In this thesis it is shown that in over 80% of enterprises there is a lack of explicit governance of their coherence, with the consequent failures of change, the emergence of sub-optimisations, the divergence of enterprises and so on. Assuming that the overall performance of an enterprise is positively influenced by proper coherence among the key aspects of the enterprise, including business processes, organizational culture, product portfolio, human resources, information systems and IT support, et cetera, the lack of explicit coherence governance is deplorable. In this thesis, control instruments are proposed to make an enterprise’s coherence explicit, to govern the coherence, as well as to measure enterprise coherence governance. The developed control instruments provide an integrated approach to solve actual business issues. Too often, solutions of important business issues are approached from a single perspective. In mergers, for example, whose success rates are deplorably low, the due diligence research approximates the merging parties often only from the financial perspective. Also in these type of studies, the control instruments provided in this thesis may be of significant value.
Enterprise Coherence Governance
Voor Gerda, ouders, kinderen en kleinkinderen
Enterprise Coherence Governance

Proefschrift

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# Contents

Table of figures ................................................................. ix
Table of tables ................................................................... xii

1. Personal motivation .......................................................... 14
   1.1 Frequently used terms .................................................. 15
   1.2 Thesis structure ......................................................... 16

2. Research problem ............................................................ 18
   2.1 Problem area ............................................................ 18
   2.2 Problem definition ..................................................... 20
   2.3 Research questions and research objectives .................. 23

3. Research approach .......................................................... 24
   3.1 Design Science research methodology ......................... 24
   3.2 Adoption of Design Science research guidelines ............ 26
   3.3 Inherent cycles in Design Science research ................. 28
   3.4 Implementation of the research approach ..................... 29
   3.5 Organisation of the research programme ....................... 35
   3.6 Coherence in the used development approach ............... 36

4. Enterprise coherence-governance assessment ....................... 38
   4.1 Introduction ............................................................ 38
   4.2 The enterprise coherence-governance assessment instrument 38
   4.3 Using the ECA Instrument .......................................... 48
   4.4 Conclusion ............................................................. 55

5. Requirements on Enterprise Coherence Governance ............... 57
   5.1 General requirements on the research programme .......... 57
   5.2 Management control ................................................... 61
   5.3 Cybernetics ............................................................. 62
   5.4 Change management ................................................... 63
   5.5 Basic philosophy for enterprise coherence governance .... 64

6. The Enterprise Coherence Framework ................................ 66
   6.1 Introduction ............................................................ 66
   6.2 Enterprise coherence at the level of purpose .................. 71
   6.3 Enterprise coherence at the design level ....................... 73
   6.4 Coherence between the levels ..................................... 79
   6.5 Coherence between several layers on design level by recursivity 81
   6.6 Coherence between enterprise level and division levels by projection 84
   6.7 Coherence between several enterprises and alliances by projection 86
   6.8 Recursive application for the perspective information security 89
   6.9 Conclusions ............................................................. 98

7. Enterprise coherence-governance approach ......................... 99
   7.1 Introduction ............................................................ 99
   7.2 GEA components ..................................................... 102
7.3 Conclusions and further research .......................................................... 110
8 Enterprise architecture: a strategic specialism ........................................... 111
  8.1 Introduction ......................................................................................... 111
  8.2 A competence matrix for EA ............................................................... 112
  8.3 Survey 1 – Ordina’s EA centre of excellence ........................................ 115
  8.4 Survey 2 – members of our research programme ................................... 117
  8.5 Survey 3 – NGI ................................................................................... 121
  8.6 The task areas of the EA function ....................................................... 122
  8.7 Conclusion and Recommendations .................................................... 124
9 Case studies ............................................................................................. 126
  9.1 Introduction ......................................................................................... 126
  9.2 Data collection protocol ....................................................................... 126
10 Case study Dga ........................................................................................ 129
  10.1 Introduction ....................................................................................... 129
  10.2 The ECF for Dga ............................................................................... 130
  10.3 The process followed in the case study ............................................... 132
  10.4 Results of the Dga case study ............................................................ 142
  10.5 Evaluation of the case ....................................................................... 144
  10.6 Discussion and conclusions towards the GEA method ......................... 146
11 Case study DJI .......................................................................................... 148
  11.1 Introduction ....................................................................................... 148
  11.2 The ECF for the DJI .......................................................................... 149
  11.3 The process followed in the case study ............................................... 151
  11.4 Results of the DJI case study ............................................................. 155
  11.5 Evaluation and conclusions ............................................................... 156
  11.6 Experiences and insights for improving GEA ....................................... 158
12 Case study SAE ......................................................................................... 160
  12.1 Introduction ....................................................................................... 160
  12.2 The ECF for the Ministry of SAE ....................................................... 161
  12.3 The process followed in the case study ............................................... 163
  12.4 Results of the SAE case study ........................................................... 166
  12.5 Evaluation of the programme ............................................................. 168
  12.6 Experiences and insights for improving GEA ....................................... 170
  12.7 Conclusion ....................................................................................... 171
13 Cross-case Conclusions ........................................................................... 172
  13.1 Cross-case conclusions based on the results achieved by the cases ....... 172
  13.2 Cross-case conclusions based on the evaluations of the cases .......... 174
  13.3 Cross-case conclusions based on the experiences and insights gained during the case studies .......................................................... 175
14 Modify theory ........................................................................................... 178
15 Extended Enterprise Coherence-governance Assessment (eECA) .............. 179
  15.1 Introduction ....................................................................................... 179
15.2 Explanation of the eECA ............................................................ 179
15.3 Spider diagram ........................................................................... 181
15.4 Quadrant diagram ...................................................................... 182
15.5 Maturity matrix .......................................................................... 188
15.6 Results of application of the eECA ................................................ 189
15.7 Conclusions ................................................................................ 192
16 Modification of the GEA theory through comparison of meta models .... 193
  16.1 GEA Meta models after development of the GEA-theory ................. 193
  16.2 GEA Meta models after execution of the cases .............................. 198
  16.3 Explanation of the differences in the meta models ......................... 202
17 Evaluation of the artefact and design process of GEA .......................... 205
  17.1 Evaluation of GEA as an artefact ............................................... 205
  17.2 Evaluation of the design process of GEA ..................................... 206
18 Conclusions and recommendations for further research ....................... 208
  18.1 Conclusions regarding the research questions and research objectives 208
  18.2 Conclusions regarding the definition of the core indicators and factors that define enterprise coherence ............................................. 209
  18.3 Conclusions regarding the definition of the core indicators and the factors that influence enterprise coherence ................................. 212
  18.4 Conclusions regarding the identification of the potential impact factors of enterprise coherence governance on the organisational performance ................................................................. 213
  18.5 Conclusions regarding the ability to measure an enterprise’s maturity level of coherence governance ...................................................... 213
  18.6 Conclusions regarding the development of a design theory of how to guard/improve the level of coherence in enterprises during transformations .. 214
  18.7 Overall conclusions .................................................................... 214
  18.8 Recommendations further research ............................................. 215
Appendix A: Elaboration of the ECA Questionnaire.................................. 219
Appendix B: Relationship EA requirements/Cohesive elements/GEA components .......................................................... 221
Appendix C: Rating questions eECA ................................................... 224
Appendix D: Open questions eECA ..................................................... 227
Appendix E: GEA Maturity Model ....................................................... 230
Acknowledgements ........................................................................... 232
References ......................................................................................... 234
Table of terms .................................................................................... 244
Table of abbreviations and acronyms .................................................... 247
Summary ........................................................................................... 248
Nederlandse samenvatting ................................................................. 249
Curriculum vitae ................................................................................ 250
Table of figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.</td>
<td>Overview of the thesis structure</td>
<td>17</td>
</tr>
<tr>
<td>Figure 2.</td>
<td>Adoption of the design science approach used in this thesis [38, 39]</td>
<td>25</td>
</tr>
<tr>
<td>Figure 3.</td>
<td>Activities conducted to achieve the research objectives</td>
<td>27</td>
</tr>
<tr>
<td>Figure 4.</td>
<td>Preliminary research approach for the development of the ECA, based on Yin [130]</td>
<td>30</td>
</tr>
<tr>
<td>Figure 5.</td>
<td>Multiple case study research approach adopted from Yin [130]</td>
<td>31</td>
</tr>
<tr>
<td>Figure 6.</td>
<td>Development life cycle of the research programme</td>
<td>32</td>
</tr>
<tr>
<td>Figure 7.</td>
<td>Detailed approach of the theory of enterprise coherence governance</td>
<td>33</td>
</tr>
<tr>
<td>Figure 8.</td>
<td>Example of a completed ECA questionnaire</td>
<td>41</td>
</tr>
<tr>
<td>Figure 9.</td>
<td>Hypothesized effects of enterprise coherence governance on the enterprise</td>
<td>43</td>
</tr>
<tr>
<td>Figure 10.</td>
<td>Hypothesized characteristics of enterprise coherence governance per quadrant</td>
<td>46</td>
</tr>
<tr>
<td>Figure 11.</td>
<td>Development scenarios</td>
<td>48</td>
</tr>
<tr>
<td>Figure 12.</td>
<td>Part of the process to determine the weight of the questions</td>
<td>49</td>
</tr>
<tr>
<td>Figure 13.</td>
<td>Diagram of individual positioning</td>
<td>50</td>
</tr>
<tr>
<td>Figure 14.</td>
<td>Individual and organizational positioning</td>
<td>51</td>
</tr>
<tr>
<td>Figure 15.</td>
<td>ECA positioning of several enterprises</td>
<td>53</td>
</tr>
<tr>
<td>Figure 16.</td>
<td>Bridging blue-print thinking to yellow-print thinking</td>
<td>59</td>
</tr>
<tr>
<td>Figure 17.</td>
<td>Summary of the ECF</td>
<td>71</td>
</tr>
<tr>
<td>Figure 18.</td>
<td>The organizational purpose triangle</td>
<td>72</td>
</tr>
<tr>
<td>Figure 19.</td>
<td>Metaphor for the derivation of cohesive elements at design level</td>
<td>78</td>
</tr>
<tr>
<td>Figure 20.</td>
<td>Example of the working of a relevant relationship</td>
<td>79</td>
</tr>
<tr>
<td>Figure 21.</td>
<td>Correlation between the cohesive elements on two interrelated levels of coherence</td>
<td>80</td>
</tr>
<tr>
<td>Figure 22.</td>
<td>Coherence between several layers at design level by recursivity</td>
<td>83</td>
</tr>
<tr>
<td>Figure 23.</td>
<td>An example of coherence between concern level and division levels by projection</td>
<td>85</td>
</tr>
<tr>
<td>Figure 24.</td>
<td>Coherence between several concerns and their alliances by projection</td>
<td>88</td>
</tr>
<tr>
<td>Figure 25.</td>
<td>Coherence between information security level / enterprise by recursivity</td>
<td>91</td>
</tr>
<tr>
<td>Figure 26.</td>
<td>Basis for BNS</td>
<td>93</td>
</tr>
<tr>
<td>Figure 27.</td>
<td>Coherence within the IS-domain and with the tactical and strategic level</td>
<td>97</td>
</tr>
<tr>
<td>Figure 28.</td>
<td>Coherent set of GEA components</td>
<td>99</td>
</tr>
<tr>
<td>Figure 29.</td>
<td>A structured view of modelling methods</td>
<td>100</td>
</tr>
<tr>
<td>Figure 30.</td>
<td>Main processes and products of GEA</td>
<td>104</td>
</tr>
</tbody>
</table>
Figure 65. Evaluation of the design process of GEA based on Peffers et al. ....... 206
Table of tables

Table 1. Coherence in the development approach used ........................................ 37
Table 2. Characteristics for success at the level of development of the EA vision 39
Table 3. Characteristics for success at the level of application of the EA vision ... 39
Table 4. Mapping GEA parts to the questions .................................................. 42
Table 5. EA Requirements from the customer reference group ......................... 61
Table 6. EA Requirements from management control theory ........................... 62
Table 7. EA Requirements from a cybernetic perspective .................................. 63
Table 8. EA Requirements from a change management perspective ................. 64
Table 9. Examples of cohesive elements on the level of purpose ...................... 67
Table 10. Cohesive elements at the level of purpose from ALIBABA Group ....... 70
Table 11. Example definitions of perspectives ............................................... 74
Table 12. Example core concepts ................................................................. 75
Table 13. Guiding statements relevant to the processes perspective .................. 76
Table 14. BNS information security perspective and definitions ....................... 95
Table 15. EA requirements contributed to /not contributed to once the ECF was developed ................................................................. 99
Table 16. Relationship between ‘way of aspects’ and development GEA components ................................................................. 100
Table 17. Overview which EA requirements led to the development of which GEA components ................................................................................................. 101
Table 18. Top-10 score for enterprise architecture competences survey 2 ........ 118
Table 19. Top-10 score for information architecture competences survey 2 ...... 118
Table 20. Scores competences information architects NGI ............................... 122
Table 21. Comparison competences 3 surveys .............................................. 122
Table 22. Task areas Enterprise Architecture Function .................................... 123
Table 23. Tasks, roles and responsibilities of the EA function ......................... 124
Table 24. Definitions of perspectives for the Dga-organisation ......................... 131
Table 25. Core concepts for Dga ................................................................. 131
Table 26. Guiding statements relevant to the processes perspective ................. 132
Table 27. Sub-analysis 1: impact on the dominant perspectives ....................... 134
Table 28. Sub-analysis 2: impact on the sub-ordinate perspectives ................. 135
Table 29. Sub-analysis 3: exploring solution space from the dominant perspectives ........................................................................................................ 137
Table 30. Sub-analysis 4: exploring solution space from the sub-ordinate perspectives ............................................................................................. 138
Table 31. Clustering sub-solutions ............................................................... 143
Table 32. Added sub-solutions from the synthesis process .............................. 144
Table 33. Evaluation of the GEA approach Dga level 1 and level 2 questions .... 145
Table 34. Perspectives and Core concepts of DJI’s ECF ........................................ 149
Table 35. Definitions of perspectives of the Enterprise Coherence Framework DJI ................................................................. 150
Table 36. Guiding statements for the processes perspective................................ 151
Table 37. Impact of and the solution space for the business issue on the dominant perspectives .................................................................................................................. 153
Table 38. Impact of and the solution space for the business issue on the sub dominant perspectives .................................................................................................................. 154
Table 39. Evaluation of the GEA approach DJI level 1 and level 2 questions.... 157
Table 40. Definitions of perspectives for the Ministry of SAE ............................. 161
Table 41. Core concepts for the Ministry of SAE ................................................. 162
Table 42. Guiding statements relevant to the processes perspective ...................... 162
Table 43. Part of the analysis of the business issue in terms of causes, implications and risks ................................................................. 164
Table 44. Group setup of workshop........................................................................ 165
Table 45. Form ‘Change initiatives based on the analysis of the business issue’ 165
Table 46. Form ‘Change initiatives based on the guiding statements’ ................. 166
Table 47. Elaboration on the four most important change initiatives ................. 167
Table 48. Evaluation of the GEA approach SAE level 1 and level 2 questions ... 170
Table 49. Evaluation of the GEA approach SAE level 3 questions ...................... 174
Table 50. Participants eECA in 2011 ..................................................................... 189
Table 51. Definitions GEA object types after development of the GEA-theory .. 198
Table 52. Definition relationships GEA object types after development of the GEA theory ................................................................................................. 198
Table 53. Definitions GEA object types at level of purpose after execution case studies ................................................................. 200
Table 54. Definitions GEA object types at level of design after execution case studies ................................................................................................. 201
Table 55. Definition relationships GEA object types at the level of purpose after execution case studies ................................................................. 202
Table 56. Definition relationships GEA object types after execution case studies at the level of design ................................................................................................. 202
Table 57. Evaluation of GEA as an artefact based on Gregor et al. ...................... 206
1. Personal motivation

How to make the concept of ‘enterprise coherence governance’ more tangibly in pursuit of the ultimate goal of doing business better? This is a question I am obsessed with. In my many years of practical experience it has become increasingly clear to me that all too often there is a sad lack of coherence in enterprises: with all its consequences. Change programs and projects end up being out of control, companies lose their reputations, there is frustration among employees and directors, and it goes on. This can and must be dealt with in a different way. Good coherence in an enterprise is a prerequisite for excellent performance. Making such coherence explicit and governable, allows inconsistencies, sub optimisations and such to be avoided and cooperation between the various disciplines in an enterprise will be strengthened while reducing the complexity inherent to all organizational situations.

Coherence is also ‘fluid’: once achieved a good level of coherence will be constantly under threat, especially when important business issues arise for which appropriate responses must be formulated. At times when this type of ‘governance’ is required one should explicitly govern on coherence. Thus, the existing coherence within an enterprise will affect the choice of approaches to manage the business issues and how these issues will be solved. In their turn the chosen approaches and solutions will affect the ‘future’ coherence of the enterprise. How can we give content to enterprise coherence governance? What should such a strategic management instrument look like? How should such an instrument be applied?

In the last quarter of 2005 I started to order my ideas into a more concrete form and began to pursue a PhD on this topic. This thesis is one of the results of my doctoral research. The consulting company Ordina, my previous employer, was also interested in an elaboration of this theme as it matched their desire to bring their enterprise architectural propositions to a higher maturity level.

In order to remain conversant with practice, after consultation with my employer I started research into enterprise coherence governance. Initially in cooperation with the Radboud University Nijmegen in the Netherlands and later also in cooperation with the Public Research Centre Henri Tudor in Luxembourg and several major government and industry enterprises in the Netherlands.

The results of my research program are discussed in this thesis and are summarized under the name GEA. This acronym stands for general enterprise architecting: general in the sense of the overall enterprise and the gerund (‘ing-form’) of the verb are used explicitly to indicate that a permanent form of ‘enterprise coherence governance’ is actively being pursued.
1.1 Frequently used terms

In this section a number of frequently used terms with their description are provided as a service to the reader, and we assume that the reader at this moment is willing to rely on his or her intuition to understand the meanings that are given. All these concepts will be explained in more detail in chapters 2 to 8.

*Enterprise*: enterprise is primarily a social system with a purpose, and involves one or more organisations. In this thesis we focus on enterprises in the public or industrial area with more than 200 employees and many forms of labour division.

*Enterprise architecture*: enterprise architecture is the consistent set of rules and models that guide the design and implementation of processes, organizational structures, information flows, and the technical infrastructure within an enterprise.

*Enterprise coherence*: enterprise coherence is the extent to which all relevant aspects of an enterprise are connected, in such a way that these connections facilitate an enterprise obtaining/meeting its desired results.

*Enterprise coherence framework (ECF)*: an ECF is an instrument that allows us to make the enterprise coherence within an enterprise explicit.

*Enterprise coherence governance*: enterprise coherence governance is the process of managing, controlling and monitoring enterprise coherence.

*Enterprise coherence-governance assessment (ECA)*: an ECA is an instrument that allows the maturity level of an enterprise’s enterprise coherence governance to be measured.

*Enterprise coherence governance-approach (ECG)*: an ECG is an instrument that allows us to govern an enterprise’s coherence.

*Enterprise transformation*: enterprise transformation concerns a fundamental change that substantially alters an enterprise’s relationships with one or more key constituencies, e.g., customers, employees, suppliers and investors.

*Extended enterprise coherence-governance assessment (eECA)*: an eECA is an instrument that allows the maturity level of enterprise coherence governance in enterprises to be extended measured.

*Level of purpose*: the level of purpose consists of the cohesive elements: mission, vision, core values, goals and strategy.

*Level of design*: the level of design consists of the cohesive elements: perspectives, that are angles from which one wishes to contemplate and to govern the enterprise, core concepts, that are angles from which one wishes to contemplate and to govern a perspective, guiding statements, that are internally agreed and published statements, which directs desirable behaviour, core models, that are views of a perspective, based on, and in line with, the guiding statements of the corresponding perspective, and relevant relationships, that are descriptions of the connections between guiding statements from different perspectives.
Organisation: an organisation is the realisation/implementation of an enterprise in terms of legal entity(ies), human beings and different kinds of supporting means e.g. technology, financing, housing.

1.2 Thesis structure

The structure of this thesis is represented in the different parts of Figure 1. The research problem in terms of the research problem area, problem definition and research motivation are discussed in chapter 2. The research methodologies are discussed in chapter 3. The research methodologies used to obtain this structure were, mainly, design science [38,39] in combination with a multiple case study research approach [130]. The translation of the problem definition into the research approach in terms of the driving research questions and research objectives, the research methodology we used and the organisation and planning of the research programme are also presented in chapter 3. The content and results of an enterprise coherence governance assessment (ECA) carried out at the beginning of the research programme are discussed in chapter 4. This assessment was used to prove the existence of the problem as defined and to provide argumentation for the need for further development of a theory to solve this problem. An extended insight into the requirements of enterprise coherence governance (ECG) is provided in chapter 5. The content of the GEA-theory in terms of the enterprise coherence framework (ECF), the enterprise coherence governance-approach (ECG), the enterprise architecture competence-profile (EAC) and the relationship of the theory with the requirements of chapter 5, are discussed in chapters 6, 7 and 8 respectively. Using the ECF one can make an enterprise’s coherence explicit, and using the ECG this explicit coherence can be governed. The EAC provides a closer look at the necessary competencies that are required for enterprise architects to facilitate activities related to the ECF and ECG. In chapters 9, 10, 11, 12 and 13 selected cases and cross case conclusions are discussed and used to evaluate and modify the GEA theory, according to the multiple case study research approach of Yin [130]. These chapters are used to demonstrate the application of the GEA theory in practice, and the results achieved are also used to provide a basis to improve the GEA-theory. The modified GEA-theory based on the case study results is discussed in chapters 14, 15 and 16. These modifications are discussed in terms of the content and results of an extended enterprise coherence governance-assessment (eECA) developed and conducted at the end of the first life cycle of the research programme. The modifications applied in the GEA-theory are shown using comparisons between the meta models developed at the end of the GEA-theory development period and after execution of the cases. The evaluation of GEA in terms of an artefact and in terms of its design process is discussed in chapter 17 in an evaluation using design science theories [35,68]. Finally an overview of the conclusions and recommendations for further research are presented in chapter 18.
Organisation: an organisation is the realisation/implementation of an enterprise in terms of legal entity(ies), human beings and different kinds of supporting means e.g. technology, financing, housing.

