measure architecture principles in practice, testing the definition and model in a real-life case.

We start this paper with the research methodology in section 2. In the third section we provide an architecture principle measurement instrument. The validation results of the measurement instrument, based on a case study, are described in section four. We finish this article with limitations, conclusions and further research.

2 RESEARCH METHODOLGY

2.1 Research Question

Our literature study (Borgers and Harmsen, 2018) resulted in a theoretical framework for architecture principles. The next step is to challenge this framework in practice: Is it, in a real-life situation, useful to measure the architecture principles? Therefore, we phrased the research question:

"How to measure architecture principles and their sets in practice?"

To answer this question, we need an instrument to measure both the individual architecture principles as

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well as the set of principles used. This instrument should be able to identify architecture principles and their sets in the first place. Secondly, using the theoretical framework, we have to determine the possible values of the characteristics and attributes out of this framework. In determining the characteristics and attributes, it is important that the description is coherent and complete. So, the first sub question is:

I: "What does an Architecture principle measurement instrument look like?"

To be able to answer the overall research question, a measurement instrument in itself is not enough. We also need a method to collect and to analyze the information. The second sub question, therefore, will be:

II: "How to use the Architecture principle measurement instrument in practice?"

To answer these two research questions, we used the approach described below.

2.2 Case Study Approach

We have chosen the case study approach for answering our research questions. There are, in general, two reasons for using the case study approach:

1. Early phases of research: case studies are useful "in early phases of research where there may be no prior hypotheses or previous work of guidance" according to (Steenhuis and De Bruijn, 2004), but also stated by (Eisenhardt, 1989).
2. Context-related: if a phenomenon is strongly related to its context, case study research "is used to investigate a specific phenomenon through an in-depth limited-scope study" (Eisenhardt, 1989). Yin states that case studies are necessary "when the boundaries between phenomenon and context are not clearly evident" (Yin, 1984).

Architecture principles have been studied since the early 1990's. This would imply that the first reason does not apply to our research. But in (Borgers, 2016) we already identified that there is a lack of research about the practical use of architecture principles. And although there is a scientific basis laid out by this theory, we would like to challenge its adequacy, "because they have little empirical substantiation" as Eisenhardt (1989) would call it. And, although some of the past publications introduced new definitions and descriptions, they all confirmed the conclusions of previous publications (Borgers and Harmsen, 2018). It is time to juxtaposition theory and practice.

For answering our research question the second reason to choose for the case study approach, is valid as well. In our literature review we cited several authors that "the context in which the architecture principles are used, is important as well, in particular for the effect of a principle." (Borgers and Harmsen, 2018). So, architecture principles are conceptual instruments used by people in the context of the design and implementation process.

2.3 Research Steps

A research approach has to be reliable and valid (Babbie, 2015a). Therefore, especially in a case study approach, it is important to guarantee the objectivity of fact findings. Therefore, we looked at the steps defined by (Eisenhardt, 1989). She based her steps on literature from authors like (Yin, 1981; 1984; Miles and Huberman, 1984; Strauss, 1987) and experience from authors conducting case studies like (Harris and Sutton, 1986; Eisenhardt and Bourgeois, 1988; Gersick, 1988). We grouped the steps of Eisenhardt in the following three phases:

Figure 1: Case study approach.

1. *Preparing the Case Study:* in this phase we defined the research question, as described above. Secondly, we selected a case. Because our overall research program is focusing on Dutch government organizations, we chose a case from the Dutch Tax Agency. One reason to choose this case study was, of course, that the project did use architecture principles in the first place. Besides, the chosen project had to be finished: we could see the use of principles during the entire implementation life cycle. We crafted the instruments and protocols to be used during the case study research. We defined our research team with subject matter experts, defined our survey, and built our measurement instrument and method.
2. *Doing the Research:* this was the iterative phase of data collection, analysis and theory building. We collected the data from documents, surveys, interviews, and a site visit. Based on the results of our desk research, we aimed at specific subjects

during our interviews. We added all collected data to the spreadsheets that contained our measurement instrument. During this phase we sharpened our measurement instrument, adding new characteristics and attributes. After all data were collected, the research team evaluated both the measurement instrument and method and made suggestions for improvement.

3. *Closing the Research:* the last phase compared the results with existing literature and to end the case study because there were no new data sources to investigate. We ended the case study after evaluating all possible data sources in our spreadsheet and reporting the results of the case study back to the Dutch Tax Agency. We closed the research by answering the research question.