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Figure 1. Overview of the thesis structure
2 Research problem

In this chapter the problem area, problem definition, research questions and research objectives are discussed. Parts of this chapter are based on earlier work reported in [113, 114, 115, 119, 121].

2.1 Problem area

Developments in the last two decades, such as the globalisation of trade, the fusion of business and IT, the introduction of new technologies and the emergence of novel business model, pose many challenges to modern day enterprises [67]. More recently, the economic crises and the growing pains of the Eurozone have driven companies to find new competitive advantages. As a result, enterprises need to cope with rapidly changing environments. This means that enterprises need the ability to transform themselves, at least, as quickly as their environment changes. Even a company like Apple that in the past could afford to pay little or no attention to the developments of competitors today must beware of the marketing techniques of other companies operating in their field. Such enterprise transformations may range from changes in value propositions and business processes, via changes to the information systems used to support the business processes, to changes of the underlying IT infrastructures used by the enterprise. These may be the result of a ‘premeditated’ top-down, strategy driven, desire to change, but these can also be the outcome of numerous ‘spontaneous’ bottom-up changes resulting from locally needed changes. Finally, the required/desired transformations will typically touch upon several additional aspects of an enterprise, such as human resourcing, finance, organisational structures and reporting structures. As stated in [76], ‘enterprises increasingly need to consider and pursue fundamental change transformation, to maintain or gain competitive advantage’. We adopt the definition of enterprise transformations from [76]: ‘enterprise transformation concerns a fundamental change that substantially alters an organisation’s relationships with one or more key constituencies, e.g., customers, employees, suppliers, and investors’, and in line with the definition of enterprise transformation, we define an enterprise as: ‘an enterprise is primarily a social system with a purpose and involves one or more organisations’. We define organisation as ‘the realisation/implementation of an enterprise in terms of legal entity(ies), human beings and different kinds of supporting means, technology, financing, housing, et cetera’. In this thesis we focus on enterprises in the public or industrial area with more than 200 employees and many forms of labour division.

As argued in [67,103, 112], enterprise architecture offers a means for management to obtain insight into the organizational structure, and to make decisions about the
direction of enterprise transformations. In line with [103] we define enterprise architecture as a consistent set of rules and models that guide the design and implementation of processes, organizational structures, information flows and the technical infrastructure within an enterprise. As such, enterprise architecture should act as a means to steer enterprise transformations, while in particular enabling senior management to govern the enterprise’s coherence. We regard enterprise architecture as the appropriate means to make enterprise coherence explicit, and controllable/manageable, or at least influenceable. More recent sources also explicitly acknowledge the need for enterprise architecture methods to look well beyond the traditional Business-to-IT stack, consider for example: [28, 33, 41].

To make large enterprise transformations feasible and manageable, these enterprises are typically managed as a portfolio of transformation programmes, where the programmes are split further into projects. Even more, the portfolio of programmes and projects that make up an enterprise transformation need to be mutually coordinated, and aligned with the enterprise’s strategy. Therefore, a coordination mechanism is needed that connects the strategic considerations at the strategy level to the execution of the different programmes and projects involved in the transformation as a whole. This coordination generally also requires a further elaboration of the enterprise’s strategy, since these tend to be too generalized to be used to steer the programmes and projects within the transformation [67]. In addition, the needed coordination mechanism must allow the coherence between the different aspects of an enterprise to be guarded across the programmes and projects transforming the enterprise [67, 103].

As early as 1957, Drucker [27] argued for an integral and complete approach towards business issues as a prerequisite for success. Traditionally, project management and programme management are put forward as the responsible entities for these coordination tasks [72, 73], however, in particular these approaches focus primarily on the management of typical project parameters such as budgets, resource use and deadlines. When only considering the typical project parameters, one runs the risk of achieving only local and or partial improvements at the level of specific projects. For example, when making design decisions that have an impact which transcend a specific project, the project manager is likely to aim for solutions that provide the best cost/benefit trade-off within the scope of this specific project, while not looking at the overall picture. Regrettfully, however, in practice such local optimisations do not just remain a potential risk: the risk will materialize, and consequently damage the overall quality of the result of the transformation [67]. This type of risk generally occurs when interests regarding general infrastructural elements of an enterprise collide with local short-term needs. This especially endangers the needed coherence and alignment between different aspects within an enterprise, such as human resources, services, customers, processes, marketing, finance, physical infrastructures and IT. As a result, more often than not, enterprises fail to realise the desired transformation even though it might be the case that
all projects are finished on time and within budget. In addition, Bower [14] acknowledges the presence of multiple levels of management, such as directing the company, directing management and directing staff and labour. He stresses the need to treat these different management levels coherently and states that integrality is a prerequisite for adequate control of change. This raises a key question: How can a company escape from sub optimizations on a local scale, and subsequent loss of business value? To find an answer to this question, we have to expand our (project) managerial dimensions with the governance of enterprise coherence and to do this, we have to make the enterprise coherence explicit and apt, able to intervene on all levels of decision making, keeping track of the causal effects on these levels and between them. Enterprise architecture is a school of thought pre-eminently suitable for this purpose.

Slot [84] has shown that a correlation exists between the performance of IT projects and the use of a well-designed enterprise architecture to steer/coordinate these projects. Commonly, IT projects implemented within a well thought out enterprise architecture result in 19% less budget over-runs. In principle, one might expect that such a positive effect would be discernible if working with an enterprise architecture was applied to enterprise transformations as a whole. Regretfully, however, in practice in various transformation assignments we have been confronted with the situation that transformation projects fail due to budget overruns, or a failure to meet objectives and expectations [113, 118]. Our informal experiences and observations are supported by the Dutch general court of auditors [20], which has produced a report on the cause of failures in ICT projects. In Op ’t Land et al. [67], the authors provide a summary of possible causes for failures of strategic initiatives, and state the need to develop a solution for them: ‘The road from strategy formulation to strategy execution, including the use of programmatic steering, is certainly not an easy one to travel. Research shows that less than 60% of the strategic objectives in organisations have been reached [85]. When considering the possible failures in strategy execution ... an instrument is needed to support this process’. In [40, 41], Hoogervorst argues in favour of using enterprise architecture to govern coherence in enterprises. The above insights and experiences provided us with the insight that coordination is needed across an enterprise’s aspects and its several levels of control to reduce the number of failed strategic initiatives and projects we see and to avoid sub optimisations and unilateral approaches being used to solve key business issues.

2.2 Problem definition

Since achieving, and/or maintaining enterprise coherence seems to be an important capability in the realm of enterprise performance, there is a potential positive correlation with the performance of an enterprise, and there is a reason to govern enterprise coherence [113]. This insight triggered the initiation of the multi-client general enterprise architecting (GEA) research programme [30]. The aim of this re-
search programme was to make enterprise coherence explicit and to find ways to govern it. To prove the correlation of enterprise coherence governance to the performance of an enterprise is outside the scope of this thesis.

The important triggers for our research programme were:

- many enterprise transformation efforts fail
- failure of enterprises to adopt a holistic approach to address key business issues, frequently leading to a unilateral approach from an IT oriented angle
- existing architecture methods do not meet their promises because:
  - they are set up from an IT perspective only
  - they hardly address the strategic level of the enterprise
  - they are set up in terms of the Business/IT gap
  - their underlying IT architectures applied on the enterprise-wide level are unjustly called enterprise architectures

The above mentioned triggers were discussed in a workshop with a customer reference group of twenty large enterprises, each with more than a thousand employees on April 11, 2006, [104, 112] and led to the formulation of our problem definition:

**Many enterprises lack enterprise coherence governance.**

This problem definition resulted in research questions such as: How can we prove that this problem exists? How can we make enterprise coherence explicit? How can we govern enterprise coherence? and: How can we measure the maturity level of enterprise coherence governance within an enterprise?

In order to begin to answer our research problems, we will start with our definitions of enterprise coherence and enterprise coherence governance so that we know exactly what we mean when we use these terms.

The general concept of coherence is described in the MacMillan English dictionary [52] as: ‘the state in which all the different parts fit together in a sensible or pleasing way’, while the Van Dale [98] dictionary describes coherence as: ‘the extent in which several aspects are connected’. In line with these definitions, we define enterprise coherence as follows [115]:

**Enterprise coherence is the extent to which all relevant aspects of an enterprise are connected, in such a way that these connections facilitate an enterprise obtaining/meeting its desired results.**

This definition is based on the following postulate:

**What must be regarded as relevant aspects, as referred to in the above definition, is enterprise dependent.**
This postulate in its turn becomes:

1. based on Chandler’s theory ‘structure follows strategy’[16]: every enterprise has its own strategy and thereby its relevant aspects in the structure
2. depending on political and social forces: every enterprise has to deal with these types of forces that will influence and partly define the aspects in the structure
3. prioritization of aspects: the strategy of an enterprise leads on determining on what aspects the focus of control is situated

Even more, the clarity with which an enterprise has identified/prioritized such aspects is, in our vision, one of the parameters determining its ability/maturity to govern its enterprise coherence. We have discussed the concept of the, enterprise specific, coherence dashboard in [115]. This coherence dashboard enables enterprises precisely to express the relevant aspects that need to be connected.

In the MacMillan English dictionary [52] governance is described as: ‘the process of governing a country or organization’. Bossert [13] defines governance as ‘to ensure the coherence of the method of managing, controlling and monitoring of organizations, based on efficient and effective achievement of policy goals and also to communicate and being accountable for the stakeholders in an open way’.

In line with this definitions we defined enterprise coherence governance as follows:

\[
\text{Enterprise coherence governance is the process of managing, controlling and monitoring enterprise coherence.}
\]

Our own experience\(^1\), and the above discussed general insights, seemed to indicate that achieving and maintaining coherence between different aspects of an enterprise, using an enterprise architectural line of thinking [40, 41, 67, 84, 103], would be a crucial factor with regard to change processes and the achievement of strategic objectives by enterprises. This led us to believe that the governance of enterprise coherence deserved a closer study of its causes, and for potential solutions to be found to the problems observed in the field of enterprise transformation.

\(^1\) During different stages of the GEA research programme, the members of the programme included: ABN AMRO; ANWB; Achmea; Belastingdienst – Centrum voor ICT; ICTU; ING; Kappa Holding; Ministerie van Binnenlandse Zaken en Koninkrijksrelaties; Ministerie van Defensie; Ministerie van Justitie – Dienst Justitiële Inrichtingen; Ministerie van LNV – Dienst Regelingen; Ministerie van Landbouw, Natuur en Voedselkwaliteit; Nederlandse Spoorwegen; Ordina; PGGM; Politie Nederland; Prorail; Provincie Flevoland; Rabobank; Radboud University Nijmegen; Rijkswaterstaat; UWV; Wehkamp.
2.3 Research questions and research objectives.

The research programme [30] for this thesis was based on the aforementioned triggers and research motivation which gave rise to the five key research questions:

1. What are the core factors that define enterprise coherence?
2. What are the core factors that influence enterprise coherence?
3. What impacts does the governance of enterprise coherence have on the performance of enterprises in practice?
4. How can enterprise coherence be expressed explicitly?
5. How can enterprise coherence be governed?

More specifically, the research objectives of the research programme discussed in this thesis were to find ways to govern enterprise coherence effectively. To do this we needed:

1. to define the core indicators and factors that define enterprise coherence
2. to define the core indicators and factors that influence enterprise coherence
3. to identify the potential impact factors of enterprise coherence governance on organisational performance
4. to be able to measure an enterprise’s maturity level of coherence governance
5. to develop a design theory of how to guard/improve the level of coherence in enterprises during transformations

Research questions numbers 1 and 4 led to research objective number 1, research question number 2 led to research objective number 2, research question number 3 led to research objectives numbers 3 and 4 and research question number 5 led to research objective number 5.
3 Research approach

3.1 Design Science research methodology

In this research we adopted the design science research methodology [121]. Design science addresses research through the building and evaluation of artefacts designed to meet an identified business need [38]. Design science research can be characterized as prescriptive research because it focuses on using existing knowledge to improve the performance of systems [53]. Thus, artefacts resulting from design science research are geared towards addressing business or organizational needs in a problem domain [38], or offering opportunities of improving practice even before practitioners identify any problem with their way of working [43]. We have chosen to use a design science methodology because this type of research, in contrast to for instance action research, is more appropriate for developing new theories. Action research is more designed to improve things within existing paradigms. Since we envisioned that, with the development of GEA, we would establish a paradigm shift in existing enterprise architecture methods, we decided that using the design science methodology would be more appropriate. How design science was adopted in the context of the research discussed in this PhD thesis is shown in Figure 2.

![Diagram of the design cycle](image-url)
Research approach

3.1 Design Science research methodology

In this research we adopted the design science research methodology [121]. Design science addresses research through the building and evaluation of artefacts designed to meet an identified business need [38]. Design science research can be characterized as prescriptive research because it focuses on using existing knowledge to improve the performance of systems [53]. Thus, artefacts resulting from design science research are geared towards addressing business or organizational needs in a problem domain [38], or offering opportunities of improving practice even before practitioners identify any problem with their way of working [43]. We have chosen to use a design science methodology because this type of research, in contrast to for instance action research, is more appropriate for developing new theories. Action research is more designed to improve things within existing paradigms. Since we envisioned that, with the development of GEA, we would establish a paradigm shift in existing enterprise architecture methods, we decided that using the design science methodology would be more appropriate. How design science was adopted in the context of the research discussed in this PhD thesis is shown in Figure 2.

Figure 2. Adoption of the design science approach used in this thesis [38, 39]

The problem domains of this research, i.e. the environment of enterprise coherence governance consisting of enterprises in the public and industrial area with more than 200 employees and many forms of labour division, the business issues that influence the level of coherence and the people involved in enterprise coherence governance are shown in the left hand box of Figure 2.

The two major phases of this research, i.e. the develop/build phase and the evaluation phase of the intended theory and artefacts (i.e. GEA) are shown in the middle of Figure 2. Examples of the theories, frameworks, instruments, constructs, models, techniques, measures and validation criteria that were adopted to develop GEA, so that it can be used to support the execution of enterprise coherence governance in enterprises are shown in the right hand box of Figure 2. For a complete overview of the used 'knowledge' we refer the reader to the list of references given at the end of this thesis. Note: the parts of Figure 1 representing the chapters 2 to 8 correspond with the upper box of the design cycle in Figure 2. The parts of Figure 1 representing the chapters 9 to 13 correspond with the lower box of the design cycle in Figure 2. The upper box of the design cycle in Figure 2 is discussed in chapter 2-8. The lower box of the design cycle and the arrow ‘evaluate’ in Figure 2 is discussed in chapter 9-13 and 17. The arrow ‘refine’ of the design cycle in Figure 2 is discussed in chapter 14-16.
3.2 Adoption of Design Science research guidelines

Hevner et al [38] discuss seven guidelines that a complete design science research initiative should follow. The following discussion is focused on highlighting how we endeavoured to fulfil these seven guidelines during our research period. 

**Guideline 1: design as an artefact.** Design-science research must produce a viable artefact in the form of a construct, a model, a method, or an instantiation [38]. As shown in the middle upper part of Figure 2, the resultant artefact in this research is GEA, consisting of a GEA theory and the artefacts ECF, ECG and ECA.

**Guideline 2: problem relevance.** The objective of design-science research is to develop ‘technology-based solutions’ to important and relevant business problems [38]. The problem environment mainly comprises enterprises, the business issues that influence the coherence of enterprises and the people involved in enterprise coherence governance. The people involved in enterprise coherence governance are decision makers, influencers and enterprise architects. Design science research is initiated when challenging phenomena are identified and represented in a problem domain [39]. As shown in the left part of Figure 2, the challenge addressed in this research was to improve enterprise coherence governance. The significance of this problem is highlighted in section 2.1.

**Guideline 3: design evaluation.** The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods. Evaluation of an artefact can be done using empirical and qualitative research methods such as observational, analytical, experimental, testing or descriptive-oriented methods [38]. The evaluation method we use in this research, an observational method, is shown in the lower box in the middle part of Figure 2. We used the observational method, the multiple case study research approach developed by Yin [130].

**Guideline 4: research contributions.** Effective design-science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies [38]. The lower arrow between the middle and right part of Figure 2 shows that the main contribution of this research to the knowledge base in enterprise governance consists of the GEA theory and its artefacts ECA, ECF and ECG and publications in which the effects of practical applications of GEA in case studies are discussed and explained.

**Guideline 5: research rigour.** Design-science research relies upon the application of rigorous research methods to construct and evaluate the design artefact. Design science artefacts are created based on existing foundations and methodologies in a knowledge base, which include theories, frameworks, instruments, constructs, models, methods, instantiations, experiences, and expertise [38]. The foundations and methodologies, i.e. existing literature, that we will adopt in the development of GEA are shown on the right side of Figure 2. From the bottom left part of Figure 3
it can be seen that the existing literature and experience will be applied in the design, evaluation, and modifying phases of the research reported here.

**Guideline 6: design as a search process.** The search for an effective artefact requires utilizing the available means to reach desired ends while satisfying laws in the problem environment [38]. Design involves iterative research activities such as constructing, evaluating, and refining artefact based on findings [39]. The major design activities used to achieve the research objectives, as explained in section 3.1, are shown in the right part of Figure 3.

It can be seen from Figure 3 that all the development activities required to conduct this research are grouped in phases 1 to 3. The results of phase 1 consisting of the first version of GEA, and the evaluation phase 2 formed the basis on which to modify GEA during phase 3 to obtain the final version of GEA. The evaluation methods we will use in this research are shown in the left part of Figure 3.

![Figure 3. Activities conducted to achieve the research objectives](Image)

Following the design science approach of Hevner et al. [38, 39] we used the research methodologies described below:
• we used the multiple case study research approach of Yin [130] to conduct research phase 2 as pictured in Figure 3, see chapter 3.4 and chapters 9-13
• we used Gregor et al’s the anatomy of a design theory [35] to evaluate GEA as an artefact, for comprehensive discussion of this, see chapter 17.1
• and we used Peffers et al’s design science research methodology for information system research [68] to evaluate the design process of GEA, for comprehensive discussion of this, see chapter 17.2

In order to develop the GEA artefacts the group decision technique MetaPlan [79] was used. After the development of steps 3 and 4, and the ECA had been used to prove that the research problem existed, the ECA was made available as a research tool and placed in the knowledge base as shown in Figure 2. At question 8 of phase 1, this ECA from the knowledgebase is reused as one of the GEA artefacts further to develop.

Step 1 of research phase 1 in Figure 3 is discussed in chapter 2.1, step 2 in chapter 2.2, step 3 in chapter 4, step 4 in chapter 2.3, step 5 in chapter 5.1 and chapter 17, step 6 in chapter 5, step 7 in chapter 5.5 and chapter 7.2.1, step 8 in chapter 4, step 9 in appendix B and step 10 of research phase 1 in chapter 16.1. Step 11, 12 and 13 of research phase 2 in Figure 3 are discussed in chapter 9, step 14 in chapters 10,11 and 12, and step 15 of research phase 2 in chapter 13. Step 16, 17 and 18 of research phase 3 in Figure 3 are discussed in chapter 16.

Guideline 7: communication of research. Design science research must be presented effectively both to the technology oriented and to the management oriented, audiences. The results of the research reported here were communicated to both audiences using their languages. The communication channels used in this research were conferences, workshops, white papers and scientific papers where the results from this research were exposed to academicians and practitioners (See e.g. [104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120]).

### 3.3 Inherent cycles in Design Science research

Fulfilling the preceding seven guidelines implied that the design science research program would use three cycles, i.e. a relevance cycle, a rigour cycle, and a design cycle [39].

These cycles are shown in the left, middle and right parts of Figure 2. The research activities to conduct in each cycle are shown in Figure 3. For example, in Figure 3 the relevance cycle is represented by activities in tasks numbered 2, 3, 11, 12, 13, 14, 15 and the review activities are represented in the left part of this figure. The rigour cycle is represented in Figure 3 by the adoption and application of existing scientific literature. See task number 5 and the bottom left corner of Figure 3. The
design cycle is represented in Figure 3 by activities in tasks numbered 1-4, 6-10 and 16-18.

3.4 Implementation of the research approach

The development of the enterprise coherence-governance assessment (ECA) was one of the first steps in the more comprehensive research programme leading to this thesis. In this section we provide more detail on the background to this research programme, and we outline the research methods we used to develop the ECA.

The ECA was developed to gain initial insight into research questions number one and three. An answer to these questions was expected to provide insight into the need to carry out further research into the governance of enterprise coherence, and to provide a first refined definition of enterprise coherence and its practical impact on organisational performance.