2.4 Boundaries of Research

In literature, different kinds of architecture principles are defined: design and representation principles (Stelzer, 2009; Winter and Aier, 2011; Haki and Legner, 2013), syntactic and semantic architecture principles (Lindström, 2006), and architecture management principles (Lumor et al., 2016). In our literature review we already took the view that these different types of principles are different perspectives on the same kind of architecture principles, all meeting our definition.

As mentioned in section 2.2, the context in which architecture principles are used, is relevant. With narrowing the scope to Dutch government organizations, we are scaling down the research scope, resulting in more reliable research results.

3 THE MEASUREMENT INSTRUMENT

To be able to measure architecture principles in practice, we need both a measurement instrument and a corresponding method to use in practice. In this section we start describing the measurement as answer on research question one. In the second part we are answering the second research question, by explaining the measurement method.

3.1 The Measurement Instrument

To measure architecture principles and related architecture principle sets in practice we need a well-defined measurement instrument. This measurement instrument should be able to:

1. Identify the architecture principles and the architecture principle sets related to them;
2. Describe Architecture principle and the architecture principle sets with their characteristics and attributes.

Based on comprehensive literature review we redefined the definition of an architecture principle. We also extended a framework for describing both the architecture principles and related sets.

3.1.1 Definitions of Principle and Set

We defined an architecture principle as: "*An architecture principle is a declarative statement, based on, at least, business and IT strategy. It normatively describes a property of the design of an information system, which is necessary to ensure that the information system meets its essential requirements.*" Of course, to be an architecture principle all elements of the definition should be fulfilled. So, in the measurement instrument we designed a definition check for the elements declarative statement, based on business and IT strategy, normatively, describes a property of the design, and necessary meeting its essential requirements. Each of these elements has to be present, including explanatory facts.

For an architecture principle set we use the definition "*a group of architecture principles defined and presented as a collection*". Because this definition is more generic, we do see every group of architecture principles described together as a set.

3.1.2 Descriptions

For describing both the individual architecture principles and the sets of architecture principles we defined a framework of characteristics and related attributes (see fig. 2). This framework is based on research of Richardson et al. (1990), Fischer, et al., (2010) and Winter and Aier (2011).

Using our framework, we listed all characteristics named in literature (Borgers and Harmsen, 2018). For each characteristic and its attributes, we provided a definition (see appendix) and defined the relationship with the architecture principle. In our measurement instrument we list all characteristics and related attributes, so we can collect the data for the characteristics and attributes found in practice.

In our literature review we also found all kinds of characteristics and documents in the context of the architecture principles of which we are calling artefacts. We described the context of the architecture principle and set by defining the relationship with the

artefacts, like ‘design’ and ‘requirements’.

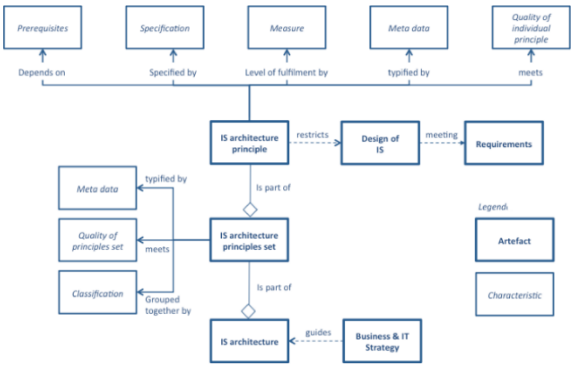

Figure 2: Framework for describing the architecture principle and set.

3.2 Measurement Method

To be able to use the measurement instrument, we also need a reliable and valid measurement method to measure the architecture principles. The measurement method helps with collecting and analyzing the right data and finally with measuring the architecture principles. The measurement method is an iterative three-step approach (see fig. 3).

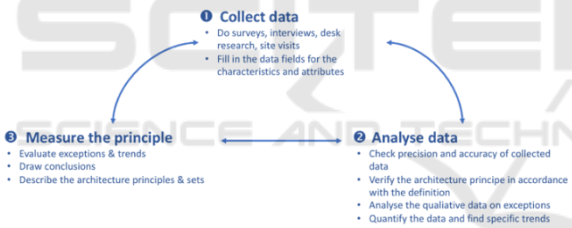

Figure 3: The measurement method.