At the start of the research, in collaboration with the partners in the research programme for this thesis we formulated the criterion that if more than 50% of the enterprises involved in the first ECA studies lacked enterprise coherence governance, it was safe to assume that a lack of enterprise coherence governance was a relevant issue that needed further elaboration. The first ECA study involved seven large Dutch enterprises. At the start of the research programme, the intention was to execute the ECA, for each of the participating enterprises, in three stages:

1. a first assessment at the start of the programme, providing a baseline measure
2. a second assessment once a shared understanding of enterprise coherence was reached, the effect of having a shared awareness of the forces that influence coherence should be measurable by comparing the results to the baseline
3. a final assessment once proper/full governance of enterprise coherence would be put in place in a participating enterprise, the additional effect of coherence governance could be made explicit by comparing these final assessment results to the earlier ones

Soon after the start of the research programme, it became apparent that doing three assessments was not feasible. Given the time needed for such longitudinal assessments, the composition of the involved enterprises, and the people involved, could change so much that the results were no longer comparable. We therefore modified this idea to implementing the first assessment in the form of the ECA instrument, and using a design science [38] and a case based research methodology [130] to evolve the instrument further. See Figure 2 and Figure 3 for the position of the ECA in the methodological framework, Figure 4 for the way we developed and used the ECA to prove that the research problem exists, Figure 5 for the way the
GEA artefacts including the ECA artefact were evaluated and Figure 7 for a depiction of the ECA within the design theory GEA.

Figure 4. Preliminary research approach for the development of the ECA, based on Yin [130]

The step ‘define research problem’ in Figure 4 is discussed in section 2.2. The steps ‘built assessment tool’ through the decision ‘proceed or cease’ in Figure 4 are discussed in chapter 4. The step ‘develop theory’ is discussed in chapters 5-8.
The step ‘develop theory’ in Figure 4 and Figure 5 is discussed in chapters 5-8. The steps ‘select cases’ through the step ‘draw cross case conclusions’ in Figure 5 are discussed in chapters 9-13. The step ‘modify theory’ in Figure 5 is discussed in chapters 14-16. The steps ‘develop policy implications’ and ‘write cross case report’ in Figure 5 are discussed in chapter 13.

In developing the theory, we followed the route depicted in Figure 2, Figure 3 and Figure 7. Based on the triggers and results of the ECA we developed and carried out at the start of the research program, we identified the research questions and associated objectives, used for the research reported in this thesis. More specifically, to meet these research questions, we:

1. gathered the requirements on enterprise coherence governance
2. developed a theoretical model, based on these requirements, to make enterprise coherence explicit and governable

To make the enterprise coherence explicit we developed the enterprise coherence framework (ECF) and to make the enterprise coherence governable we developed an enterprise coherence governance-approach (ECG).
3.4.1 The development life cycle of the research programme

In the first year, the research programme for this thesis started with the development of the EA vision, consisting of the GEA theory and the first version of the ECA, and the scientific foundation of GEA, see the rigour cycle of Figure 2 and the knowledge base we used. In the ensuing years 2 and 3, the EA vision was transformed into an EA governance tool, consisting of the GEA artefacts ECF, ECG and eECA, and we published a number of white papers [104, 105, 106, 107, 108, 109, 110, 111]. In the fourth year, the resulting GEA method was published in book form [112]. Since the start of the second year, the GEA method has been applied in several enterprises [108, 114, 117, 119, 120]. Evaluations of these applications were used to obtain feedback on the GEA method to improve the method further, see Figure 6.

<table>
<thead>
<tr>
<th>Development phases</th>
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<tbody>
<tr>
<td>EA vision</td>
</tr>
<tr>
<td>Year 1</td>
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</table>

Figure 6. Development life cycle of the research programme

Year 1 in Figure 6 is discussed in chapters 2-5, year 2-3 in chapters 6-8, the marketing activities of year 4 fall out of the scope of this thesis and the application/evolution activities of years 2-7 are discussed in chapters 9-18.

3.4.2 Develop theory

A detailed approach to the step ‘develop theory’ shown in Figure 5 is given in Figure 7.
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3.4.2 Develop theory

A detailed approach to the step ‘develop theory’ shown in Figure 5 is given in Figure 7.

The activities performed to carry out the research are shown in the rectangles of Figure 7; the circle represents the decision that the requirements are the basis for the development of the artefacts and that the development of the artefacts must meet the established requirements. The rectangles with rounded and cut corner represent the GEA artefacts. The arrows 1, 2, 3, 5 and 7 in Figure 7 are used to indicate the order of the activities. The arrows 4, 6 and 8 represent the relation between the activities and their results. The arrows 9 and 10 represent the relations between the requirements and the GEA artefacts.

The step ‘organize research programme’ in Figure 7 is discussed in section 3.5. The step ‘develop research questions and research objectives’ is discussed in section 2.3. The step ‘identify requirements enterprise coherence governance’ is discussed in chapter 5. The steps ‘develop a model of how to make EC explicit’ through the step ‘develop a model of how to measure ECG’ including the artefacts ECF, ECG and ECA are discussed in chapters 6-8. The results of the decision circle in Figure 7 are discussed in section 7.1 and Appendix B.
3.4.3 Selected cases

During and after the first development life cycle, the results of GEA or parts of it were applied in several enterprises, see Figure 5 and the activity 'develop theory'. The results of these cases were evaluated and transformed into a modified theory. We selected three cases to obtain enough practical insights to evaluate and improve the theory in line with the multiple case study research approach of Yin [130]. The main selection criteria concerned large enterprises in which there was full application of the ECF and ECG of GEA. The selected cases were:

- professionalization of the execution of an administrative body of a ministry of the Dutch government [119].
- questioning the impact of the introduction of a new law at the Dutch Dienst Justitiële Inrichtingen [120].
- the issue of digitization of the documents flows at a Dutch ministry [114, 117].

These comprehensive cases were considered to form a sufficient basis for the proposed evaluation.

3.4.4 Design data collection protocol

Yin’s [130] method was used to evaluate and improve the GEA method based on input from the different situations in which it was applied. Yin distinguishes five levels of questions:

1. questions to specific interviewees.
2. questions at the level of an individual case, these are the questions in the case study protocol that need to be answered by the investigator during a single case, even when the single case is part of a larger, multiple-case study.
3. questions focused on finding patterns across multiple cases.
4. questions at the level of the entire research effort, for example, calling on information beyond the case study evidence and including literature or published data that may have been reviewed.
5. normative questions about policy recommendations and conclusions, going beyond the narrow scope of the study.

After the development of the design theory GEA and before conducting the selected cases these questions were translated into a series of sub questions, this is

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2 The name of this body is classified and all data pertaining to it has been anonymised throughout the thesis.
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During and after the first development life cycle, the results of GEA or parts of it were applied in several enterprises, see Figure 5 and the activity 'develop theory'. The results of these cases were evaluated and transformed into a modified theory. We selected three cases to obtain enough practical insights to evaluate and improve the theory in line with the multiple case study research approach of Yin [130]. The main selection criteria concerned large enterprises in which there was full application of the ECF and ECG of GEA. The selected cases were:

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5. normative questions about policy recommendations and conclusions, going beyond the narrow scope of the study.

After the development of the theory GEA and before conducting the selected cases these questions were translated into a series of sub questions, this is because such sub questions can only be established after the required theory has been developed, including the GEA artefacts.

3.5 Organisation of the research programme

The research programme for this thesis was organized in terms of four groups:

- a core team consisting of 6 to 8 people with in-depth knowledge in the field of enterprise architecture
- a, co-financing, customer reference group of 20 major enterprises with representatives consisting of policy makers, managers of enterprise architecture departments and lead enterprise architects
- an expert review team of 30 lead enterprise architects
- a steering committee composed of 7 leading representatives from science and business

The conditions for participation in this research were for the members of:

- the core team to have in-depth knowledge in the field of enterprise architecture and a willingness to give a lot of their time
- the customer reference group came from enterprises that met our definition of enterprise, affinity with the discipline of enterprise architecture, affinity with the triggers and research problem of this research, were willing to discuss the interim results of this research on a regular basis and to cofund this research
- the expert review team had to have in-depth knowledge in the field of enterprise architecture and be willing to attempt to falsify the interim results of the research in a relatively short response time
- the steering committee which came from the scientific world at a leading level or worked in industry at a boardroom level needed to be willing to discuss the innovation strategy of this research on a regular basis and be accessible to the researcher(s).

The interest of participation in this study consisted of:

- the members of the core team meeting their deep passion for the field of enterprise architecture
- the members of the customer reference group obtaining better instruments to resolve the problems in practice related to the triggers of this research
- for the members of the expert review team to enrich early their knowledge in the field of enterprise architecture.
- the members of the steering committee at a scientific level were able to form deeper contacts within industry, while members of the steering committee operating at board level obtained better control instruments to use in their work.
The actual involvement, and composition, of these groups depended on the specific phase of the research programme. The actual development activities were discussed with the core team and the customer reference group. The members of the expert review team were charged with the task of attempting to falsify all the developed theories and the development strategy was assessed regularly by the steering committee.

### 3.6 Coherence in the used development approach

In Table 1 the coherence in the development approach used is shown by representing the development steps of the thesis structure and the used research methodologies and the chapters and figures in which these steps are discussed.

#### Table 1. Coherence in the development approach used

<table>
<thead>
<tr>
<th>Chapter/ approach</th>
<th>Thesis structure</th>
<th>Hevner Design science</th>
<th>Hevner Design science</th>
<th>Yin Preliminary research approach</th>
<th>Yin Multiple case study research approach</th>
<th>Yin Detailed approach of the theory</th>
<th>Gregor e.a. Design science to evaluate GEA as an artefact</th>
<th>Peffers e.a. Design science to evaluate the design process of GEA</th>
<th>Figure 1</th>
<th>Figure 2</th>
<th>Figure 3</th>
<th>Figure 4</th>
<th>Figure 5</th>
<th>Figure 6</th>
<th>Figure 7</th>
<th>Table 57</th>
<th>Figure 65</th>
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<tbody>
<tr>
<td>1</td>
<td>Thesis structure</td>
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<td>2</td>
<td>Research problem</td>
<td></td>
<td></td>
<td>Define research problem</td>
<td>Steps: 'develop research questions and research objectives'</td>
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<td>3</td>
<td>Research approach</td>
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<td>Step: 'organize research program'</td>
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<tr>
<td>4</td>
<td>Proof of existing problem/need for a theory</td>
<td>Develop GEA theory and GEA artefacts ECF, ECG, ECA</td>
<td>Research phase 1: Major tasks done in the design of the GEA theory and GEA artefacts; step 1-9</td>
<td>Steps 'built assessment tool' through the decision 'proceed or cease'</td>
<td>Step: 'modify theory'</td>
<td>Steps: 'develop a model how to measure enterprise coherence governance', 'develop a model how to measure enterprise coherence governance' including the artefacts</td>
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<td>5</td>
<td>Requirements to meet the theory</td>
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<tr>
<td>6</td>
<td>Content of theory</td>
<td></td>
<td></td>
<td>Develop theory</td>
<td>Develop theory</td>
<td>Steps: 'develop a model how to make enterprise coherence explicit', 'develop a model how to measure enterprise coherence governance' including the artefacts</td>
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</table>
The actual involvement, and composition, of these groups depended on the specific phase of the research programme. The actual development activities were discussed with the core team and the customer reference group. The members of the expert review team were charged with the task of attempting to falsify all the developed theories and the development strategy was assessed regularly by the steering committee.

### 3.6 Coherence in the used development approach

In Table 1 the coherence in the development approach used is shown by representing the development steps of the thesis structure and the used research methodologies and the chapters and figures in which these steps are discussed.

<table>
<thead>
<tr>
<th>Coherence in the development approach used</th>
<th>Chapter/</th>
<th>approach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thesis</td>
<td>structure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 1</td>
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<tr>
<td></td>
<td>Hevner</td>
<td>Design science</td>
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<td></td>
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<td>Figure 2</td>
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<td></td>
<td>Hevner</td>
<td>Design science</td>
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<td>Research guidelines</td>
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<td>Figure 3</td>
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<td></td>
<td>Yin</td>
<td>Preliminary research approach</td>
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<td></td>
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<td>Figure 4</td>
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<td>Yin</td>
<td>Multiple case study research approach</td>
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<td>Figure 5</td>
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<td>Yin</td>
<td>Detailed approach of the theory</td>
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<td>Figure 7</td>
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<td></td>
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<td></td>
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<td>Table 57</td>
</tr>
<tr>
<td></td>
<td>Peffers e.a.</td>
<td>Design science to evaluate the design process of GEA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Develop / build GEA theory including GEA artefacts (ECF, ECG, ECA) and the 'decision circle'</th>
<th>ECF, ECG and ECA, and the 'decision circle'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case studies to evaluate the theory</td>
<td>Steps ‘select cases’ through ‘draw cross case conclusions’ and steps ‘develop policy implications’ and ‘write cross case report’</td>
</tr>
<tr>
<td>Research phase 2: Evaluation phase of GEA; step 11-15</td>
<td>Step ‘modify theory’</td>
</tr>
<tr>
<td>Research phase 3: Refine GEA theory and GEA artefacts; step 10 and step 16-18</td>
<td></td>
</tr>
<tr>
<td>Evaluation GEA development process by Peffers e.a.</td>
<td>Evaluate GEA artefacts by Gregor e.a.</td>
</tr>
<tr>
<td>Evaluate GEA artefacts by Gregor e.a.</td>
<td>Evaluate GEA development process by Peffers e.a.</td>
</tr>
</tbody>
</table>

Table 1. Coherence in the development approach used
4 Enterprise coherence-governance assessment

4.1 Introduction

A fundamental first step in the research programme was the development of the enterprise coherence-governance assessment (ECA) to attain a clearer understanding of the challenges to enterprise coherence and its associated governance of coherence [112], and of the expected impact of enterprise coherence governance on organizational performance. We assumed that if the enterprise coherence governance of an enterprise was not adequately applied any good coherence would be a coincidence, and an enterprise would consider this situation to be undesirable. This assumption was also motivated by cybernetic theory [24]. This theory states systems consists of a governed (sub)system and a governing (sub)system, where the governed system needs the governing system to ensure that the goals of the system as a whole are achieved. So when an enterprise needs improvement of its enterprise coherence a governance mechanism is needed to achieve this.

The remainder of this chapter is structured as follows. We present the current version of the ECA instrument in Section 4.2. We continue with a report on the application of the instrument in the context of seven large Dutch enterprises in Section 4.3. Our conclusions are discussed in Section 4.4.

4.2 The enterprise coherence-governance assessment instrument

A series of MetaPlan [21] sessions was organized involving experts from eighteen enterprises involved in our customer reference group [30] as a first step in the development of the ECA. Our aim in these sessions was to gather a set of established characteristics for the success of enterprise coherence governance, from the perspective of practitioners in the field. To this end, the experts of this group of enterprises were asked to indicate the success factors for enterprise architecture. These success factors were then clustered according to the characteristics listed in Table 2 and Table 3.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>E.A. Vision</td>
<td>To prove the value of EA one prerequisite is that the top of the enterprise holds a vision on EA.</td>
</tr>
<tr>
<td>Added value</td>
<td>The added value of EA as a strategic control tool should be recognised and promoted by all parties concerned, also the added value of EA compared with other control tools that are in use</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integral</td>
<td>To establish the EA function an integral approach to vision development, architecture processes and products, and the people and resources needed for EA, is necessary.</td>
</tr>
<tr>
<td>Open</td>
<td>EA is an open model, managers control the number and the name of EA perspectives and the related components.</td>
</tr>
<tr>
<td>Customer orientation</td>
<td>The EA processes and products should support the control processes in a tailor made way, while supplying the results supporting these control processes.</td>
</tr>
<tr>
<td>Scope</td>
<td>There are never many principles. The limitation of principles illustrate the strength of the EA management tool because it means decisions can be made quickly. Therefore EA moves at a strategic level and gives direction to tactical and operational levels by means of frameworks.</td>
</tr>
<tr>
<td>Product distinction</td>
<td>From the point of accessibility and understanding it is necessary to distinguish between EA management products and EA specialist products. This means that it is possible to communicate with the right target groups and the right EA products.</td>
</tr>
</tbody>
</table>

**Table 2. Characteristics for success at the level of development of the EA vision**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocating resources</td>
<td>Management must provide people with the necessary competencies, time, budget and resources for EA to realise the added value of EA.</td>
</tr>
<tr>
<td>Participation</td>
<td>Enterprise architects must possess access to managers and participate in their enterprise’s control processes.</td>
</tr>
<tr>
<td>Directional</td>
<td>The EA management products require approval and control by the managers and provide direction to change programmes and the existing enterprise.</td>
</tr>
<tr>
<td>Coherence</td>
<td>All business perspectives must be brought together coherently by the responsible managers.</td>
</tr>
<tr>
<td>Permanence</td>
<td>EA must be arranged as a continuous process whereby coherence is permanently adjusted to the dynamics of the internal and external environment.</td>
</tr>
<tr>
<td>Event driven</td>
<td>EA must be used as a management tool at the moment when major company issues arise to establish timely integral solutions and approaches.</td>
</tr>
</tbody>
</table>

**Table 3. Characteristics for success at the level of application of the EA vision**
As an additional source of input for the creation of the ECA, we also used characteristics taken from the architecture maturity model (AMM) embedded in the dynamic enterprise architecture (DYA) method of Wagter et al. [103]. The AMM has a leading role in the world of architecture in the Netherlands and is used by a number of the participating enterprises. The choice for AMM was therefore a pragmatic one, and AMM was primarily used in the development of the first version of the ECA. In later iterations of the ECA instrument, see chapter 15, we also included characteristics drawn from additional sources, including the IT architecture capability maturity model [23], the normalized architecture organisation maturity index (NAOMI) [99], the enterprise architecture score card [78] and the NASCIO enterprise architecture maturity model [62].

The ECA instrument was not designed to carry out large-scale surveys in which all the current rules in the field of statistics apply, it is specifically designed to make differences in the opinions of respondents of an enterprise explicit. This provides an explicit indication of the degree of governing coherence in an enterprise, while also providing a base to achieve a shared understanding of this level of coherence, and the actions needed to improve it. At the same time, however, the ECA instrument has been designed in such a way that the results remain comparable across enterprises. To reduce the variance that might result from different interpretations of the ECA results by the respondents, all the respondents were taken through a joint discussion of the questions and their further explanations (see Appendix A).

During the research programme, the inventory of characteristics led to the decision to develop the following parts of GEA: the EA vision, EA government, EA processes, EA products, EA people and EA means. The core of the ECA is comprised of twelve key questions and their connections to the GEA parts listed above. The resulting twelve questions were divided into two blocks of six questions. The first block of six questions addressed the level at which an enterprise had developed a vision on the governance of its coherence. The second block of six questions addressed the extent to which the vision to the enterprise architecture practices had been applied within an enterprise. The resulting set of questions are listed in the example questionnaire shown in Figure 8.
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Figure 8. Example of a completed ECA questionnaire

<table>
<thead>
<tr>
<th>Questions ECA instrument</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>1  We possess an EA vision agreed by the management.</td>
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<td>2  Our EA vision is the result of cooperation between the representatives of all stakeholders.</td>
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<tr>
<td>3  Our organisation’s vision, objectives and strategy are characterised by the various EA elements as perspectives, key concepts, guiding statements, principles, etc.</td>
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<tr>
<td>4  Our EA vision is developed into EA processes, products, people and resources.</td>
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<tr>
<td>5  In our organisation one or more control tools are used to rate organisational results in coherence.</td>
<td></td>
<td></td>
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<tr>
<td>6  In our organisation one or more control tools are used to control change processes by coherence.</td>
<td></td>
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<tr>
<td>7  Our EA architects are involved in setting up control processes at a strategic and tactical level.</td>
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</tr>
<tr>
<td>8  It is known whether all our change programmes were developed with or without ‘EA’.</td>
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<tr>
<td>9  In our managers’ competence profile ‘EA’ is included as a competence.</td>
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<td></td>
</tr>
<tr>
<td>10 Our managers understand and use EA products in their control processes.</td>
<td></td>
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</tr>
<tr>
<td>11 At least once a year there is an updated version of the content of our EA framework.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Those with end-responsibility for our change processes are accountable for time, money and quality as well as meeting EA principles and guidelines.</td>
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</table>

The extent to which an enterprise answers ‘yes’ to the questions determined its score. Before answering the questions, a process was carried out whereby the questions were weighted by the respondents and respondents assigned a higher importance to a specific question than others. We will return to the role of this weighting process below.

To ensure that the assessment questions were answered as objectively as possible, the interviewer responsible for the collection of the answers is provided with a reference frame (see Appendix A). As mentioned before, before the respondents are asked to answer the questions, the interviewer will take them jointly through the list of questions and the associated reference frame. This frame was used to ensure that the answers of all respondents were ‘calibrated’. The relationships between the questions and the GEA parts are given in Table 4. The numbers in Table 4 correspond to the twelve ECA questions shown in Figure 8.
Table 4. Mapping GEA parts to the questions

With regards to the content aspects of Table 4:

- **EA Vision**: statements will give answers to questions such as:
  - Whether EA is defined in terms of what it is within the enterprise?
  - Why is the enterprise using EA?
  - Who does the EA work, how?
  - What do we as an enterprise do with the results of EA?
  - What does using EA solve? What are the enterprise’s desired effects of using EA?
  - Are there several management theories included in the enterprise’s EA vision principles?
  - Are the success factors of EA established within the enterprise?
  - Is there a clear degree of urgency to apply EA within the enterprise?

- **EA Governance**: the way of managing, controlling and monitoring the EA function within an enterprise

- **EA Processes**: the execution and governance processes of the EA function within an enterprise

- **EA Products**: the deliverables of the EA processes for an enterprise

- **EA People**: the employees who have to conduct the EA processes within an enterprise

- **EA Means**: the resources allocated by an enterprise to support the EA people in conducting the EA processes

The results of an ECA are reflected in a quadrant model, see Figure 9. This model is composed of two axes, the horizontal axis represents the level of development of the EA Vision within an enterprise and the vertical axis represents the level of the application of EA in that enterprise. These axes represent two dimensions of the governance of enterprise coherence, which correspond to the aforementioned GEA parts that need to be developed.
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  - Who does the EA work, how?
  - What do we as an enterprise do with the results of EA?
  - What does using EA solve? What are the enterprise’s desired effects of using EA?
  - Are there several management theories included in the enterprise’s EA vision principles?
  - Are the success factors of EA established within the enterprise?
  - Is there a clear degree of urgency to apply EA within the enterprise?

- **EA governance**: the way of managing, controlling and monitoring the EA function within an enterprise

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The results of an EA are reflected in a quadrant model, see Figure 9. This model is composed of two axes, the horizontal axis represents the level of development of the EA Vision within an enterprise and the vertical axis represents the level of the application of EA in that enterprise. These axes represent two dimensions of the governance of enterprise coherence, which correspond to the aforementioned GEA parts that need to be developed.

**Figure 9. Hypothesized effects of enterprise coherence governance on the enterprise**

The axis ‘EA vision’ describes the extent to which an enterprise body of knowledge concerning the governance of enterprise coherence has been made explicit. Is there a vision about enterprise architecting within an enterprise? Is the EA-vision aligned with the chosen methodology that supports how an enterprise wants to use it? Is there an implementation plan within the enterprise? Is there a real ambition for the application of EA in the enterprise? The axis ‘EA application’ describes the extent to which an enterprise actually operates the body of thought. The correlation between the two axes results in four quadrants. A brief outline of the hypothesized characteristics per quadrant is provided in Figure 10.

These hypothesized characteristics were developed in a workshop with the customer reference group using the MetaPlan [46] technique.
Below we will discuss the quadrants in more detail, while in Section 4.3 we provide the seven, selected and anonymized real world examples of enterprises and their positioning in relation to the quadrants.

**The Degenerating quadrant**
If an enterprise has no vision about enterprise architecting and does not know how to apply this form of management then the enterprise scores in this quadrant. Coherence in the enterprise will continue to deteriorate with proportionate effects on the enterprise’s performance.

The expected characteristics for this quadrant are:
- coherence is not considered to be an important aspect of the enterprise
- there is no synchronisation between representatives of the important aspects of the enterprise
- no EA vision or activities within the enterprise
- strategy of the enterprise is not supported by EA
- there is no awareness of EA within the enterprise
- no people or resources are allocated to EA in the enterprise
- solutions to business issues are implemented without architecture within the enterprise
- there is a decrease in effectiveness and efficiency within the enterprise

**The Philosophical quadrant**
There is a vision of enterprise architecting, this is also translated into how it should be implemented, but it is not developed beyond terms of ‘paper’ and ‘goodwill’. It is not ‘exploited’, let alone implemented. The vision document seems to have disappearance in the well-known bottom drawer black hole. There may be some basic increase in effectiveness within the enterprise. A basic level/awareness of governance of enterprise coherence may have been developed, therefore, there is an increased likelihood that things will move in ‘the right direction’ within the enterprise.

The expected characteristics for this quadrant are:
- coherence is considered to be a strategic aspect throughout the enterprise
- there is regular synchronisation between representatives of the important aspects of the enterprise
- there is an integral EA vision, with limited EA activities in the enterprise’s operations
- EA is integrated into the enterprise’s strategy
- EA is inspired within the enterprise, especially by third parties
- a limited number of people and resources has been allocated to EA
- some solutions are implemented with architecture
- increase in effectiveness, not in efficiency

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44
**The Suboptimal quadrant**

Enterprises positioned in this quadrant will be enterprises with EA individuals with their own vision and ideas about enterprise architecting, who have taken their own local actions. Models will have been designed that perhaps offer the most potential for reinforcing governance of coherence throughout the enterprise, however, these models are not synchronized/aligned and are formulated in enterprise’s jargon. The biggest flaw is that the managers, who should be the customers of these products, do not know that they exist or they do not know how to include them in their management processes. The application of EA is the next stage but not on an enterprise level. A number of things are done well, but these are not good things by definition. Throughout the enterprise there is some increase in efficiency.

The expected characteristics of this quadrant are:

- coherence is only experienced as an enterprise aspect locally and in different ways
- there is no synchronisation between representatives of the important enterprise aspects
- local EA visions and activities are on the agenda
- EA is integrated in one or more department strategies
- EA is applied particularly by third parties
- local and frequent temporary allocation of people and resources to EA
- local solutions are implemented with architecture
- not effective, increase in efficiency

**The Optimisation Quadrant**

In this quadrant, vision and action go hand in hand. The enterprise has a detailed view of enterprise architecting and knows how to use it to its advantage. The managers take strategic decisions from their integral and current knowledge about the meaning and design of the enterprise. The enterprise works on optimising management and implementing processes that are supported by EA processes and products. The good things are done well, in other words efficiency and effectiveness go hand in hand.

The expected characteristics for this quadrant are:

- coherence is experienced as an important aspect and governance of coherence is applied throughout the enterprise
- there is frequent synchronisation between representatives of the important aspects of the enterprise
- there is an integral EA vision and activities that as a framework give direction on a strategic, tactical and operational level
- EA is integrated in the enterprise’s strategy
- EA is internalized in the thinking and action of its own leaders and managers
- there is talk of structural allocation of people and resources
- integral solutions for major issues are implemented with architecture
- structural improvements in coherence within the enterprise is on the agenda
- there is high effectiveness and efficiency

**Figure 10. Hypothesized characteristics of enterprise coherence governance per quadrant**

Once the questions of the questionnaire in Figure 8 have been answered, then the respondents’ scores can be used as a good starting point for follow up actions to improve the governance of enterprise coherence, in particular the following questions should be used as drivers:

- How can the (possible) differences in the positioning of the respondents be explained?
• Which steps for improvement of enterprise coherence governance can be made in connection with the positioning at an organisational level, using the average of the respondents’ scores?

The discussions arising from the first question may lead to employees with very different scores adjusting their scores. If this is not the case, it may lead to new insights for the whole group. The enterprise’s score is an average of the given scores from the individual respondents, however, as we will see in the next section, the average is not just computed, but rather determined in a joined session with all the involved respondents. During such a session, individual respondents may change their scores in response to improved insights into and their understanding of the actual situation in the enterprise and/or insight into the question. If the results of the enterprise’s score are in the optimisation quadrant then people will reap the rewards of applying coherence governance. It is important to maintain this optimisation within an enterprise and to guard against falling back into old habits. If the positioning falls in one of the three following quadrants: degenerative, philosophical or sub-optimisation, then this offers greater possibilities for improvement. If the score falls in the degenerative quadrant this means that an enterprise must first take a step to the right and then one directly upwards, before the step can be made towards optimisation (see Figure 11). These approaches correspond to an enterprise’s management style. One enterprise first wants to consider it properly, as supporters of the design school of thought and another enterprise wants to first initiate experiments, such as supporters of the learning school of thought [69].
4.3 Using the ECA Instrument

In this section we will deal with the use of the ECA instrument in practice, and we start with a discussion of the steps involved in applying the instrument, followed by a description of how the ECA instrument has been applied in seven large enterprises in the Netherlands.

The following steps are used in the ECA instrument to position an enterprise:

1. Determine the relative weight of the questions: rank the questions in order of importance.
2. Gather responses to situational questions: which questions do, or do not, apply to your enterprise?
3. Process the answers and feedback of the positioning per respondent.
4. Analyse the differences between the individual positions.
5. Aggregate the individual positions to determine the enterprise’s positioning.

**Step 1: Determine the weight of the questions**

As a first step, for each question the respondents indicate the question’s relative importance to the enterprise, see Figure 12. A question’s importance is determined according to the situation; no two enterprises are the same. Where, for example in a more hierarchal enterprise it is an absolute must for the management to have agreed a vision on enterprise architecting, in a different enterprise it may be much more important for all the stakeholders to be involved in formulating the vision. The weighting of the questions is conducted using the pair wise comparison method [77]. In a pair wise comparison the twelve questions are ranked by pairing them by comparison. It is subsequently possible to divide the research population into segments, all of which have the same standpoints regarding the questions, by bundling the results of this weighting. The actual comparison is computed using an analytic hierarchy process (AHP) [77]. In the ECA case, two dimensions and twelve questions are used. These are respectively (D)evelopment and (P)eration, resulting in two times six questions (D1 to D6 and P1 to P6). The questions take the form of a statement that does (factor 1) or does not (factor 0) apply to an enterprise. The weighted averages for D and P are calculated from the weighted average of weight × factor (1 or 0), for each statement. The weights are determined by comparing the questions, separately for D and P. D1 is compared with D2 to D6, then D2 with D3 up to D6, and so on. Then we ask the question: is D1 much more important than D2, if so, then D1 4 and D2 are awarded a 1/4 point, if D1 is more important than D2, 2 respectively 1/2 point and if D1 and D2 are equally important each get 1 point. The total number of points per statement determines the weight.

<table>
<thead>
<tr>
<th>Weight determination EA vision development</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>D6</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 We possess an EA vision agreed by the management.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2 Our EA vision is the result of cooperation between the representatives of all stakeholders.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3 Our organisation’s vision, objectives and strategy are characterized by the various EA elements as perspectives, guiding statements, principles, etc.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4 Our EA vision is developed into EA processes, products, people and resources.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5 In our organisation one or more control tools are used to rate organisational results in coherence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6 In our organisation one or more control tools are used to control change processes by coherence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 12. Part of the process to determine the weight of the questions
**Step 2:** *Answer situational questions*

After determining the weight of the twelve questions, the form with the situational questions is completed with a yes/no. See Figure 8.

**Step 3:** *Process and provide feedback and position each respondent*

The details of each respondent are entered into an application that calculates the individual position of a respondent. See the diagram in Figure 13 in which the position of such an individual is shown.

![Diagram of individual positioning](image)

**Figure 13. Diagram of individual positioning**

**Step 4:** *Analyse the differences between individual positions of employees*

Analysis of the differences between the individual positions of employees can be carried out in one of two ways: one, on the aspect of the weight determination that is known for the questions and two, on the aspect of the situation. Making these differences explicit can result in interesting discussions and may already lead to

---

**Employee 1**

**EA-application**

**EA-vision**

Suboptimisation

Optimisation

Degeneration

Philosophising

Employee 1

Org. X

EA-application

EA-vision

0

1/2

1

0

1/2

1

0

1/2

1

0

1/2

1

0
adjustments in the opinions of individuals or groups of people at this stage of the process. See Figure 14, in which the positioning of individual employees and the position of the enterprise are illustrated. In Figure 14 we illustrate the scores of three employees from one enterprise, resulting from an assessment carried out by participants in a growth platform, and we also show the enterprise’s total score. Significant differences are apparent in the ratings completed by the employees. We can also deduce that the related enterprise scores 0.545 on the EA development axis.

Analysis of the responses reveals that there is a vision within the enterprise but it has not been developed into an implementation plan. There is also no ambition to use any tools to strengthen coherence governance within the enterprise. A further analysis of the score 0.241 on the EA vision application axis reveals that ideas about the application of enterprise architecting held within the enterprise are being implemented in a fragmented manner.

**Figure 14. Individual and organizational positioning**

**Step 5:** Aggregate the individual positioning at an organisational level

After the relative weighting of the situational questions has been performed and the questions have been answered, the model automatically provides the position of the total enterprise in the matrix, see Figure 14. This yields an initial average of the individual scores of the respondents. These results are then discussed in a joint session with the involved respondents. These discussions may lead to insights about the actual situation in the enterprise and/or a better interpretation of the ques-
tions. This may, in its turn, lead the respondents to want to change their individual scores, and eventually the aggregate scores for the enterprise; using this joint discussion, undesired variance due to misinterpretations and/or incomplete knowledge about the enterprise, is reduced. The starting points for a development and implementation strategy for enterprise architecting can be identified using this position data, note Figure 10 can be helpful at this stage. Is it necessary, for example, to first develop a vision, translate it into workable concepts and subsequently develop an implementation strategy? Or can one already get to work because sufficient homework has already been done on developing a vision et cetera? In this case it is perhaps necessary first to establish a communication offensive.

In the context of the research question: How does governance of enterprise coherence work in enterprises? We applied ECA to seven selected large enterprises in the Netherlands, involving twenty-five participants. These enterprises were chosen because they had more than 1000 employees, were willing to participate in this assessment and the results of an assessment carried out in these 7 major enterprises, in our opinion, for this stage of the research would offer sufficient insight into the status of enterprise coherence governance to facilitate our research further. Two enterprises that participated had an industrial base and 5 were governmental enterprises. This pilot study was followed by an extended research assessment conducted in 54 enterprises within the Netherlands, see chapter 15. Before the assessment we set the condition that if there was a lack of governance of enterprise coherence in more than 50% of the case study enterprises, then the problem ‘lack of coherence governance in enterprises’ was present. If this was proved then the conditions were met for further research and the development of a theory for enterprise coherence governance. It is our claim that there a general lack of governing of enterprise coherence exists, if less than 50% of the pilot study enterprises score in the optimization quadrant. The results of the pilot study assessment are summarized in Figure 15.
Figure 15. ECA positioning of several enterprises

Figure 15 provides an initial overview of the situation of the parties participating in the pilot study and their differences. More specifically, the assessment resulted in the following comments/feedback from the respondents:

– Enterprise 1 is characterized by the fact that its vision on enterprise architecture and its management has been developed in-house, while being based on methods used in the market, such as dynamic enterprise architecture (DYA) [103] and the open group enterprise architecture framework (TOGAF) [92]. Therefore it has been accepted and supported at board level. The relationship between the level at which meaning is assigned and the tactical/operational levels of the enterprise are also well defined in the enterprise architecture. The people who have developed the enterprise architecture vision and management have also managed to implement the enterprise architecture processes and allocate people and resources on this basis. Given this process orientation all change processes are implemented ‘under architecture’. This is achieved by consistently developing program start architectures (PgSAs) [103] that can be used as an effective steering instrument for transition before initiating change process transitions. The fact that the relevant directional frameworks that apply at the level of the enterprise at which meaning is assigned are also incorporated in the PgSAs bridges the gap between the strategic and tactical levels. In short, the coherence of the enterprise is made explicit, updated on an ongoing basis and used to develop integral solution options and approach choices for major issues. This ensures that the coherence and therefore the performance of the enterprise are continuously improved.
– Enterprise 2 is a large Dutch government enterprise, which consists of several divisions that operate with a high degree of autonomy. Within this enterprise, high quality architecture products have been designed at concern level in the form of an extensive enterprise architecture vision, business process models, use cases, et cetera, however, because the divisions operate with such a high degree of autonomy the enterprise architecture function can only attempt to elicit ‘architecture behaviour’ and has achieved only limited success in this respect. In practice, only a few of the divisions are prepared to work with reference models that describe situations encountered in daily practice.

– Enterprise 3 is a large executive agency of the Dutch government, which was created out of a merger of several similar enterprises. This background has made the development of an enterprise architecture difficult. There was a strong emphasis on producing an enterprise architecture as a product. Yet little success in developing architecture processes and embedding these in the merged enterprise. Therefore, the first large project that was supposed to be implemented ‘under architecture’ failed miserably. Even though there were other contributing factors, the architecture was held to be the primary cause of this failure. The enterprise architecture was written off as un receptive and the architecture function was largely dismantled. Although the individuals involved in this thankless task were on the right track with the enterprise architecture vision, etc., they were a long away from implementing and applying it in the enterprise.

– Enterprise 4 is a large construction enterprise in which the enterprise architecture vision is still very limited and ‘hidden’ in several documents. The situation is also complicated by the fact that people throughout the enterprise describe themselves as ‘architects’, and apply architecture in their own personal way.

– Enterprise 5 is a large Dutch government agency with many offices located throughout the country. At a corporate level, the enterprise has made considerable progress in articulating their enterprise architecture vision. Those involved have produced ample architectural models that have, however, a strong IT focus. The process orientation in their architectural thinking is also lagging behind. The architecture processes have not been identified, described and implemented.

– Enterprise 6 is a large Dutch transport enterprise. The architecture function is this enterprise involves a relatively small architecture group. The situation is characterized by the fact that the enterprise does not employ a separately managed change process. In other words, all organizational changes are directly implemented by line managers and/or business unit managers. Despite the fact that the architects are doing their best to develop an architecture vision and get it supported at board level they have no sway with the managers who implement the changes. The fact that ‘working under architecture’ sometimes requires investments in the interest of the greater whole is a complicating factor. The line and business unit managers are not prepared to authorise such investments, partly because of the way in which financial management and accounting are organised.
– **Enterprise 7** is a large association with several million members. The association organises activities in five different domains. The enterprise structure reflects these domains. Several attempts have been made to determine the form and content of the architecture function. Due to several external influences, the enterprise has entered troubled times and its survival has come under threat. The major cost cuts resulting from this situation, mean that the architecture function has not been developed further, while architectural initiatives have been reduced considerably. Regretfully, the board of this enterprise did not realize that enterprise architecture can provide adequate support for effective cost cutting during such cost cutting periods.

### 4.4 Conclusion

A fundamental first step in our research programme was to develop an enterprise coherence-governance assessment tool (ECA) to attain a clearer understanding of the challenges to enterprise coherence and its associated governance of coherence \[113\], and the hypothesized impact of enterprise coherence governance on organizational performance.

One of the investigated enterprises is clearly on the right track with coherence governance. This involves a very large financial enterprise that by ‘working with architecture on an enterprise level’ has already managed to halve its ICT costs over five years \[51\]. Two other enterprises scored in the philosophical quadrant and four enterprises in the degenerative quadrant. These overviews of the relative positions were discussed and validated in a meeting with the involved parties, with the aim of identifying actions that would lead to improvement in their respective governance of enterprise coherence.

Since six of the seven enterprises did not score in the optimisation quadrant, an important conclusion that could be drawn from this pilot assessment was that it clearly demonstrates the need for further research into the governance of enterprise coherence, in particular there is a need to develop a theory for the governance of enterprise coherence. In this assessment conducted in 2007 \[113\] we claimed there was a lack of governing enterprise coherence, if less than 50% of the assessed enterprises scored in the optimisation quadrant.

It is also interesting to note that enterprise 5 suffered from similar problems to enterprise 2, in terms of the autonomy of divisions and offices. This resulted in the provisional conclusion that it might be more difficult to implement enterprise architecture in enterprises with divisions that operate with a relatively high degree of autonomy than in more centrally managed enterprises.

The ECA provides enterprises with a simple measure for positioning their enterprises on an EA vision development level and on its level of application. Situational differences can be taken into account. In particular, respondents can define the relative importance of the questions. The principles, design, procedure and backgrounds to the ECA tool were also discussed. Our research revealed that, in a
substantial number of the assessed enterprises, there was a lack of governance of enterprise coherence. The results of an assessment will offer an enterprise the tools required to begin discussions about the use of enterprise architecture as an instrument to achieve better governance of enterprise coherence.

Requirements on Enterprise Coherence Governance

We will discuss the requirements regarding enterprise coherence governance in this chapter. These requirements result partly from a workshop with the members of our customer reference group, see the relevance cycle shown in Figure 2, and partly from desk research of sources taken from relevant adjacent domains with the aim of identifying additional requirements to strengthen the development of GEA, see also the knowledge base and the rigour cycle shown in Figure 2. The adjacent domains for research were selected based on the daily experiences of the members of our customer reference group, which led us to define three key domains: management control, cybernetics and change management.

5.1 General requirements on the research programme

Effective governance of enterprise coherence requires the active involvement of senior management. This, however, implies two important requirements.

1. The process of enterprise coherence governance should be strategy driven: it is necessary to take the concerns, and associated strategic dialogues, of senior management as a starting point [19]. In other words, the way in which architecture is integrated into the strategic dialogue should take the concerns, language, and style of communication of senior management as a starting point. When this is not done it will be difficult to involve senior management. Even more, a strategic dialogue will provide the starting point for steering an enterprise’s transformations and guards coherence. The process of enterprise coherence governance should be

2. respecting social forces [54]: the social forces, be they of political, informal, or cultural nature, within an enterprise should be a leading element in governing enterprise coherence. As discussed in the introduction, an important reason for using architecture to steer and coordinate enterprise transformations is the fact that those design decisions, which, in principle, transcend the interests of a specific project, can be guarded/enforced in this way. Doing so, however, also requires a strong commitment from senior management to implement the design decisions [7]. Local business stakeholders, such as business unit managers, who have a direct interest in the outcome of a project, may want to lead projects in a different direction, those may be more favourable to their own local/short-term interests, than might be desirable from an enterprise-wide perspective [82]. Such divergent forces are also likely to lead to erosion of the desired enterprise coherence [4]. This explains the need to reduce the space for own interpretation at lower management levels by substantiating the decisions made on the strategic level [19, 4], with unambiguous arguments that harmonize all the concerns at stake.
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We argue that existing approaches and frameworks, such as those of Zachman [87, 131], DYA [103], Abcouwer [1], Henderson & Venkatraman [36], TOGAF [92], IAF [101], ArchiMate [42, 48], take an ‘engineering oriented’ style of communicating with senior management and stakeholders in general. The architecture frameworks underlying each of these approaches are very much driven by ‘engineering principles’, and as such correspond to a blue-print style of thinking about change [21].

The above requirements, however, suggest the use of another style of thinking in terms of stakeholder interests [45], the formal and informal power structures within enterprises [7, 4, 49], and the associated processes [29] of creating win-win situations and forming coalitions [60]. In terms of De Caluwé [21], this is more the yellow-print style of thinking about change. Yellow-print thinking according to De Caluwé [21] is based on socio-political views on organizations, where interests, conflicts and power play an important role and brings the interests of the most important players together by means of a process of negotiation enabling consensus or a win-win solution. Blue-print thinking formulates clear goals and results, then designs rationally a systematic approach and then implements the approach according to plan. Red-print thinking motivates and stimulates people to perform the best they can, contracting and rewarding desired behaviour with the help of HRM-systems. Green-print thinking creates settings for learning by using organizational interventions, allowing people to become more aware and more competent on their job. White-print thinking understands what underlying patterns drive and block an organization’s evolution, focusing interventions to create space for people’s energy. In the research programme for this thesis, the yellow-print line of thinking was taken as a starting point, by taking the perspective that the actual social forces and associated strategic dialogues within an enterprise should be taken as a starting point, rather than the frameworks of existing architecture approaches suggesting the full make-ability of an enterprise.