3.2.1 Collect Data

The objective of this step is to collect data about architecture principles and the architecture principle set. Therefore, data about the related artefacts are also relevant: IS architectures, IS designs, requirements and business & IT strategies. We use different methods to collect data: desk research, surveys, interviews and site visits.

For the desk research all kind of documents might be useful, like architecture descriptions, requirements specifications, test reports, and so on. All these address elements of the architecture principles and/or the related artefacts. The survey is used to collect data before the interview sessions, to be able to focus on specific items during the interview. The survey consists of open questions based on the characteristics in the framework. The interviews take place with at least two members of the research team. All interviews are recorded, and the minutes of the interview are sent to the interviewee for feedback. Interviewees are architects, software engineers, the test manager, the project leader, and the system owner. Site visits are useful to see the information system running in the daily operation and to consider to what extent the essential requirements are implemented.

We record all relevant data per architecture principle and per source, in order to have different facts about the same characteristic or attribute available. This is useful for the analysis of data, when differences or even conflicts among the data about a specific characteristic or attribute occur.

3.2.2 Analyze Data

In this step we analyze the data to check the precision and accuracy of the data and to find exceptions and trends. For all data collected we check for inconsistencies between sources. If so, we have to go back for data collection to find the right or new data. If, afterwards, data conflicts remain, we have to explain the differences or decide not to use the data.

Secondly, we check whether or not so-called architecture principles are in accordance with the architecture principle definition. We determine if the principle satisfies each element of the definition and write down that reasoning in a spreadsheet. If not, the so-called architecture principle is declared be out of scope.

We then analyze the qualitative data on exceptions. The analysis has to be done per principle, but also between different principles. We look at remarkable differences between attributes or characteristics of a principle or between principles. For instance, the key action cannot be related to the prerequisite of the principle. Or, one architecture principle is fulfilled completely, while another one is not, although those two are strongly related.

The final action is to quantify the data and find specific trends from the quantified data. We simplify the analysis between principles out from different cases. We quantify the data of each principle and set as follows.

- We review the different sources per attribute and set the numerical score;
- The score reflects the level of fulfilment of the definition of the attribute: ‘0’ is no fulfilment, ‘1’ is partly fulfilment and, ‘2’ is complete fulfilment. We call this our code scheme (Babbie, 2015b). The reasoning for the score is described in the spreadsheet;

- The score of the characteristic is the average of the score of its attributes;
- Only for the "classification" characteristic of the principle set we use an alternative score: the scores used refer to the specific values the attribute can have. See the appendix for all attribute values of principle sets;
- Finally, we calculate the average score of each characteristic over all principles and sets.

We now are able to make cross-section analyses, to create graphics and to search for trends.

3.2.3 Measure the Principle

This final step is to evaluate the exceptions and trends. We describe the architecture principles and the architecture principle sets, including the overall conclusions about their state.

Based on the qualitative and quantified analysis we evaluate the exceptions and trends. We explain those exceptions and trends and draw our conclusions as subject-matter experts. Of course, we add evidence supporting those conclusions.

We end up with describing the architecture principles and the architecture principle sets by describing their characteristics and attributes. In this description we add the qualitative and quantified analysis, including the conclusions.

4 CASE STUDY RESULTS

We started challenging our measurement instrument with one case study only. Before we use the instruments for many cases simultaneously, we first would like to test to what extent the instrument is useful in practice. Depending on the outcome of the first case study, we can decide how to continue. If there is a big misfit with the instrument itself, we will focus on improving the instrument. If it is working in practice quite well, we can start directly with the research itself and optimize the measurement instrument where necessary.

We used the 'Teruggaaf Dividendbelasting' (TDi), in English: 'Return of Dividend Tax', of the Dutch Tax Agency as case in our research. TDi is an information system supporting the return of tax on dividend payed to legal entities. TDi was rebuilt in an agile project, which we investigated until system release in December 2017. For this case study we reviewed nineteen documents, conducted five interviews with six different stakeholders and examined the TDi system itself during a site visit. These activities were done by our research team consisting of three researchers.

4.1 Architecture Principles of the TDi Case

In the rebuilding of the TDi system 55 potential architecture principles were used. According to our definition (see section 3), only 36 architecture principles could be identified as such. In fig. 4 we see the level of completeness of all those 36 architecture principles together, while the individual scores may differ between the principles.

Looking at the specification characteristic of the architecture principles we did recognize that none of the principles included a rationale, while the statement and implications were worked out well. A reference to the rationale, as they were described in other architecture documents, was missing as well.