In future research, we intend to position governing enterprise coherence in relation to the green, red and white ‘colours’ of De Caluwé [21]. This does not imply that the existing blue-print style frameworks and approaches are not useful. On the contrary, an engineering perspective is very much needed. At the same time, it needs to be embedded in a yellow-print oriented process. Architecture models produced from an engineering perspective potentially provide, thorough underpinning of the views, sketches and models that can be used in the strategic dialogues with senior management: however, rather than structuring the models and views in terms of information architecture, application architecture and infrastructure, they need to be structured based on those domains that are meaningful to decision makers within the strategic and political dialogue in an enterprise. For example, in terms of human resourcing, clients, regulators, culture, intellectual property, suppliers, et cetera. Needless to say that this will be highly enterprise specific.
This leads to the situation as suggested in Figure 16, where we find on the left hand side the blue-print style of thinking and associated frameworks, and on the right hand side the yellow-print oriented approach. Note the (tentative) position of the Zachman framework; more so than frameworks such as IAF, ArchiMate or TOGAF’s content framework, the Zachman framework clearly suggests tuning the models and views to the interests/concerns of stakeholders and even suggests a classification of stakeholders. In our view, however, it still does so from a blue-print thinking perspective and certainly does not take the stakeholder interests, formal and informal power structures in an enterprise into account.

**Figure 16. Bridging blue-print thinking to yellow-print thinking**

The results of the initial application of the enterprise coherence-governance assessment were discussed in a workshop with the members of our customer reference group. This workshop, supported by the MetaPlan [46] technique to achieve consensus about the requirements for enterprise coherence governance, resulted in a more specific list of requirements based on the practical needs from the participating stakeholders of EA, see the relevance cycle and the aspect ‘people’ in Figure 2. These requirements combined with the generic requirements as discussed above, resulted in the list of requirements, also referred to as EA success factors [115], as shown in Table 5.

<table>
<thead>
<tr>
<th>EA success factor</th>
<th>EA Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy driven</td>
<td>1) It is necessary to take the concerns, and associated strategic dialogues, of senior management as a starting point.</td>
</tr>
<tr>
<td>Social forces</td>
<td>2) Forces, be they of political, informal, or cultural nature, within an enterprise should be a leading element in</td>
</tr>
<tr>
<td>Requirement</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>E.A. Vision</td>
<td>3) One must have an EA vision to establish EA as a business value driver and make explicit how coherence contributes to both the image and opinion formation phases of the decision-making process and must closely resemble and simulate the way of thinking. One prerequisite is that the top of the enterprise holds this EA vision.</td>
</tr>
<tr>
<td>Commitment</td>
<td>4) The added value of EA as a governance tool should be recognized and promoted by all parties concerned, also the added value of EA compared with other control tools that are in use.</td>
</tr>
<tr>
<td>Organisation</td>
<td>5) To establish the EA function, an integral approach to EA vision development, EA processes, EA products, EA people and EA resources needed for EA, is necessary.</td>
</tr>
<tr>
<td>Customization</td>
<td>6) EA is a flexible concept, which means that the number and character of organisational angles to govern the enterprise and their associated relationships depend on the situation.</td>
</tr>
<tr>
<td>Customer orientation</td>
<td>7) The EA processes and products should support the control processes of the enterprise in a tailor made way, by supplying the necessary results supporting these control processes.</td>
</tr>
<tr>
<td>Scope</td>
<td>8) EA moves at a strategic level and gives direction in decision-making on tactical and operational levels using policy lines and must be done in an independent way to include all angles at stake in decision-making processes.</td>
</tr>
<tr>
<td>Product distinction</td>
<td>9) From the point of accessibility and understanding it is necessary to distinguish between EA management products and EA specialist products. This means that it is possible to communicate with the right target groups and with the right EA products.</td>
</tr>
<tr>
<td>Resource allocation</td>
<td>10) Management must provide the EA function with people with the necessary competencies, time, budget and other resources for EA to realize the added value of EA.</td>
</tr>
<tr>
<td>Participation</td>
<td>11) Enterprise architects must participate in the enterprise’s governance processes and must have direct access to managers on a peer-to-peer basis.</td>
</tr>
<tr>
<td>Direction</td>
<td>12) The EA governance products must provide direction to change programmes and the existing enterprise.</td>
</tr>
<tr>
<td>Completeness</td>
<td>13) A complete, and coherent, set of organisational per-</td>
</tr>
</tbody>
</table>

As a next step, the sources taken from the relevant adjacent domains were studied, with the aim of identifying additional requirements to strengthen the development of GEA, see the knowledge base and the rigour cycle of Figure 2. The adjacent domains were selected based on the daily experience of the core team members of the research programme resulting in three key domains: management control, cybernetics and change management.

### 5.2 Management control

One of the leading theories in the field of management control is Simons’ "Levers of Control"[83]. Simons identifies the following levers of control that must be governed in conjunction:

1. Diagnostic control systems used to monitor and adjust operating performance
2. Belief systems that communicate core values such as mission statements, credos and vision statements
3. Boundary systems that define the limits of freedom, such as codes of conduct and statements of ethics
4. Interactive control systems that provide strategic feedback and vehicles to update and redirect strategy such as competitive analysis and market reports

These levers of control led us to the following insights. To govern an enterprise we have to distinguish between its 'sustainable' purpose and its realisation as an enterprise. The purpose is formulated on the level of purpose and its realisation as an enterprise is described on the design level. Belief systems typically contribute to the level of purpose. Inspired by Simons’ levers of control we derived the following requirements for the development of GEA, consisting of the artefacts ECF, ECG and ECA.
3) One must have an EA vision to establish EA as a business value driver and make explicit how coherence contributes to both the image and opinion formation phases of the decision-making process and must closely resemble and simulate the way of thinking. One prerequisite is that the top of the enterprise holds this EA vision.

4) The added value of EA as a governance tool should be recognized and promoted by all parties concerned, also the added value of EA compared with other control tools that are in use.

5) To establish the EA function, an integral approach to EA vision development, EA processes, EA products, EA people and EA resources needed for EA, is necessary.

6) EA is a flexible concept, which means that the number and character of organisational angles to govern the enterprise and their associated relationships depend on the situation.

7) The EA processes and products should support the control processes of the enterprise in a tailor made way, by supplying the necessary results supporting these control processes.

8) EA moves at a strategic level and gives direction in decision-making on tactical and operational levels using policy lines and must be done in an independent way to include all angles at stake in decision-making processes.

9) From the point of accessibility and understanding it is necessary to distinguish between EA management products and EA specialist products. This means that it is possible to communicate with the right target groups and with the right EA products.

10) Management must provide the EA function with people with the necessary competencies, time, budget and other resources for EA to realize the added value of EA.

11) Enterprise architects must participate in the enterprise’s governance processes and must have direct access to managers on a peer-to-peer basis.

12) The EA governance products must provide direction to change programmes and the existing enterprise.

13) A complete, and coherent, set of organisational perspectives must be brought together for/by the decision makers.

14) EA must be arranged as a continuous process whereby coherence is permanently adjusted to the dynamics of the internal and external environment.

15) EA must be applied as a governance instrument at the moment major business issues arise in order to establish integral solutions and approaches on time.

Table 5. EA Requirements from the customer reference group

As a next step, the sources taken from the relevant adjacent domains were studied, with the aim of identifying additional requirements to strengthen the development of GEA, see the knowledge base and the rigour cycle of Figure 2. The adjacent domains were selected based on the daily experience of the core team members of the research programme resulting in three key domains: management control, cybernetics and change management.

5.2 Management control

One of the leading theories in the field of management control is Simons’ ‘Levers of Control’ [83]. Simons identifies the following levers of control that must be governed in conjunction:

1. diagnostic control systems used to monitor and adjust operating performance
2. belief systems that communicate core values such as mission statements, credos and vision statements
3. boundary systems that define the limits of freedom, such as codes of conduct and statements of ethics
4. interactive control systems that provide strategic feedback and vehicles to update and redirect strategy such as competitive analysis and market reports

These levers of control led us to the following insights. To govern an enterprise we have to distinguish between its ‘sustainable’ purpose and its realisation as an enterprise. The purpose is formulated on the level of purpose and its realisation as an enterprise is described on the design level. Belief systems typically contribute to the level of purpose. Inspired by Simons’ levers of control we derived the following requirements for the development of GEA, consisting of the artefacts ECF, ECG and ECA.
TABLE 6. EA REQUIREMENTS FROM MANAGEMENT CONTROL THEORY

<table>
<thead>
<tr>
<th><strong>Management control</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lever of control</strong></td>
</tr>
<tr>
<td>Diagnostic control systems</td>
</tr>
<tr>
<td>Belief systems</td>
</tr>
<tr>
<td>Boundary systems</td>
</tr>
<tr>
<td>Interactive control systems</td>
</tr>
</tbody>
</table>

Table 7. EA Requirements from a cybernetic perspective

5.3 Cybernetics

The second theoretical foundation concerned the cybernetic perspective, from which an enterprise is seen as a controllable open system [24, 45]. The control paradigm, as introduced in e.g. [24], identifies a set of conditions required to achieve an effective control situation. So compliance with these conditions implies a promise, namely to achieve an effective control situation. These conditions are [24]:

1. the controlling system must have a goal to guide it in governing the controlled system
2. the controlling system must have a model of the controlled system
3. the controlling system must have information about the controlled system, namely the state of the specified system parameters and subsequent acting environment variables
4. the controlling system must have sufficient control variety
5. the controlling system must have sufficient information processing capacity to transform information (3), using a model (2), taking into account the objectives (1) into effective control measures (4)

Inspired by these conditions for effective control we derived the requirements for the development of GEA listed in Table 7.
**Cybernetics**

<table>
<thead>
<tr>
<th>Conditions for effective control</th>
<th>EA Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify a goal to the controlled system</td>
<td>1) Objectives have to be an element of enterprise coherence at the design level of an enterprise. This requirement is also formulated from the theory of management control in table 2 requirement no. 1.</td>
</tr>
<tr>
<td>Have a model of the controlled system</td>
<td>2) The model of enterprise coherence must represent the dynamics of the design level of an enterprise.</td>
</tr>
<tr>
<td>Have actual information about the controlled system</td>
<td>3) The actual state of enterprise coherence must be represented on a permanent basis including current state and future directions.</td>
</tr>
<tr>
<td>Have sufficient control variety</td>
<td>4) Enterprise coherence governance must have sufficient levers to influence enterprise coherence on the design level, and also support the interdependency with the level of purpose. The latter should include: forward and backward governance, event driven and cyclic governance, single and multi-level governance i.e. recursivity and projection.</td>
</tr>
<tr>
<td>Have sufficient information processing capacity</td>
<td>5) Restrict the complexity and information overload by differentiating enterprise coherence in several interdependent levels. Allocate sufficient resources to enterprise coherence governance, distinguished by processes, products, people, means, governance, methodology and all based on a clear vision.</td>
</tr>
</tbody>
</table>

**Table 7. EA Requirements from a cybernetic perspective**

### 5.4 Change management

A third theoretical foundation for GEA is based on the notion that enterprises are a social technical combination of humans and supporting technology [4, 6, 7, 44, 54, 59, 82]. Here we refer to the work of Julia Balogun and Veronica Hope Hailey: Exploring Strategic Change [6]. The basic idea is that every choice made in a change process should be based on the context and the purpose of the change process. A study conducted in 2004 by Deloitte & Touche, ‘What is the best change approach’ [74] enhances this basic idea with the statement that there is a link between the choice of approach and purpose of the change. Since this study concerns successful change processes, in various sectors, the conclusion has been drawn that it is sensible regarding change processes to consider on which organizational aspects the change is essentially focussed and, in line with this, to choose an appropriate approach.
Inspired by these insights we derived the additional requirements for the development of our theory for enterprise coherence governance listed in Table 8.

<table>
<thead>
<tr>
<th>Socio-technical combinations</th>
<th>EA Requirement</th>
</tr>
</thead>
</table>
| Choice made in a change process should be based on the context and the purpose | 1) The scope of enterprise coherence governance should include both the internal and external angles of the organizational transaction environment.  
2) The purpose of a change process should be in line with the goals on the level of purpose and objectives on the design level.  
3) The organizational aspects that are dominant in the solution for a business issue, determine the choice of approach.  
4) Every change process should be argued by the application of the enterprise coherence governance before execution. |
| Choice of an appropriate approach determines the success | 5) The solution direction and choice of approach should be just one element of the decision.  
6) Regarding the decision-making process, enterprise coherence governance should contribute to both the solution direction and choice of approach of a business issue.  
7) Enterprise coherence governance should guide the realisation of the solution direction and choice of approach of a business issue.  
8) An appropriate approach needs appropriate enterprise coherence products. |

Table 8. EA Requirements from a change management perspective

These aggregated requirements formed the starting point for developing a new theory and approach to govern enterprise coherence. The first step was to develop a theory for enterprise coherence governance that answered our research questions and met these requirements.

5.5 Basic philosophy for enterprise coherence governance

At this stage of the research process, after the exploration of the requirements, we were able to establish the basic philosophy of our theory for enterprise coherence governance. In this philosophy, the following postulate was used as the starting point.
The overall performance of an enterprise is positively influenced by proper coherence among the key aspects of the enterprise, including business processes, organizational culture, product portfolio, human resources, information systems and IT support, et cetera.

When taking this postulate as a starting point, it is natural to accept that coherence is an important issue. More importantly, an issue that senior management of an enterprise should want to influence and govern. To govern coherence one needs the levers to adjust that coherence and to do this one has to make the coherence of the enterprise explicit. Taking our definition of coherence into account and the fact that enterprises are social systems, in which humans play the dominant role, enterprises are living entities that have a dynamics of their own. As such, they can be conceived of as interacting subsystems to balance internal needs and to adapt to environmental circumstances, this delivers the insight that coherence has a fluid character, which implies the governance should be carried out continuously. These insights triggered us to pose the question: by means of which concepts, and when, is the coherence of an enterprise improved or decreased? Coherence will be especially influenced at the moment an enterprise formulates answers on major business issues. So coherence governance must be part of, and contribute to, these processes of formulating answers. Using coherence governance in these processes leads to integral solutions and approaches and via this to a permanent improvement of the organisational coherence.

Given the statement in the basic philosophy for enterprise coherence governance that major business issues will improve or decrease an enterprise’s coherence we needed to answer the research question: What are the core factors that influence enterprise coherence? and the research objective: How can we define the core indicators and factors that influence enterprise coherence? We define a business issue as: a business issue is a problem, bottleneck, challenge or alleged solution, that is considered and controlled from the coherence of several perspectives. An event in the outside world of an enterprise becomes a business issue as it has been observed that enterprise coherence governance is necessary, i.e. several relevant perspectives have been identified.
6 The Enterprise Coherence Framework

6.1 Introduction

With the development of the ECF we answered the research questions: What are the core factors that define enterprise coherence? and How can enterprise coherence be expressed explicitly?, and we met the research objective to define the core indicators and factors that define enterprise coherence.

The enterprise coherence framework (ECF) [115] defines a series of cohesive elements and cohesive relationships, which together define the playing field for an enterprise’s coherence. Making the definition of these elements explicit in a specific enterprise, a coherence dashboard results in terms of which one can gain insight into the ‘state of coherence’ within an enterprise while also being able to assess the impact of potential/on-going transformations. This then enables the deliberate governance of enterprise coherence during, or to drive, transformations within an enterprise.

The ECF is defined in terms of two levels and their connections: the level of purpose and the level of design. At the level of purpose, the cohesive elements that were identified, corresponded to the commonly known concepts of strategy formulation [18, 44, 81, 97]: mission, vision, core values, goals and strategy. To bring these cohesive elements to life, a few examples are provided in Table 9.

<table>
<thead>
<tr>
<th>Cohesive elements</th>
<th>Statements</th>
</tr>
</thead>
</table>
| **Mission**       | • To make people happy (Walt Disney)  
|                   | • To experience the joy of advancing and applying technology for the benefit of the public (Sony)  
|                   | • To bring inspiration and innovation to every athlete in the world (Nike)  
|                   | • To help leading corporations and governments be more successful (McKinsey) |
| **Vision**        | Walt Disney  
|                   | • Creativity + Innovation = Profits  
|                   | • One of the world's leading producers and providers of entertainment and information |
|                   | Sony  
|                   | • We anticipate in the changing relationship between content, technology and the consumer by our four pillars: e-Entertainment, Digital Cinema, Higher Definition and |
The Enterprise Coherence Framework

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<table>
<thead>
<tr>
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<th>Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission</td>
<td>To make people happy (Walt Disney)</td>
</tr>
<tr>
<td></td>
<td>To experience the joy of advancing and applying technology for the benefit of the public (Sony)</td>
</tr>
<tr>
<td></td>
<td>To bring inspiration and innovation to every athlete in the world (Nike)</td>
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<td></td>
<td>To help leading corporations and governments be more successful (McKinsey)</td>
</tr>
<tr>
<td>Vision</td>
<td>Walt Disney</td>
</tr>
<tr>
<td></td>
<td>Creativity + Innovation = Profits</td>
</tr>
<tr>
<td></td>
<td>One of the world's leading producers and providers of entertainment and information</td>
</tr>
<tr>
<td>Sony</td>
<td>We anticipate in the changing relationship between content, technology and the consumer by our four pillars: entertainment, Digital Cinema, Higher Definition and PlayStation</td>
</tr>
<tr>
<td>Nike</td>
<td>Sustainable Business and Innovation is an integral part of how we can use the power of our brand, the energy and passion of our people, and the scale of our business to create meaningful change</td>
</tr>
<tr>
<td></td>
<td>The opportunity is greater than ever for sustainability principles and practices to deliver business returns and become a driver of growth, to build deeper consumer and community connections and to create positive social and environmental impact in the world</td>
</tr>
<tr>
<td></td>
<td>Creativity, dreams, imagination, consistency, detail, preservation of the magic (Walt Disney)</td>
</tr>
<tr>
<td></td>
<td>Being a pioneer, authentic, doing the impossible, individual ability and creativity (Sony)</td>
</tr>
<tr>
<td>Goals</td>
<td>To build a radically new kind of amusement park, known as Disneyland (in 1950s, Walt Disney)</td>
</tr>
<tr>
<td></td>
<td>Become the company most known for changing the worldwide poor-quality image of Japanese products (1950s, Sony)</td>
</tr>
<tr>
<td>Strategy</td>
<td>Continued diversification consistent with Walt Disney’s early actions.</td>
</tr>
<tr>
<td></td>
<td>The company’s increased focus on Sustainable Business and Innovation (SB&amp;I) will be more seamlessly integrated across Nike's business strategies.</td>
</tr>
<tr>
<td></td>
<td>Nike utilizes innovation to produce top quality athletic footwear and apparel.</td>
</tr>
</tbody>
</table>

Table 9. Examples of cohesive elements on the level of purpose

A complete picture of the vision, mission and core values of an enterprise is shown in table 9. This example concerns a part of the cohesive elements of the ALIBABA Group, Hangzhou, China, provided during a visit to the company in the context of the IEEE 14th International Conference on Commerce and Enterprise Computing (CEC 2012), Hangzhou, China Sept. 2012. See also: http://news.alibaba.com/specials/aboutalibaba/aligroup/culture_values.html
<table>
<thead>
<tr>
<th>Cohesive elements</th>
<th>Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission</td>
<td>To make it easy to do business anywhere</td>
</tr>
</tbody>
</table>
| Vision           | • To become the first platform of choice for sharing data  
                    • To be an enterprise that has the happiest employees  
                    • To last at least 102 years |

Because of the nature of our businesses, Alibaba Group subsidiaries are repositories of massive amounts of market information and statistical data. As part of our commitment to SMEs, we are working to be the first company to make this market data available free to all of our users, enabling them to adjust their strategies to suit fast-changing market conditions and to expand the reach of their businesses. In addition, we strive to be the company with the highest employee satisfaction and to build a company that flourishes for at least 102 years, spanning three centuries (Alibaba was founded in 1999).

<table>
<thead>
<tr>
<th>Our Values:</th>
<th>We work every day to uphold the following tenets: ‘customer first, employee second and shareholder third.’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Our six core values that guide our operations and are fundamental to our corporate culture and an integral component of Alibaba Group’s DNA are:</td>
</tr>
</tbody>
</table>

**Customer First:** The interests of our community of users and paying members must be our first priority.
- Respect others and maintain the image of ALIBABA at any place and any time.
- Smile, even in the face of complaints or misunderstandings and positively and proactively help customers.
- When communicating with customers, do not ‘pass the buck’ to others – help the customer even if it is outside of our responsibilities.
- See things from the customer’s perspective, while adhering to the principles that satisfy both the company as well as the client.
- Anticipate customer needs well in advance. Prepare for and resolve an issue before it becomes a problem.

**Teamwork and Cooperation:** We expect our employees to collaborate as a team in pursuit of our shared mission. We believe teamwork enables ordinary people to achieve ex-
traordinary things.
- Actively work to become a part of the team, be willing to accept help from colleagues and cooperate with others to complete tasks.
- Before decisions are made, actively speak up with constructive opinions and fully join discussions; after decisions are made, regardless of any reservations in mind, consistently show support in words and with actions.
- Proactively share knowledge and experiences; actively offer colleagues help when necessary; utilize the synergy of the team to solve all the problems and overcome difficulties.
- Work well with different kinds of colleagues regardless of personal preferences, and embody the principle of ‘focus on the issue, not the person’.
- Maintain a sense of ownership, positively influence colleagues, as well as improve the spirit and atmosphere of the team.