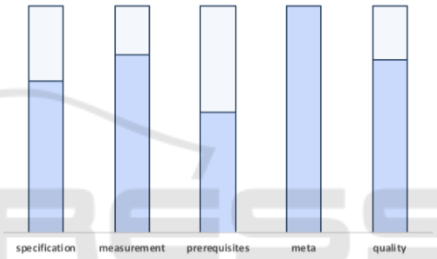

Figure 4: Level of completeness of the 36 architecture principles.

80% of the principles has been fulfilled partly (36%) or fully (44%). Only one principle was not followed ("from object based to subject based working") and in 17% we could not determine whether or not the principles had been fulfilled because of missing resource data (see fig. 5). Interestingly, developers didn't respect some of the principles as meant to be and implemented parts of the system in other directions.

With respect to the prerequisites, for seven principles specific preconditions were defined, while for all, some overall preconditions were defined. Not all of the preconditions have been fulfilled (completely) at the start or during the project, like "*B/CAO building blocks available*". Therefore, not all principles could be fulfilled, as we did see. Surprisingly, there were no "*key actions*" identified, to get the preconditions fulfilled.

All meta data was in place, so that managing the architecture principles was no issue. Information about author, status, version, users and much more was easy to find.

The architecture principles were meeting the quality attributes as well. The main reason why the overall score of the quality is not 100 percent, is that the rationale was missing. Therefore, we were not able to determine the principle's intention and relevance as described in the "*specific*" and "*relevant*" attribute. All architecture principles, even when they were imposed from outside the project, were translated to the TDi context.

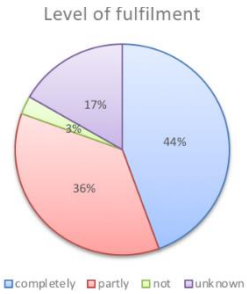

Figure 5: Level of fulfilment of the principles.

The architecture principles originate from two documents: a High Level Design (HLD) and a Project Start Architecture (PSA). The HLD describes the process, application and technical infrastructure of the TDI system, while the PSA focuses on the application and technical infrastructure only. In the HLD, twelve architecture principles are defined explicitly but most principles are only addressed by referring to other architecture documents. In the PSA, nine ICT principles are described, including directives for using in the TDi system implementation. In both documents many meta data attributes can be found, like authors, administrator, status, target audience, etc.

Given the many architecture principles mentioned in both sets we conclude that the sets are not representative for meeting the essential requirements. There are too many architecture principles adopted from the overall architectures, resulting in overlap. Those principles are not translated to a single principle specific for the TDi system. Although there are many overlapping architecture principles, there are no contradictory principles in the sets. The accessibility of the sets themselves is good, because they were managed by the architects of the TDi project. Because the sets refer to other documents, the accessibility of the original sets of principles is less evident.

4.2 Evaluation of the Measurement Instrument in the Case

For evaluating the measurement instrument, we have to test for both the identification and the description of the architecture principles, whether they are complete and coherent. To start with the identification of the architecture principles, the instrument was helpful in determining which of the so-called architecture principles are fulfilling the elements of the definition. As a result, nineteen of the 55 so-called architecture principles did not pass verification. On the other hand, we did not find any other statements, not explicitly called architecture principles, that did fulfil the elements of the definition.

The definition of the architecture principle set was not differentiating enough. There are many ways to present a group of principles together. In our case we analyzed the different kinds of sets to understand the interrelationships between those sets. We did see in this case study that the presentation of the architecture principles was related to other architecture documents, which were already in place. So, the way of presenting the principles is not necessarily related to the system itself but influenced by external factors. Therefore, our case study resulted in a changed definition of the architecture principle set: "*a group of architecture principles defined and presented as a collection based on a similar type or scope of the architecture principles*."

Although we might state that - in this case - the identification of all individual principles was done, we also learned that the identification is also related to the essential requirements. In our case study the essential requirements were defined at a high level, e.g. "the system has to be future-proof", so it was quite easy to link architecture principles to the essential requirements. So, in next cases more in-depth research to the essential requirements is necessary.

The coherence of the architecture principle definition was already theoretically explained in our literature review with the WH-questions approach (Borgers and Harmsen, 2018). During the case study we did not find any inconsistencies between the elements, which might suggest that the elements of the definitions are incorrect.

The second part of the measurement instrument describes the architecture principles. Looking at the completeness of the instrument we found in the case all but two of the attributes defined in the model. The "*rationale*" attribute was defined in other documents and, although no "*key actions*" were defined, in some interviews necessary key actions to take were brought forward. So, none of the attributes are irrelevant.