**Embrace Change:** We operate in a fast-evolving industry. We ask our employees to maintain flexibility, continue to innovate and adapt to new business conditions and practice.
- Adapt to daily changes without complaints.
- Face changes with a rational mindset, fully communicate and sincerely cooperate with others.
- Accept and internalize change when facing difficulties and frustrations, positively influence and guide colleagues.
- Take a long term view to innovate with new ideas and pioneer new trails.
- Create changes which result in performance breakthroughs for the company.

**Integrity:** Integrity is at the heart of our business. We expect our employees to uphold the highest standards of integrity and to deliver on their commitments.
- Be honest and upright, with consistency in values and behaviour.
- Accurately express one’s opinion through the right channels following the right procedures. Propose alternatives and solutions when providing feedback or constructive criticism. Be straightforward in expressing your ideas, while considering of the feelings of others.
- Never circulate unverified information or speculation. Never discuss other people or personal issues irresponsibly behind people’s backs. Take comments and feedback from others in a positive manner – sometimes personal development requires hearing both good and bad news.
- Admit mistakes and take responsibility in a courageous manner – always strive for improvement.
- Protect the company from dishonest actions – do the right thing to protect the interests of the company.

**Passion:** Our employees are encouraged to maintain a positive attitude towards their work and never give up doing what they believe is right.
- Embrace one’s own job, recognize and accept the culture of ALIBABA.
- Love ALIBABA, when working, put the interests of team and company above one’s self-interest.
- Treat one’s daily job with an active and positive mind, never give up when facing difficulties and frustration, always be self-motivated and strive to improve one’s performance.
- Always influence and bring along colleagues and team with optimism and a ‘can do’ attitude.
- Constantly set higher targets – today’s best achievements represent tomorrow’s minimum requirements.

**Commitment:** We expect our employees to demonstrate professionalism and continuously strive for excellence.
- Never put off today’s work until tomorrow. Only do work-related matters during office hours.
- Follow necessary working procedures, avoid repeated mistakes.
- Keep on learning as well as self-improving be results-oriented.
- Arrange work according to priorities and do the right things.
- Follow working procedures but avoid being paralyzed by focusing only on procedure, turning the complex into simple, obtaining the best output with the least input.

Table 10. Cohesive elements at the level of purpose from ALIBABA Group
As mentioned before, the ECF distinguishes three areas of coherence: coherence at the level of organizational purpose, coherence at the design level of the enterprise and coherence between these levels, a summary of the ECF is provided in Figure 17. The triangle in Figure 17 represents the level of purpose and the circle the level of design within an enterprise. In the next sections we discuss these terms extensively. In general terms, the enterprise coherence framework consists of a set of cohesive elements and the cohesive relationships between them. The overall level of coherence within an actual enterprise is really determined by the explicitness of the cohesive elements, and the quality/consistency of the cohesive relationships, in an enterprise. This also allows enterprises to govern their coherence, in particular by guarding the cohesive relationships. While this may sound abstract, the discussion of the cohesive elements and their relationships as provided in the remainder of this section, and the next sections, will make this more tangible.

**Figure 17. Summary of the ECF**

### 6.2 Enterprise coherence at the level of purpose

At the level of organizational purpose, we essentially adapted the ‘Strategic Development Process Model’ proposed by Kaplan & Norton [44], the ‘Strategy Formulation’ approach of Themmozhi [97] and the notion of endless pursuit of a company’s mission taken from ‘Building Your Company’s Vision’ by Collins & Porras [18]. Based on these theories we distinguished five key cohesive elements: *mission, vision, core values, goals and strategy*:
**Mission:** the mission is a brief, typically one sentence, statement that defines the fundamental purpose of the enterprise [44] that is *‘enduringly pursued but never fulfilled’* [18]. It should include what the enterprise provides to its clients and inform executives and employees about the overall goal they have come together to pursue [44].

**Vision:** the vision is a concise statement that operationalizes the mission in terms of the mid to long-term goals of the enterprise. The vision should be external and market oriented and should express, preferably in aspirational terms, how the enterprise wants to be perceived by the world [44]. Senge [81] indicates that in a vision there must be a creative tension between the present and an enticing image of the future, a vision has to show enough ambition, which can be translated into goals and strategies.

**Core values:** the core values of an enterprise prescribe its desired behaviour, character and culture [44] and is conditional to be or become successful within the formulated vision. We consider core values to be guiding statements at the highest level of sense giving in an enterprise. The core values together with the mission are therefore regarded as the most invariant statements made about an enterprise.

**Goals:** a goal is a formulation of a desired stage of development of an enterprise towards achieving the vision. In other words a vision will be operationalized in terms of concrete goals. These goals act as success factors in judging the feasibility of strategies. The goals, as success factors, are used to define the desired outcome(s), short term goals, from a successful strategy execution [44].

**Strategy:** the strategy of an enterprise forms a comprehensive master plan stating how the enterprise will achieve its goals. It should also maximize the competitive advantages and minimize competitive disadvantages faced by an enterprise [97].

These cohesive elements are represented in Figure 18 in an organizational purpose triangle.

![Figure 18. The organizational purpose triangle](image-url)
Coherence within an enterprise at the level of purpose can be derived, and made explicit, by the enterprise’s definitions of the cohesive elements and by establishing/assessing the consistency and quality of the relationships between the elements:

- the strategies should arguably lead to the achievement of the set goals, while not violating the core values
- the goals should be in line with the vision of the enterprise, and ultimately its mission, while being consistent with its core values
- the core values should at least be consistent with the enterprise’s mission

To establish/assess the consistency and quality of these cohesive relationships, it is very important that an enterprise’s definitions of the elements are available, and are explicit enough. The definitions of the cohesive elements constitute the fundamental drivers that shape the enterprise coherence at the design level of the enterprise. In practice, the elements at the organizational purpose level are often documented in rather broad and informal terms and this increases the risk of a low level of enterprise coherence at the design level.

The presence of a well-documented enterprise mission, vision, core values, goals and strategy are preconditions to determine the content of the cohesive elements at the design level of an enterprise and they are the essential resources for this determination. With the application of GEA in practice signals will be given if or when inconsistencies are discovered in the relationships between the cohesive elements, and not valuation statements about the elements.

### 6.3 Enterprise coherence at the design level

At the design level, the enterprise’s strategy is translated into the blue-prints of the operational enterprise, involving among other things its business processes, financial flows, logistic flows, human resources, information systems, housing, machines and IT. To achieve enterprise coherence, the coherence at the design level also needs to be governed. Decision makers need indicators and controls to govern the coherence at this level.

#### 6.3.1 Perspectives

A distinction between coherence at the level of organizational purpose, and coherence at the level of design, is consistent with the *structure follows strategy* principle of Chandler [16]. This leads to the question: *How do we make the enterprise coherence explicit on the design level of the enterprise?* Since one person is likely to be unable to have an indepth overview of an entire large enterprise, let alone to control it, it is necessary to distinguish multiple angles of governance. Our research programme introduces the cohesive element of *perspective* for the several angles of
governance. In the research programme for this thesis a perspective was defined as: *an angle from which one wishes to contemplate and to govern the enterprise* [115]. In line with the ‘structure follows strategy’ theory from Chandler [16], the set of perspectives used in a specific enterprise depends very much on its formal and informal power structures; both internally, and externally. Typical examples are culture, customer, products/services, business processes, information provision, finance, value chain, and corporate governance. In the view of our research it is really these perspectives that need to be aligned, to achieve enterprise coherence.

As an example, the perspectives selected by the Dutch Ministry of Social Affairs and Employment (SAE) are shown in Table 11. The chosen set of perspectives shows that when it comes to alignment, stakeholders do not think in terms of Business/IT alignment, but in a much refined web of aspects that need alignment.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information provision</td>
<td>All processes, activities, people and resources for obtaining, processing and delivery of relevant information for SAE.</td>
</tr>
<tr>
<td>Collaboration</td>
<td>In view of general interest to contribute to a common result on a team level, entity level or organization level.</td>
</tr>
<tr>
<td>Processes</td>
<td>A coherent set of activities needed to deliver results of SAE.</td>
</tr>
<tr>
<td>Governance</td>
<td>The influencing of the SAE organization so that a desired goal is attained.</td>
</tr>
<tr>
<td>Employees</td>
<td>All persons who execute tasks or activities within the SAE-organization.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Legal entities or persons for whom the activities of SAE are important.</td>
</tr>
<tr>
<td>Culture</td>
<td>Explicit and implicit norms, values and behaviours within the organization SAE.</td>
</tr>
<tr>
<td>Services</td>
<td>All services that SAE within legal frameworks, or through agreed appointments with statutory authorities, establishes and delivers to customers.</td>
</tr>
<tr>
<td>Finance</td>
<td>The planning, acquisition, management and accountability of funds SAE.</td>
</tr>
<tr>
<td>Customer</td>
<td>The customer of a service of SAE</td>
</tr>
<tr>
<td>Law &amp; regulations</td>
<td>All legal frameworks that form the basis for the task performance of SAE.</td>
</tr>
<tr>
<td>Communication</td>
<td>An active process in which information is exchanged between two or more parties or persons, regardless of how that is achieved.</td>
</tr>
</tbody>
</table>

Table 11. Example definitions of perspectives

In principle, our concept of perspective can be seen as the notion of viewpoint as defined in architecture standards such as TOGAF [92] and the IEEE Architecture definition [93]. These concepts are, however, not the same. A perspective is an angle from which one wants to govern enterprise transformation. Given the underlying concern of this desire to govern, a viewpoint can be defined that captures the way one wants to view/contemplate the enterprise from this concern. As such, one might say that our notion of perspective could be defined as a governance viewpoint.

Note again, that we takes the stance that the set of perspectives used by a specific enterprise on its coherence dashboard is highly enterprise specific. This set is therefore expected not to correspond to the cells of well-known design/engineering
frameworks such as Zachman [87], TOGAF’s content framework [92] or the Integrated Architecture Framework [101].

6.3.2 Core concepts

The practices of the enterprises participating in the our research programme have shown that in general nine to twelve perspectives are identified. The reason for this range of perspectives is rooted in the general administrative span of control. Regarding this span of control, psychologists and behavioural researchers have found that most people try to bring down large amounts of data to between 5 and 9 categories [56]. We recommend further study on the difference between our experiences with 9 to 12 perspectives and trying to bring down large amounts of data to between 5 and 9 categories as done by most people. In practice, however, we encountered several situations in which senior management initially wanted to govern the enterprise from far more than twelve angles. In these cases we discovered clusters of perspectives with a high correlation, allowing us to compose these perspectives into broader ones. This also led to the realization that another cohesive element was needed: core concepts. A core concept is defined as: an angle from which one wishes to contemplate and to govern a perspective. In the cases where we were initially confronted with many more than nine perspectives, most of these actually turned out to be core concepts within a more broadly defined perspective. Examples of core concepts within the perspective of finance are: financing and budgeting. We have listed some of the core concepts that are relevant to one of the Dutch ministries participating in the our research programme in Table 12.

<table>
<thead>
<tr>
<th>Information provision</th>
<th>Processes</th>
<th>Governance</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitization</td>
<td>Time and place independent</td>
<td>Policy cores</td>
<td>Labour market</td>
</tr>
<tr>
<td>Integrity</td>
<td>Selection policy</td>
<td>Programs</td>
<td>Municipalities</td>
</tr>
<tr>
<td>Security</td>
<td>Efficiency</td>
<td>Scaling up</td>
<td>Labour force</td>
</tr>
<tr>
<td>Standardization</td>
<td>Actor</td>
<td>Collectivity</td>
<td>Employers</td>
</tr>
<tr>
<td>Facilities</td>
<td>Effectiveness</td>
<td>Mission/vision assessment</td>
<td>Unions</td>
</tr>
<tr>
<td>Information</td>
<td>Predictability</td>
<td>Employer ship</td>
<td>Employee Unions</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Planned</td>
<td>Themes and tasks</td>
<td>Other Ministries</td>
</tr>
<tr>
<td>Systems</td>
<td>Procedures</td>
<td>Functioning</td>
<td>Funds</td>
</tr>
<tr>
<td>Ownership</td>
<td>Organization</td>
<td>Independent adm. bodies</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td>Society</td>
<td></td>
</tr>
<tr>
<td>Architecture</td>
<td></td>
<td>Social and Economic Council</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research agencies</td>
<td></td>
</tr>
</tbody>
</table>

Table 12. Example core concepts

6.3.3 Guiding statements

In order to govern the perspectives, and subsequent core concepts of an enterprise, a directional framework is needed that consists of guiding statements which form an additional class of cohesive elements. We define a guiding statement as: an
internally agreed and published statement, which directs desirable behaviour. Such statements only have to express a desire and/or give direction. Guiding statements may therefore cover policy statements, (normative) principles [34] and objectives. To make the perspectives, including their core concepts, governable, the guiding statements must be assigned to the perspectives and core concepts to which they pertain. Some examples of guiding statements are shown in Table 13.

<table>
<thead>
<tr>
<th>Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A dual situation in which paper and digital systems or more systems are used in parallel, should where possible be avoided.</td>
</tr>
<tr>
<td>SAE is based on the tenet that the entire work of staff and processflow of documents goes digital</td>
</tr>
<tr>
<td>Existing paper-based processes of SAE are as much as possible adjusted to the features of the automated document management system</td>
</tr>
<tr>
<td>Integral approach: It is important to think about sustainability already at the &quot;front&quot; of the information chain</td>
</tr>
<tr>
<td>Selection policy must play a fully involved role at the beginning of the &quot;information creation&quot;</td>
</tr>
<tr>
<td>The coming years it is expected that firm pressure will be on the business operations and IT to operate cost-efficiently</td>
</tr>
<tr>
<td>We aim to ensure the government can operate decisively, transparently and fast.</td>
</tr>
<tr>
<td>We involve at the front of the process the external actors in the issues and developments we are working on.</td>
</tr>
<tr>
<td>We must have more attention to the process.</td>
</tr>
<tr>
<td>We want better performing processes, more efficient and effective</td>
</tr>
<tr>
<td>We want more predictability in the process</td>
</tr>
<tr>
<td>It must be clear how processes run through the organization and who has which responsibilities.</td>
</tr>
</tbody>
</table>

Table 13. Guiding statements relevant to the processes perspective

6.3.4 Core models

In order to communicate the directions provided by the guiding statements better to the representatives of the perspectives and other stakeholders, it is common to use models to provide more specific instructions. These models provide instructions that represent more specific choices/directions that are consistent with the guiding statements. In other words, these models are in line with the guiding statements formulated for that particular perspective. These models are also cohesive elements, which we refer to as core models. We define a core model as: a view of a perspective, based on, and in line with, the guiding statements of the corresponding perspective.

The well-known design/engineering frameworks, such as Zachman [87], TOGAF’s content framework [92] or the Integrated Architecture Framework [101], have an important role to play in the development of the core models within the different perspectives. Based on their respective underlying design philosophies, these more design/engineering oriented frameworks provide a way (1) to ensure completeness and consistency from an engineering point of view, (2) to enforce/invite a specific line of reasoning on the design/ construction of the enterprise and (3) to classify/structure the different core models.

The different core models are also where modelling languages such as ArchiMate [42], e3Value [32], BPMN [15], or UML [94] can be used to classify/structure these models. Furthermore, frameworks such as Zachman [87], or TOGAF’s con-
tent framework [92], can be used to structure further the core models within the perspectives.

6.3.5 Relevant relationships

The real world case studies conducted within the research programme for this thesis, and discussed in chapters 10-12, showed that guiding statements can be allocated predominantly to one perspective, although they often also address other perspectives. This means that it is possible that a single guiding statement relates to several perspectives and in this way establishes one or more relationships between these perspectives. To clearly connect the perspectives, while firmly founding the relationships within the involved perspectives, the guiding statements are (re)formulated in terms of the concerns/scope of each of the involved perspectives. Similarly, such relationships may also exist between the core concepts and core models of the different perspectives.

These relationships are an important feature in ensuring the coherence between the different perspectives. Therefore, we introduced an additional cohesive element: relevant relationship, which we defined as a description of the connection between guiding statements from different perspectives. The relevant relationships should describe, in particular, the causal relationship between the guiding statements involved.

The coherence of an enterprise at this level is made explicit by formulating the cohesive elements on the design level. This is illustrated, and summarized, in Figure 17, in which nine example perspectives are represented. As argued before, the actual set of perspectives depends on the enterprise. Note, diagrams such as that represented in Figure 17 are used to put the roles of the different cohesive elements in perspective. The diagram is by no means intended for stakeholder communication.

We now have a coherent system of cohesive elements that shape an enterprise at the levels of purpose and design. Later in this thesis we will demonstrate how we utilised this coherent system as a steering mechanism and used it to help us formulate answers to major business issues. We will also discuss how this way of working strengthens enterprise coherence. A visualization of how occurrences of the cohesive elements at the design level of an enterprise are derived from the level of purpose is given in Figure 19, in which a metaphor is used to show the transition from an unstructured set of control information at the level of purpose into a structured coherent set of content, differentiated into cohesive elements at the design level.
6.3.6 Experiences

The presence of a well-documented enterprise mission, vision, core values, goals and strategy are preconditions for determining the content of the cohesive elements at the design level of an enterprise and they are the essential resources for this determination. Case studies carried out within our research programme, as discussed in chapters 10-12, showed that we need to make the relationships between different perspectives of an enterprise explicit in such a way that it becomes possible to develop integral solutions for important business issues. New and adjusted guiding statements within a perspective will affect other perspectives within an enterprise through the relevant relationships. The insight into the enterprise coherence gained from an understanding of the relevant relationships contributes to the governance of an enterprise, since the impact of a change in one perspective can be translated into possible effects in other perspectives.

As an example, consider the situation depicted in Figure 20. In this example, acquisition, as part of the growth strategy, is a new and important perspective. The main guiding statement in this perspective is: We acquire only enterprises with cutting edge knowledge appropriate to the spearheads of our services. This statement has implications for other perspectives, primarily for the perspective knowl-
edge. In this perspective, due to the new relevant relationship acquisition/knowledge, the existing guiding statement: We innovate our knowledge concepts in line with our service priorities by knowledge CREATION is adjusted to the guiding statement: We innovate our knowledge concepts in line with our service priorities by knowledge INTEGRATION.

The relevant relationship responsible for this adjustment is formulated as: innovation by buying service concepts. The change of this guiding statement in the perspective knowledge, will subsequently invoke a causal series of first order and even second and higher order changes to guiding statements in other perspectives.

**Figure 20. Example of the working of a relevant relationship**

In a workshop, the core team of our research program assessed the extent to which the identification, in a specific enterprise, of the five cohesive elements of the design level, might already meet the requirements of the programme. It was established that these cohesive elements contribute to, and substantiate, requirements 1, 2, 8 and 13 of Table 5, requirements 1, 2, 3 and 4 of Table 6, requirements 1, 3 and 4 of Table 7 and requirements 1, 2 and 6 of Table 8.

### 6.4 Coherence between the levels

In addition to horizontal coherence on one level of contemplation, we also distinguished vertical coherence between two adjacent levels of coherence. With reference to the strategic fit, as proposed in Hendersson & Venkatraman’s [36], strategic alignment model, we correlated the cohesive elements defined on the purpose
level with the cohesive elements defined on the design level. This is illustrated in Figure 21.

<table>
<thead>
<tr>
<th>Intensity of coupling</th>
<th>Core factors on design level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong ++</td>
<td>Perspectives</td>
</tr>
<tr>
<td>Weak +</td>
<td>Core concepts</td>
</tr>
<tr>
<td></td>
<td>Principles</td>
</tr>
<tr>
<td></td>
<td>Objectives</td>
</tr>
<tr>
<td></td>
<td>Policy statements</td>
</tr>
<tr>
<td></td>
<td>Core models</td>
</tr>
<tr>
<td></td>
<td>Relevant relationships</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core factors on the level of meaning</th>
<th>Mission</th>
<th>Vision</th>
<th>Core values</th>
<th>Goals</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspectives</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Core concepts</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Principles</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Objectives</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Policy statements</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Core models</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Relevant relationships</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

Figure 21. Correlation between the cohesive elements on two interrelated levels of coherence

The fundamental, transcendent, nature of the mission of an enterprise gives a high level understanding of the core activities an enterprise wishes to excel in, and the desired behaviour to achieve this excellence. Therefore an enterprise’s mission harbours information on relevant perspectives and principles. The guiding statements of an enterprise should therefore also be motivated in terms of its mission. As soon as guiding statements are allocated to different perspectives, enterprise coherence is made explicit by coupling them using the relevant relationships.

In its vision, an enterprise elaborates on its envisioned position in the future. Vision statements indicate new candidate perspectives and/or new core concepts, they may also underpin and/or confirm the role of the already identified perspectives and core concepts. Furthermore the envisioned position of the enterprise in the future is translated into principles and policy statements. Core values diffuse to the design level by way of principles. These values may also indicate major and minor focus areas to govern, respectively referred to as the perspectives and core concepts. Objectives on the design level, defined as a more concrete formulation of an enterprise’s goal, are derived from the goals on the purpose level, goals may also indicate major or minor focus areas to govern. Finally the enterprise’s strategy, seen as the strategic execution path to achieve its goals, supplies the content to major focus
areas, the perspectives, minor focus areas, core concepts, and directional information, guiding statements.

In practice there will be many internal and external sources available from which to gather definitions of the cohesive elements on both the purpose and the design level. As part of the overall governance of enterprise coherence, it is important to guard continuously the consistency between these sources and the definitions of the cohesive elements obtained to date. Collectively, the formal definitions of the cohesive elements provide the steering instrument, which allows senior management to influence enterprise coherence. Different source/documents that deal with the strategy, design, and operations of the enterprise should be consistent to the definitions.

In the course of time, several factors may lead to disturbances in already achieved coherence. In such a case, an adjustment in the coherence must be made. An example of such adjustment to deal with a disturbance in the relationship between the level of purpose and the level of design, can be taken from Philips. During the initial stages of the market for mobile phones, Philips was one of manufacturers of such devices. After some time the dynamics of the selected product/market combination intensified in such a way, that this combination no longer fitted to the definition of Philips’ level of purpose. Philips’ overall strategy was to operate in slowly circulating markets, however, due to the intensifying dynamics of the mobile phone market, Philips would either have to make fundamental changes at its level of purpose, or make a change to its design level: Philips decided to do the latter and withdraw from the mobile phone market.

6.5 Coherence between several layers on design level by recursivity

An intrinsic property of an ECF is the possibility of recursive application, this is possible through the identification and definition of the cohesive elements perspectives and core concepts of an enterprise. So it is possible to govern enterprise coherence on different levels of the design level by recursively applying an ECF. As an example of the different levels in Figure 22 we have mapped the enterprise level, the level of information provision and the level of technical infrastructure. This is in principle possible for every perspective. Zooming in on the perspective information provision at enterprise level, occurs on the middle level in Figure 22 the ECF of information provision with the perspectives applications, standardization, et cetera. Then we zoom in on the perspective technical infrastructure of the information provision ECF which gives rise to the technical infrastructure ECF at the bottom level of Figure 22 with the perspectives networks, server platforms, et cetera. Each layer as indicated in Figure 22 has its own level of purpose, and by applying recursivity, it becomes possible to indicate the relationships between the 3 layers of this example. In this case everything of information provision expressed
at the level of purpose on enterprise level, will be inherited by the level of purpose at the level of information provision. See the triangles in Figure 22 representing these levels, at this level the level of purpose shall be enriched with visions, goals and strategies of the information provision level. The same reasoning is valid for the level of technical infrastructure. The cohesive elements are derived for these levels from these enriched levels of purpose. Besides these relationships at the respective levels of purpose, the relationships at the levels of design are indicated as follows. The perspectives at the level of technical infrastructure are, at the level of information provision, the core concepts of the perspective technical infrastructure and the perspectives at the level of information provision are, at the enterprise level, the core concepts of the perspective information provision. In this way, by recursively applying an ECF, the relationships between the strategic, tactical and operational level can be made visible and controlled both bottom up and top down. Issues that arise at the strategic, tactical or operational level can lead to changes in the coherence of those levels. Insight into the recursive relationships, as explained above, offer the possibility to align the coherence at and between the identified levels. For example, the guiding statements for the perspective employees on enterprise level are also valid for this perspective on the level of information provision and on the level of technical infrastructure. For instance, at the level of information provision for the perspective employees is the additional guiding statement applicable, 24 * 7 helpdesk support and associated fees. This guiding statement is also valid in its turn to the level of technical infrastructure. On the level of technical infrastructure additional guiding statements for the perspective employees are applicable such as obligations in the field of physical security zones.
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Figure 22. Coherence between several layers at design level by recursivity
6.6 Coherence between enterprise level and division levels by projection

In cases of enterprises with multiple divisions, which have a relatively low degree of autonomy and a relatively high similarity in operations, application of the ECF using projection makes sense. If these assumptions are not met, it is better for each unit of the enterprise to apply an ECF independently, because the inheritance of elements at group level in this case is not at issue.

So in the first case the relationships between corporate level and divisions we express using projection, see Figure 23, the divisions inherit all the guiding frameworks of the corporate level. Only those items that have no meaning at all for divisions, such as corporate guidance on the provision of stock information, are not applied at division level. Each division is in case of projection capable of adding specific elements of its own coherence at both the level of purpose and the design level, such as goals and perspectives. If at divisional level a new guiding statement arises with a generic character, this guiding statement will be recorded at concern level and is therefore valid for all divisions. In this way by applying the ECF through projection, the relationships between units of comparable level can be made visible and controlled.
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Figure 23. An example of coherence between concern level and division levels by projection
6.7 Coherence between several enterprises and alliances by projection

The relationships between several enterprises and their contractual alliances can also be expressed through projection. In Figure 24 we give as an example, the well-known Senseo alliance, an contractual alliance between Philips and Sara Lee/DE. This example is taken from De Man’s [22] work in the field of alliance governance. De Man distinguishes, with respect to the governance of contractual alliances, 13 building blocks, all positioned on a dichotomy formal / informal. If the character of the alliance requires a stronger control approach the elements expressed on the corresponding part of the dichotomy, such as legal form, financial details, scope and exclusivity, conflict solution procedures, authority structure/hierarchy, are more dominant in the governance of the alliance. If the character of the alliance requires a relatively high trust approach the elements expressed on that corresponding part of the dichotomy, such as norms/values, trust/commitment, culture, personal relationships, reputation, leadership and communication structure, are more dominant. De Man argues that both formal and informal elements should be addressed to get a governance system that works. In line with this theory, we take both the formal and informal elements within the ECF’s of Philips and Sara Lee/DE to obtain the 13 building blocks of alliance control as core concepts at the perspective alliance. All effects of the agreements, guiding statements, associated with these 13 building blocks of the perspective alliance, must be implemented in both Philips and Sara Lee/DE in terms of new or changed elements of coherence, perspectives, core concepts, guiding statements, core models and relevant relationships. This makes clear what actions the two enterprises in their own enterprises have to carry out to be ready for the actual execution of the proposed alliance. See the two bottom spheres in Figure 24, the Senseo alliance is represented in the uppermost sphere of Figure 24. All guiding frameworks concerning the above mentioned 13 building blocks inherit by the level of purpose of the alliance Senseo, and from this Senseo level of purpose, the Senseo level of design will be derived in terms of perspectives, et cetera. Besides the common perspectives customer, employees, et cetera all the frameworks of the 13 building blocks of alliance governance can be represented at the design level in all forms of cohesive elements, depending on their nature and importance. At this level, all agreements made in the form of cohesive elements by Philips and Sara Lee/DE come together. If within Senseo each guiding statement the relationship is defined with the original perspective / guiding statement of respectively Philips / Sara Lee/DE, due to a change in a guiding statement at Senseo level, the effects respectively within Philips / Sara Lee/DE are seen very quickly. We discuss this value with a brief example. Within the perspective finance at Philips as a result of agreements concerning the distribution of profit, the guiding statement was included: the Senseo alliance will pay monthly x% of the profits made on coffee pads to Philips. Within the perspective
finance at Sara Lee/DE in this case the guiding statement was included: the Senseo alliance will pay monthly to Sara Lee/DE \( y\% \) of the profits made on coffee pads. At the alliance Senseo within its perspective finance the guiding statement is included: profits made on coffee pads will be paid monthly in proportion to \( x\% \) and \( y\% \) respectively to Philips and Sara Lee/DE. When, after a while, it became clear that the patent for the Senseo coffee pads was no longer tenable, it was immediately clear for all the stakeholders, representatives of the Senseo perspectives, that this situation had financial consequences for Sara Lee/DE, and it would affect the financial position of Philips. This new situation might also lead to changing the ratio of profit distribution for the coffee pads. Thus by applying an ECF through projection, the relationships between several enterprises were made visible and controlled leading to higher quality in decision making.
6.8 Recursive application for the perspective information security

In this section we show how the recursive property of GEA can be applied using a case study taken from the field of information security.

Information security from a historical perspective

The desire for more rigorous answers to security issues arises partly from changes in legislation, partly from the availability of new technology and from the need to deal with an aggressive hacker community. Additionally we found that in case of performing risk analyses and determining mitigating security measures, there is often little attention paid to security at board level. Security is mostly seen as a technical matter, to be handled via the IT department. Experience shows that the implementation of security projects is often an afterthought, possibly in response to a security break, and must be realized after the sensitive information is available. The consequences are that inadequate security requirements are included in the design phases of applications, making these systems not optimally protected against threats, and this can lead to security incidents resulting in damage to reputation, loss of business data and associated high repair and failure costs.

A recently published report, prepared by the Cylab of Carnegie Mellon University [127], indicates that many top managers of companies do not see any link between ICT risks and business risks to their enterprises. They do not appear to have an overview of the role of computer systems and information with regard to all types of business risks. Although this is an American study, we assume that this situation also occurs closer to home, where managers have insufficient awareness of the dangers to which their enterprise are exposed as a result of inadequate information. Apparently information security does not get the priority it deserves.

In this section we give an example of how this priority can be controlled. We show how a strategy change at enterprise level acted at the information security domain through the field of information provision.

Despite a lack of perception at senior management in terms of necessity and urgency regarding security measures, in particular e-security measures, the discipline is growing. There are various frameworks that can be used in the field of security as for instance Zachman [131], SABSA [95], Cobit [17] and the security section of NORA 2.0. [66]. All these frameworks have in common that they provide a structure for the security infrastructures from an organizational, functional and technological perspective. What these operational structures do not provide is an overview of the relationship between the security and the strategic level of an enterprise, in this section we show how, using the GEA model, this relationship can be delineated within the structure of the model.

Figure 24. Coherence between several concerns and their alliances by projection
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Vision on information security
In our view, information security (IS) is a perspective of governance within the area of responsibility of the chief information officer (CIO) of an enterprise, whose guiding frameworks are directly derivable from the level of purpose of the enterprise. In this way 'automatically' the impact and solution space from IS will be included in solving strategic issues by this positioning of IS. As a result, directly the (im) possibilities of IS and its impact on all other angles of governance are discounted in the first development stage of a possible solution. Application of the governance instrument GEA will thus make a significant contribution to solving security issues within an enterprise.

Coherence between multiple levels by recursively application of GEA
In Figure 25 we show, as an example of different levels within an enterprise, the enterprise level, the level of information provision (IP) and the level of information security (IS). A recursive application of GEA is, by definition, possible for each perspective.

To show how the recursively functioning for the IS-domain can be applied we can zoom in on the IP perspective at the enterprise level. This perspective causes, in Figure 25, the GEA-circle at the level of information provision, middle circle, with the examples, perspectives governance, processes, technical infrastructure, data, information security, standardization, applications, finance, employees and laws and regulations.

If we then zoom in on the IS perspective of the level information provision, in Figure 25, the GEA circle information security arises, bottom circle, with perspectives governance, availability and continuity, media management, identification, authentication and authorization, logging, alerting and monitoring, application and software security, hardware and network security, physical security, integrity and reliability and employees.
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If we then zoom in on the IS perspective of the level information provision, in Figure 25, the GEA circle information security arises, bottom circle, with perspectives governance, availability and continuity, media management, identification, authentication and authorization, logging and monitoring, application and software security, hardware and network security, physical security, integrity and reliability, and employees.

Figure 25. Coherence between information security level / enterprise by recursivity
Specific security issues are resolved at the information security level, bottom circle, of an enterprise as an enlargement of the IS perspective at the level of information provision, middle circle, which in turn is an enlargement of the IP perspective at the enterprise level.

The integral solution of an IS issue at the information security level can lead to a disruption of the coherence at the next higher level because, for example, changes in the guiding statements from the perspective IS affect other perspectives at the level of information provision. This leads to an IP issue for which the integral solution can work through at the enterprise level. The recursively reasoning can also be applied upstream, showing that security issues can cause strategic effects in this way.

The IS of an enterprise is naturally embedded in the decision-making processes by simultaneously applying ‘enterprise coherence governance’ at three interconnected levels of governance as discussed in chapter 7 section 2.2, and thus it gets the attention it deserves and requires.

Finally, the security aspects of an enterprise may be distributed over different perspectives, such as security as a core concept of the perspective technical infrastructure (TI) at the level of information provision. The level IS, bottom circle in Figure 25, then provides the guiding framework for this core concept.

**Example of GEA elements in the IS-domain of the Dutch government**

Facing the problem of many different confusing standard frameworks, that were hindering the introduction of controlled security and the implementation and management of standards for security, the Dutch government has made a strong effort in recent years to establish common standards for all its information security frameworks, leading to the definition of an integral vision in the field of information security. This government-wide framework has replaced the existing departmental frameworks, and the integral vision is expressed in a new baseline national security (BNS) [9] document. At the time of writing, March 2013, the BNS [9] was being used in an approval process for establishing it as an integral government baseline document. Working as a consultant on this project we have had, and continue to have, extensive experience in various departments within the Dutch government; because of this we felt that the BNS was a starting point in the field of information security and designed it to be governable using GEA. In public areas, the BNS is considered to be the guideline for setting up departmental security measures within the Netherlands.

In the sense of purpose at the level of information security, see the triangle of the bottom circle in Figure 25, the goal of the BNS is to contribute the debate on the IT security of governmental authorities.

Some examples of the guiding statements taken from the BNS are given below:

- Risk management is the starting point for information security
Specific security issues are resolved at the information security level, bottom circle, of an enterprise as an enlargement of the IS perspective at the level of information provision, middle circle, which in turn is an enlargement of the IP perspective at the enterprise level.

The integral solution of an IS issue at the information security level can lead to a disruption of the coherence at the next higher level because, for example, changes in the guiding statements from the perspective IS affect other perspectives at the level of information provision. This leads to an IP issue for which the integral solution can work through at the enterprise level. The recursively reasoning can also be applied upstream, showing that security issues can cause strategic effects in this way.

The IS of an enterprise is naturally embedded in the decision-making processes by simultaneously applying "enterprise coherence governance" at three interconnected levels of governance as discussed in chapter 7 section 2.2, and thus it gets the attention it deserves and requires.

Finally, the security aspects of an enterprise may be distributed over different perspectives, such as security as a core concept of the perspective technical infrastructure (TI) at the level of information provision. The level IS, bottom circle in Figure 25, then provides the guiding framework for this core concept.

Example of GEA elements in the IS-domain of the Dutch government

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In the sense of purpose at the level of information security, see the triangle of the bottom circle in Figure 25, the goal of the BNS is to contribute the debate on the IT security of governmental authorities.

Some examples of the guiding statements taken from the BNS are given below.

- Risk management is the starting point for information security
- The methods for classification of information and the effectiveness of security measures should be assessed regularly
- Employees must demonstrate responsible and conscious behaviour with respect to working with government information

The BNS is based on a number of laws, norms and standards, see Figure 26, such as the VIR (Voorschrift Informatiebeveiliging Rijksdienst), the Dutch national requirements on governmental information security, a baseline of information security for the entire civil service. Each Dutch government ministry also possesses its own information security baseline. However, with the increasing flow of information between the different ministries there is a need for a more comprehensive, government-wide baseline, the BNS.

Once finalized and accepted as a legal document the security codes of the BNS will replace all departmental and interdepartmental baselines in the field of information security within the Dutch government. One of the main aims of using the BNS will be to obtain secure contact between the different Dutch ministries and departmental networks and promote the sharing of information. In this context the BNS can be used to select the desired level of reliability of information provision for specific cases.

![Figure 26. Basis for BNS](image)

Regarding the development of the perspectives and core concepts at the design level of the level of information security, bottom circle of Figure 25, the grouping...
of the BNS is kept. This grouping fits well with the angles from which, in practice, information security is governed. For further details on this and the core concepts we refer the reader to the BNS grouping [9]. These perspectives and their definitions are formulated in Table 14.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrity and reliability</td>
<td>Integrity and reliability covers the information being processed which must be true and correctly entered, when it is part of an operational process, that is not accidently manipulated or altered as a part of the communication and storage process.</td>
</tr>
<tr>
<td>Identification, authentication and authorization</td>
<td>Identification, authentication and authorization concerns the determining of the correct identity of the user and testing this against the rights and responsibilities set out for that user to access the information for which they have been granted authorization to access.</td>
</tr>
<tr>
<td>Physical security</td>
<td>Physical security concerns preventing unauthorized physical access to buildings, etc., damage or disturbance to a site and to the information held by an enterprise. Employees, hired staff and external users must be made aware of their responsibilities, understand these and be suitable and well equipped to carry out the roles to which they have been assigned.</td>
</tr>
<tr>
<td>Hardware and network security</td>
<td>Hardware and network security covers securing the systems and infrastructure used to process and transmit information.</td>
</tr>
<tr>
<td>Application and software security</td>
<td>Application and software security covers securing applications and operating software platforms that are used in the processing of information.</td>
</tr>
<tr>
<td>Logging, alerting and monitoring</td>
<td>Logging, alerting and monitoring concerns the recording of all activities done on all applications, software, hardware and network components to detect incidents timely, i.e. to monitor, and to take timely action, i.e. to alert the appropriate authority to a security breach. If the detection of a security breach takes place at a late stage in a process, the events which preceded the breach can be identified using log-</td>
</tr>
<tr>
<td>Perspective</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Media management</td>
<td>Media management concerns achieving and maintaining adequate protection of the assets of an enterprise. The assets should have an owner and be classified and inventoried, in compliance with specific rules for documentation, processing, and storage.</td>
</tr>
<tr>
<td>Availability and continuity</td>
<td>Availability and continuity covers the prevention of business interruptions, that is, the protection of critical business processes from the effects of major failures of information systems or due to external disasters such as floods and power outages and to ensuring a timely recovery from such disasters.</td>
</tr>
<tr>
<td>Employees</td>
<td>Employees covers the specialized staff tasked to carry out activities in the field of information security.</td>
</tr>
<tr>
<td>Governance</td>
<td>Covers governance of the IS domain. The BNS contains a chapter on controllability with a reference to the VIR. An internal investigation is conducted and a control statement is used to indicate to what extent compliance with the set security level has been achieved. This statement will be given in the report on operations.</td>
</tr>
</tbody>
</table>

Table 14. BNS information security perspective and definitions.

Coherence within the IS domain and with the tactical and strategic level through recursive applying of GEA

Having explained the IS domain of an enterprise in the previous sections, we will now discuss how the coherence between the perspectives on the IS domain and the coherence with the other levels of purpose and design of an enterprise works in practice through recursivity. We do this based on a practical example.

An enterprise decides to a new goal, at enterprise purpose level, that from 2014 it will embrace a new way of working and allow its employees to use their private equipment to work pertaining to that enterprise, to use its business information on their own hardware, see Figure 27. This is also called the bring-your-own-device (BYOD) concept. This goal will lead at the design level of the enterprise level, for a number of perspectives, to the need for a number of new guiding statements (GS), see upper circle of Figure 27. Taking the perspective information provision as an example we get the new GS: all primary business systems must facili-
tate the work of employees independent of place and time (No. 2a), and in the perspective employees the new GS: employees who wish to use the BYOD concept must comply to additional information security rules (No. 2b). This also has implications at the level of purpose and for the design level at the level of information provision. At this level, this leads to the next goal: by 01.01.2014 it is our goal that our information provision will be equipped to support the BYOD concept (No. 3). This goal results in several new GS for a number of perspectives. For instance, the GS in the perspective information security: the latest BNS security policies must always be applied on all business systems and IT equipment (No. 4). The aforementioned changes in goals leads at the level of information security to the formulation of the goal: we will secure 24x7 all the corporate information stored on our servers, PCs and BYOD equipment, against external threats by 01.01.2014 (No. 5). This results in changes at the design level at the level of information security in a number of GS for several perspectives. For instance, the GS in the perspective identification, authentication and authorization: access to business information from private devices is only permitted using strong authentication (No. 6a), and in the perspective hardware and network security: access to wireless networks must be equipped with a safe standard for encryption (No. 6b).
96. The work of employees independent of place and time (No. 2a), and in the perspective employees the new GS: employees who wish to use the BYOD concept must comply with additional information security rules (No. 2b). This also has implications at the level of purpose and the design level at the level of information provision. At this level, this leads to the next goal: by 01.01.2014 it is our goal that our information provision will be equipped to support the BYOD concept (No. 3).

This goal results in several new GS for a number of perspectives. For instance, the GS in the perspective information security: the latest BNS security policies must always be applied on all business systems and IT equipment (No. 4).

The aforementioned changes in goals lead at the level of information security to the formulation of the goal: we will secure 24x7 all the corporate information stored on our servers, PCs, and BYOD equipment, against external threats by 01.01.2014 (No. 5).

This results in changes at the design level at the level of information security in a number of GS for several perspectives. For instance, the GS in the perspective identification, authentication and authorization: access to business information from private devices is only permitted using strong authentication (No. 6a), and in the perspective hardware and network security: access to wireless networks must be equipped with a safe standard for encryption (No. 6b).

Figure 27. Coherence within the IS-domain and with the tactical and strategic level
This example given above is a fragment of a GEA analysis and shows how an intention at a strategic level finally will move through the governance level of information provision to manifest in changes at the information security level. Note: here we showed for illustrative purposes, only a single, downward causal pattern of changing framework propositions. In reality, downward and upward patterns will run side by side so that the three levels of governance can be stabilized, stability is a prerequisite of efficient operation conditions.

Conclusion and recommendations
In this section, we discussed the value of the governance instrument GEA reflected at the overall enterprise level, and its value at and between hierarchically lower levels of governance. We gave some examples of how the domains technical infrastructure and information security can be integrally incorporated in the resolution power of an enterprise. This method makes a preventive governance approach possible to tackle issues in these areas and their adverse impacts at all levels of coherence and between these levels. Use of GEA creates the possibility to connect, for example, the technical infrastructure (TI) governance to other governance cycles within an enterprise with the result that the TI-aspects will directly influence the development of integrated solutions for issues that arise at the enterprise level. We also showed how important it is to make the coherence between enterprises transparent and thus make them more governable.