In our case study we detected some omissions in the model. The attribute "*degree of acceptance*" has

to be added to the "*measure*" characteristic, because in our case this element was addressed by several sources. It describes an aspect relevant to the fulfilment of the principle and will be defined as: "*level of acceptance of the principle by all of its users*". The attribute "*preconditions fulfilled*", related to the "*prerequisites*" characteristic, is also relevant to add. We explicitly saw in the case that, when preconditions were set, it was also relevant to know whether the preconditions were fulfilled. The definition of this attribute can be described as "*the level of fulfilment of the preconditions defined*."

For the architecture principle set we will add an extra characteristic: "*prerequisites*". We discovered in the case study that some prerequisites were not related to a specific principle, but to a group of principles. Besides the "*precondition*" attribute, "*basic assumptions*" were described for some sets as well. Basic assumptions are "*relevant criteria for successful use of the principle*".

In this case we did not find any inconsistencies in the coherence of the description model. Some of the relationships as described in the model, e.g. "*depends on*" or "*level of fulfilment*", were described explicitly in the documents or way mentioned during the interviews. The amount of information, though, is insufficient to make fact-based statements about the consistency of the coherence. In this case it was clear that there are interrelationships between attributes, e.g. the missing of the rationale and therefore a lower score at quality, as we already described in (Borgers and Harmsen, 2016). More research data is necessary to make clear statements about the coherence.

4.3 Evaluation of the Measurement Method

We evaluate the measurement method by discussing the reliability and validity of the case study results. To challenge the reliability of the results, we want to know to what extent the results would be consistent when doing the case study research again. In the measurement method are different protocols defined to assure the reliability of the outcome: using different kinds of data collections, working with a research team, minutes including feedback, etc. All these mechanisms are important, because this case demonstrates the subjectivity of facts collected. Two architects, for example, were working closely together during the project, but had different opinions about the fulfilment of some of the architecture principles. The research team could, based on all different sources, make an expert judgement about the fulfilment.

Although we used different ways of collection data, in this case study we were lacking some in-depth information about the essential requirements. As a result, it was difficult to see to what extent architecture principles were adding value in meeting the essential requirements. Additional sources related to the essential requirements, e.g. interviewing extra business owners, would help to bridge this gap.

In evaluating the validity of the measurement method, we concluded that the description of the architecture principles reflects the real situation of TDi. Although we found some contradictory data, especially in the interviews, we were able to explain the differences in the data. In this specific case we were not always able to go into details of specific architecture principles. Because the case used quite some principles, 36 in total, it was difficult to address all individual principles. So, in following cases we need mechanisms to get more in-depth information about the individual principles.

5 LIMITATIONS, CONCLUSIONS AND NEXT STEPS

The aim of this research was to build and test the architecture principle measurement instrument. To do so, we chose the case study approach to juxtaposition theory with practice.

5.1 Limitations

Although the arguments for using the case study approach are still valid, there are some limitations important to address in this case study.

We are aware that one case cannot prove the completeness of the measurement instrument. As discussed in section 4, the objective of this research is to test to what extent the instrument is useful in practice in the first place. For an extended test on completeness and coherence of the measurement instrument, we need more test cases.

A second limitation might be that the researchers, although all kind of protocols are defined, are biased in searching for characteristics and attributes. The moment we are introducing a model as a description of our research object, we see architecture principles through this model. We tried to avoid this prejudice by avoiding naming of attributes during the survey and interviews. The fact that we identified new attributes and characteristics, shows that we were open for new elements as well.

Finally we can also note that there is currently no

other instrument that measures architectural principles, so we cannot compare this instrument with other instruments. Studies have been done on the added value of architecture in general and we could apply that approach to the same case to assess whether comparable results will be achieved.

5.2 Conclusions

To answer the overall research question, we first had to investigate how an architecture principle measurement instrument looks like. Based on a theoretical framework we described a measurement instrument tested in a real-life case study. Based on the experiences from practice we can conclude that the measurement instrument is fit for purpose, although the instrument can be extended with extra characteristics and attributes. These extensions are '*degree of acceptance*' and '*preconditions fulfilled*' for describing the individual principle and the characteristic '*prerequisites*', including the attributes '*precondition*', and '*basic assumption*' for the architecture principle set. Although we know that we tested the instrument with one case only, we are beyond doubt that with these add-ons the model has added value in measuring architecture principles and in measuring related architecture principle sets.

Secondly, we had to determine how to use this measurement instrument in practice. We defined a three-step method to collect, analyze and measure the architecture principle. We carried out this measurement method in our case study, with a description of the architecture principles and principles sets for the TDi case as a result. We have the opinion that the method yields reliable and valid results, although we discovered in this case that more information on the requirements and the individual principles, would strengthen the results of the case study.

5.3 Next Steps

In summary, the conclusions and limitations combined confirm that it is feasible to enlarge the number of tests of architecture principle measurements with more cases. With more cases we are able to test the ability to compare architecture principles and principle sets between case studies.

When carrying out new cases, we would prefer the number of cases to be as large as possible. However, the substantial scaling up of the number of cases requires automatic processing of the data. We are going to investigate whether automatic processing is possible, since architectural principles are written in human language and we have found that this requires human interpretation.

Secondly, we can use the new case studies to test the completeness and coherence of the measurement instrument and method. We need to investigate whether or not the vision of using architecture principle is a characteristic in itself and we also have to see how we can elaborate on the essential requirements. So, new case studies will give new insights in the use of the instrument and method and help in optimizing them both.

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APPENDIX

Table 1: Characteristics for Architecture principles.

Characteristic	Attribute	Definition
Specification		
	Statement	Succinctly and unambiguously communicates the fundamental rule to the user of the principle
	Rationale	Highlights the business benefits of adhering to the principle
	Implications	Highlights the requirements for carrying out the principle
Measure		Level of the fulfilment of the statement
Prerequisites		
	Precondition	Preconditions and requirements to be fulfilled before the principle can be applied
	Key action	Guidelines for implementing the principle, giving the preconditions
Meta data	Several	Specifications to be able to govern the principle
Quality		
	Specific	The user can understand its intention and its effects to use it in his work
	Measurable	Possible to determine whether or not a given behaviour is in line with architecture principle
	Achievable	The implications of it can all be performed by or adhered to by all those affected
	Relevant	The principle should lead to a improvement of the system meeting the essential requirement
	Time framed	Principle should be stable in context and time

Table 2: Characteristics for architecture principle set.

Characteristic	Attribute	Definition
Classification		
	Type	The principles in the set are related to one of the architecture layers.
	Scope	Level of use of the principle.
Meta Data	Several	Specifications to be able to govern the principle set.
Quality of the set		
	Representative	The set covers all relevant requirements in a specific problem domain.
	Accessible	Users can find and retrieve the set of principles and they can comprehend the principles.
	Consistent	No contradictions between the architecture principles in the set.

Table 3: Possible values for the attributes of the classification characteristic.

Attribute	Score	Value
Type: The principles in the set are related to one of the architecture layers.		
	0	Infrastructure
	1	Application
	2	Information system
Scope: Level of use of the principle.		
	0	Part of the target organisation.
	1	Full target organisation.
	2	More than the target organisation.

Table 4: The 36 architecture principles used within the TDi case (translated from Dutch).

Number	Architecture principle
1	Organisational units do specialize
2	Collaboration based on services
3	We share proven services within the Dutch government
4	We communicate digitally with citizen and companies, if possible
5	Data administration is done digitally only
6	Digital workspaces offer customized information
7	We connect with the activities of citizens and companies
8	We develop knowledge about laws and regulations and share them
9	We strengthen the information position of citizens and companies
10	Design modularity carefully
11	Unique management and multiple use of data
12	Design the continuity of business operations completely
13	Use standards
14	Use services available (re-use, before buy, before build)
15	Use ICT products as intended
16	Deliver robust ICT services
17	Take security risks consciously
18	Solve problems at the source
19	Employee centrally, tailor-made information
20	Standard building blocks
21	Client-oriented payment and management of data
22	Establish source data
23	Exchange of information
24	Process characteristics
25	From object-oriented to subject-oriented
26	Maximize compliant behaviour
27	Integral production control
28	Data is used across contexts
29	Event-driven transactions exist alongside periodical transactions
30	The handling time of transactions matches the expectation of the customer
31	We are preparing for settlement of positive and negative claims
32	Advances can be partially paid
33	Operational Excellence is for Customer Intimacy
34	Decoupling of risk detection and determining legal consequences
35	Sensible reuse of process patterns and ICT facilities
36	Where possible, we shift functionality for transaction processing to the interaction process