6.9 Conclusions

In this chapter we discussed the enterprise cohesion framework (ECF) that was developed iteratively during our multi-client research programme. Using the ECF allows enterprises to make their coherence explicit, thus enabling them to govern their coherence. We now have an instrument that enables a consistent way to govern coherence at the organizational level, between different levels of an enterprise and over organizational boundaries. So the ECF can be used as a reference tool to govern coherence between and within similar organizational units within the framework of one control paradigm. During the development of the framework, members of our research programme applied it in their enterprises. An elaborate discussion of these cases, can be found in [114, 117, 119, 120] and chapters 10-12.
At this stage in the development of GEA it was possible to make the coherence of a given enterprise explicit. This provided the answer to the research questions: What are the core factors that define enterprise coherence? and: How can enterprise coherence be expressed explicitly? In doing so, we also met the research objective: Define the core indicators and factors that define enterprise coherence.
7 Enterprise coherence-governance approach

7.1 Introduction

A survey was conducted to determine the extent to which the requirements for enterprise coherence governance, as discussed in chapter 5, were being contributed by developing the ECF. The results of this survey, held among the members of the core team of the programme, are shown in Table 15.

<table>
<thead>
<tr>
<th>EA requirement table</th>
<th>EA requirement nrs. contributed</th>
<th>EA requirement nrs. not contributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1, 2, 3, 5, 6, 7, 8, 9, 12, 13, 14</td>
<td>4, 10, 11, 15</td>
</tr>
<tr>
<td>6</td>
<td>1, 2, 3, 4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1, 2, 3, 4, 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1, 2, 3, 6, 7, 8</td>
<td>4, 5</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 15. EA requirements contributed to/not contributed to once the ECF was developed

The survey showed that solely making enterprise coherence explicit within an enterprise does not suffice to meet all the requirements. Our need to find a way for enterprises to meet all these requirements and the desire to make enterprise coherence governable, led to an initiative to develop the following set of GEA components, see Figure 28: EA vision, EA processes, EA products, EA people, EA means, EA governance and EA methodology.

Figure 28. Coherent set of GEA components
Making a distinction of these GEA components is based on and in line with the framework that provides a structural view of modelling methods as depicted in Figure 29.

Figure 29. A structured view of modelling methods

Our framework was based on the framework proposed for understanding methods used in information system development in Seligmann, et al [80]. We adopted this framework for determining the development of the GEA components due to the methodological character of GEA, as we felt that the framework, originally developed to describe, and compare, information system development methods and approaches, would suit our purposes as well. Seligmann et al’s [80] framework distinguishes the following aspects: a way of thinking, a way of modelling, a way of working, a way of supporting and a way of controlling. In Table 16 we show which method aspects of this framework correspond to the different GEA components.

<table>
<thead>
<tr>
<th>Way of:</th>
<th>Corresponds with GEA-components:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking</td>
<td>EA vision (holistic, recursivity, …)</td>
</tr>
<tr>
<td>Modelling</td>
<td>EA products</td>
</tr>
<tr>
<td>Working</td>
<td>EA processes and EA people</td>
</tr>
<tr>
<td>Supporting</td>
<td>EA means</td>
</tr>
<tr>
<td>Controlling</td>
<td>EA governance</td>
</tr>
</tbody>
</table>

Table 16. Relationship between ‘way of aspects’ and development GEA components
Our aim when developing these components in addition to the cohesive elements was to achieve the research objective: Develop instruments to guard/improve the level of coherence in enterprises during transformations, and answer the research question: How can enterprise coherence be governed? Furthermore, the EA requirements also resulted in the insights needed to develop the GEA components. More specifically, the EA requirements required to stimulate the development of which GEA components are shown in Table 17.

<table>
<thead>
<tr>
<th>Tables EA-requirements</th>
<th>GEA Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EA-vision</td>
</tr>
<tr>
<td>5</td>
<td>1, 2, 3, 5, 6, 8, 9, 12, 13, 15</td>
</tr>
<tr>
<td>6</td>
<td>1, 2, 4</td>
</tr>
<tr>
<td>7</td>
<td>1, 4, 5</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 17. Overview which EA requirements led to the development of which GEA components**

From Table 17, it can be seen by comparing it with Table 15, how a number of EA requirements, that were already addressed in the list of cohesive elements, still triggered the development of further GEA components. This might seem odd, but it can be explained by the fact that while the cohesive elements contributed to a large number of EA requirements, these requirements had not been fully met, and, as a requirement of GEA, the GEA components, which consist of seven distinguishable subsets, must fully meet these requirements.

There is also a strong coherence among the GEA components. The promises held by an EA vision, such as improving the coherence of an enterprise, should be achieved through the execution of EA processes. In their turn, the execution of EA processes results in EA products that will direct change programmes and via this enterprise coherence; EA people are needed to carry out EA processes and produce EA products. These EA people need, to execute the EA processes, to be allocated the means to do this in terms of time, budgets and tools. The EA people and the execution of EA processes need to be governed by EA governance. Finally there is need for an EA methodology that can be used to store a maintainable formal description of the formulation of the EA Vision, EA processes, EA products, EA people and EA governance within an enterprise. Note: how each of the GEA components meets specific GEA requirements is shown in appendix B. In the remainder of this chapter we give a brief explanation of the GEA components.
7.2 GEA components

7.2.1 EA vision, way of thinking

The concept of GEA, presented in this thesis, is a method that can be used for enterprise coherence governance. Depending on the stakeholders one can also speak of an enterprise architecture method or a governance method. An important part of the EA vision is the identification of GEA’s essence in terms of three key questions and answers:

*What is GEA?*
GEA is a method for enterprise coherence governance consisting of vision, processes, products, competences, means, governance and methodology that is used to guide the development of an enterprise with a focus on coherence

*What is the intended effect of using GEA?*
The implementation of GEA permanently increases the governance capacity of an enterprise

*How does using GEA give the desired results?*
The required guidance will be achieved by the application of GEA within an enterprise, it facilitates the control processes actively and helps to maintain an insight into the coherence of the organizational components and aspects, such as the relevant environment of the enterprise, on a continuous basis.

The EA vision of GEA consists of the following elements:
1. the triggers and the definition of enterprise coherence as described in section 2.2 and 2.3
2. the requirements discussed in chapter 5
3. the basic philosophy of GEA as described in section 5.5
4. the description of the cohesive elements of enterprise coherence described in chapter 6
5. the coherent set of 7 GEA components described in chapter 7 and as shown in Figure 28

Below we give a brief explanation of a number of the important aspects of the EA vision based on the EA requirements. The other EA vision aspects are:

- scope of GEA: the cohesive elements on both the level of purpose and the design level of the enterprise gives direction to the deeper levels of the perspectives of GEA, the levels of the core concepts. See EA-requirement 8 Table 5.
- relationship between GEA-processes/GEA-products and the organisational control processes: the execution processes of GEA that contribute to the
organized control processes and the GEA-products that are involved. See EA-requirement 7 and 12 of Table 5 and EA-requirement 4 of Table 7.

- organizational embedding of GEA: the way the EA function is organized. This can be a virtual EA function or a real allocation of an organizational unit. A special attention is needed for the role of the EA function in the light of the degree of independency. See EA requirement 5 and 8 of Table 5.

- recursivity of the GEA governance instrument: the possibilities of applying the GEA model at the strategic, tactical and operational levels of an enterprise and establishing the relationships between these levels. See EA-requirement 4 of Table 7.

- projection of the GEA governance instrument: the possibilities of applying the GEA model at a concern level and respective divisions, alliances, supply chains and networks of enterprises and their relationships. See EA-requirement 4 of Table 7.

7.2.2 EA processes, way of working

Based on Deming’s [26] well known work we distinguished the following types of processes within an enterprise: planning, execution, review and adjustment processes, see Figure 30 and Figure 35. The planning, review and adjustment processes, the lowest row in Figure 30, concern the governance of GEA and must be tailored to the existing control processes of the enterprise.

In the context of the execution of the GEA processes, we distinguished two types of processes: steering processes, steering the GEA activities, and performance processes, the actual GEA work. The steering processes are geared towards supporting the control processes of an enterprise, while the performance processes are aimed at developing and maintaining the GEA deliverables/products. The processes, see Figure 30, make enterprise coherence explicit and maintain enterprise architecture, are performance processes. The processes, develop integral solutions, develop program start architectures and check change programs by applying PgSA, are steering processes. To understand the working of the steering processes we now give a brief explanation of the process: develop integral solutions.

Once an enterprise has identified the aforementioned GEA cohesive elements, the enterprise is able to continue with the process, develop integral solutions, to solve actual business issues. In this process, based on the theory of Sol [86], a business issue will be fully analysed, with the aim of developing an approach and solution to the problem. Such an analysis of a business issue will be presented at a meeting with the representatives of the different perspectives. This enables each of the participants from the enterprise to appreciate the issue and reflect on the consequences and necessary change initiatives required to solve the problem. Then, in close col-
laboration with the representatives of the perspectives, it is determined which of the perspectives should be considered dominant and which should be considered sub-ordinate, with respect to the business issue at hand. The reason this distinction is needed is to raise awareness within the enterprise of which of the elements within in the enterprise offer the highest possible contribution towards a solution. After this step, four sub-analyses need to be carried out. In the first sub-analysis, the impact of the issue on the dominant perspectives is determined. The second sub-analysis is used to determine the impact of the issue on the sub-ordinate perspectives. In the third sub-analysis, the possibilities and impossibilities from the viewpoint of the dominant perspectives in relation to the issue are determined. Finally, the fourth sub-analysis is used to determine the possibilities and impossibilities from the viewpoint of the sub-ordinate perspectives in relation to the business issue at hand.

A synthesis between these four analyses leads to an integral solution for the business issue at hand, including an approach that can be used to implement the solution. This result should serve as a basis for further decisions by the board members of an enterprise, while serving as a directional framework for the development of a program start architecture (PgSA) [112], to support the actual change. The integral solution, and associated implementation approach, may also include several scenarios to allow for a final choice to be made by an enterprise’s board members. Note: Three practical, real world, cases of this process are discussed in chapters 10 to 12.

<table>
<thead>
<tr>
<th>Input</th>
<th>Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Make Enterprise Coherence explicit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Develop integral solutions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Develop Programme Start Architecture (PgSA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check change programme by applying PgSA</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Maintain Enterprise Architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Govern Enterprise Architecture Function</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 30. Main processes and products of GEA*
7.2.3 EA products, way of modelling

The EA products consist of two main product groups: EA governance products and EA operational products. The EA governance products govern the EA function and are used to plan, manage and evaluate the EA work. Examples of this type of products are a GEA development plan and a periodic GEA evaluation report. The EA operational products consist of two types: EA performance products and EA steering products, produced by the performance and steering processes respectively. Examples of EA performance products are: the content of perspectives, core concepts, guiding statements, relevant relationships, core models and aspect/domain architectures. These EA performance products form the basis for shaping the EA steering products such as impact analysis reports with recommendations for solutions and approach choices and program start architectures to govern change programmes. This latter category is concerned with products that support the enterprise coherence governance of the enterprise; i.e. the rationale of GEA.

A summary is given of the main processes and products of GEA in Figure 30 and their relationships including a classification by task areas are given in Figure 31. These classifications will be used in sub-section 7.2.4 and section 8 concerning EA people.

### Figure 31. Task areas, processes and products of the enterprise architecture function

<table>
<thead>
<tr>
<th>TASK AREAS</th>
<th>PROCESSES</th>
<th>PRODUCTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initialising &amp; mobilising</strong></td>
<td>Organise sessions</td>
<td>Enough sessions and a high attendance for realizing enterprise coherence framework</td>
</tr>
<tr>
<td></td>
<td>Determine cohesive elements</td>
<td>All cohesive elements with appropriate depth</td>
</tr>
<tr>
<td></td>
<td>Set up enterprise coherence framework</td>
<td>Coherent enterprise coherence framework, consistent, supported</td>
</tr>
<tr>
<td><strong>Advisory</strong></td>
<td>Analyse integral coherence</td>
<td>Relevant relationships between perspectives, core concepts, etc.</td>
</tr>
<tr>
<td></td>
<td>Develop integral solutions major business issues</td>
<td>Integral solutions including choices of approach</td>
</tr>
<tr>
<td></td>
<td>Conduct strategy fit analyses</td>
<td>Strategy impacts</td>
</tr>
<tr>
<td><strong>Frameworking</strong></td>
<td>Develop programme start architectures</td>
<td>Programme Start Architectures and affiliation with derived Project Start Architectures</td>
</tr>
<tr>
<td></td>
<td>Develop aspect and domain architectures</td>
<td>Relevant sub, domain and aspect architectures</td>
</tr>
<tr>
<td></td>
<td>Carry out programme- and project evaluation</td>
<td>Assessment Reports regarding Program Start Architectures</td>
</tr>
<tr>
<td></td>
<td>Provide permissions</td>
<td>Start Licenses Programme phases</td>
</tr>
<tr>
<td><strong>Maintaining</strong></td>
<td>Maintain enterprise coherence framework</td>
<td>Releases enterprise coherence framework</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td>EA plan</td>
<td>Enterprise Coherence Development plan, EC annual plan and EC detailed plans</td>
</tr>
<tr>
<td></td>
<td>EAcheck</td>
<td>Enterprise Coherence Progress reports, Enterprise Coherence Audit reports</td>
</tr>
</tbody>
</table>
7.2.4 EA people, way of working

The GEA processes, and the corresponding products, require people with specific competencies in terms of knowledge, attitude and skills. These people are known as enterprise architects. This component makes clear how the competencies, responsibilities, powers and duties are to be arranged when working with GEA. From Figure 32 one can see how, based on the theory of Luken [50], we distinguish between a vertical axis with the task areas of the EA function and a horizontal axis with the necessary competencies of the enterprise architects.

The task areas are distinguished by initialising and mobilising tasks, advisory tasks, frame working tasks, maintaining tasks and governance tasks. The task areas are derived from the above discussed process activities. In the cells one can see the importance of the competencies for the task areas, in Figure 32, when the relevance derived from the above discussed process activities. In the cells one can see the major required competencies for a task. The matrix in Figure 32 also includes the management function of the enterprise architects.

![Figure 32. GEA competence profile](image)

Figure 32. GEA competence profile

The GEA competence profile can amongst others be used for:
- selecting the right people for giving content to the enterprise architecture function
- supporting potential candidates in their development process into a role within this function

106
identifying and giving content to the roles within the enterprise architecture function

The GEA competence profile is the result of an extensive study conducted in 2007 at seven major enterprises of our research program. More details of this study can be found in [110, 112, 116]. See an extended version of this study in chapter 8: enterprise architecture: a strategic specialism.

7.2.5 EA means, way of supporting

Templates and other support means, such as reference architectures, play an important role in standardizing and enhancing EA productivity. Therefore it is necessary to develop advanced tooling to support the EA function. An important element in this is a clear meta model of GEA. Therefore, for the research programme, discussed in this thesis, we also developed such meta models, to cover the GEA processes, the GEA products and the GEA concept as a whole. These meta-models are a part of the EA methodology; see for an extended version of the GEA meta-models chapter 16.

In addition, various architecture frameworks, architecture languages and architecture tools are available to enterprise architects. The John Zachman framework [87, 131] for instance, was one of the first and probably the best-known enterprise architecture frameworks, though many have been developed since Zachman’s. In addition, in recent years, a number of tools have been developed that claim to support enterprise architecture. Examples include enterprise architecture languages like ArchiMate [48] with associated tools such as architect [3] and ARIS [5], and the enterprise architecture language and associated tool MEGA [55], however, these languages and tools take a traditional ‘business-to-IT’ stack perspective, rather than a true enterprise coherence perspective.

7.2.6 EA governance, way of controlling

We combined the EA processes planning, review and adjustment, plan, check, act, under the name of EA governance, and by carefully performing these processes, enterprises can achieve more control over their architecture function. It is important for enterprises to achieve this control to obtain the added value of GEA. Key in this remains the question: Does the EA supply the intended added value?

The purpose of EA governance is to look continuously and critically at the effects of enterprise architecture and determine if the agreed goals can be met. In other words, GEA should function to ensure that the contribution of EA to the control function of an enterprise is continuously made explicit in terms of its costs and benefits; see also Figure 35. Depending on the specific situation of an enterprise, it
can be necessary to set up the EA function as a formal organizational unit, while in other cases it may be possible to organize the EA function as a virtual function.

**Figure 33. Relationship EA execution processes/ enterprise governance processes**

The relationships between the EA function and the enterprise are shown in Figure 33. We distinguish here the current organisation, the change organisation and the EA function. The current organization represents the control and daily performance of the enterprise. The change organization represents the control and daily performance of change programmes and change projects on behalf of the current organization. The steering processes of the execution processes of the EA function form the relationships with the governance processes of the current organization and the change organization.

We will explain these relationships using some examples. In the current organization a problem exists that multiple perspectives of that enterprise affect in their way of working. The planning function of the current organization provides the planning function of the EA function the assignment to develop an integrated solution for the business issue in question. The execution function of the EA function conduct this assignment and delivers the integral solution to the planning function of the current organization, see part I of Figure 34. Subsequently the planning function of the current organization provide the planning function of the change organi-
zation, the assignment to realize the integral solution and the planning function of the change organization starts the development process of making a project initiation document (PID), see part II of Figure 34. The execution function of the EA function will start after the delivery of the integral solution, i.e. the development of the program start architecture (PgSA).

![Diagram](image)

**Figure 34. Collaborations between parties**

After approval of this PgSA, by the planning function of the current organization, see part I of Figure 34, the PgSA will be issued by the execution function of the EA function at the planning function of the change organization, see part III of Figure 34. Subsequently the planning function of the change organization will coordinate the PID and PgSA, bring them closer together and issue the execution function of the change organization, i.e. the assignment to realize the integral solution within the frameworks of the PID and the PgSA. In Figure 34 part IV represents the relationships between the involved parties during the realization of the integral solution. For instance, during the realization phase of the integral solution the execution function of the EA function will support the execution function of the change organization by explaining the PgSA but it will also check if the realization takes place within the framework of the PgSA. This way of collaboration leads to practical content within the enterprise coherence governance.
7.2.7 EA methodology, way of thinking

The EA methodology includes (1) the formal descriptions of the GEA components EA vision, EA processes, EA products, EA people, EA means and EA governance, (2) all the developed figures of these components and, (3) the meta-model of the entire GEA concept including meta-models of both the GEA processes and products. For further details of this meta-models see [112] and chapter 16.

7.3 Conclusions and further research

The discussions in chapters 6 and 7 of this thesis elaborated the theory that formed a part of the research programme discussed here, and we obtained answers to the following research questions, see also section 2.3:

- What are the core factors that define enterprise coherence?
- How can enterprise coherence be expressed explicitly?
- How can enterprise coherence be governed?

We also achieved the following research objectives:

- We have defined the core indicators and factors that define enterprise coherence
- We have developed a design theory of how to guard/improve the level of coherence in enterprises during transformations
8 Enterprise architecture: a strategic specialism

8.1 Introduction

The field of enterprise architecture aims to provide management with insight into, and overview of, the aspects needed to harness the complexities involved in the evolution and development of enterprises [67, 92]. Where classical approaches will handle problems on a one by one basis, enterprise architecture aims to deal with these issues in a coherent and integral fashion. At the same time it offers a medium to achieve shared understanding and conceptualisation among all the stakeholders involved and a means to govern the enterprise’s evolution and development based on this conceptualisation. In this chapter, we are concerned with the people who need to execute these tasks; the enterprise architects.

In the mid 2000’s we were already involved in a survey on the competencies of enterprise, information and IT architects. The results of this earlier work, conducted between 2005 and 2006, and reported in e.g. [67, 129, 90], were based on inputs from standardization efforts by e.g. The Open Group [91] and the Netherlands Architecture Forum [89, 88], and internal certification programmes developed by consultancy companies such as IBM, HP and Capgemini.

More recently, the results of our research programme into enterprise architecture [112, 113, 115, 116], have provided us with clear indications that the role of enterprise architects was changing. The role of EA has to moved away from the role of information and IT architects, as studied in [67, 129, 90], towards the business strategic level. Even more, as also suggested in [90], it is necessary to look not only at the competencies of an enterprise architect as an individual, but rather as a function in the enterprise. This triggered a new series of surveys, with the aim of obtaining a more refined view on the competencies needed from both individual enterprise architects and information architects, and the functions as a whole. The results of these surveys are reported and discussed in this chapter.

As mentioned above, the results, and experiences, gained by the researchers during the research programme indicated a shift in the role of the enterprise architecture function, and in the competencies needed from the architects involved, moving enterprise architecting closer to the strategic level of an enterprise. This triggered a series of three surveys:

1. among the members of Ordina’s enterprise architecture centre of excellence
2. among the members of our research programme
3. among the members of the architecture working group of the Dutch society for informatics (NGI)

The surveys confirmed the shift in the role/function of enterprise architect. This overview of the competencies required of enterprise architects and information architects, in conjunction with a mapping to the key areas, can be used to:

1. select the right mix of people needed to develop an enterprise architecture function
2. support potential candidates in their development process into a role within this function
3. identify and scope the roles within the enterprise architecture function

The remainder of this chapter is structured as follows: we discuss the perspective we take on competences and the role of enterprise architects in section 8.2. We give a brief report of the surveys in sections 8.3, 8.4 and 8.5 before giving the combined results in section 8.6 followed by conclusions.

8.2 A competence matrix for EA

A wealth of information, approaches, models and definitions available on competencies is available in the literature. As the competence surveys were done in a Dutch context, we preferred to use definitions of competencies et cetera that are commonly used in the Dutch-speaking community, and because the concept of ‘architecture’ applied to design enterprises originated in the field of information provision we also took relevant literature in the field of information provision into consideration.

In earlier work on the competencies of IT architects, Steghuis et al. [129, 89, 88, 128] applied the competence iceberg, see Figure 36, taken from Bergenhenegouwen [8] to the field of IT architecture.

---

3 The Netherlands, and the Flemish part of Belgium.
The surveys confirmed the shift in the role/function of enterprise architect. This overview of the competencies required of enterprise architects and information architects, in conjunction with a mapping to the key areas, can be used to:

1. select the right mix of people needed to develop an enterprise architecture function
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In earlier work on the competencies of IT architects, Steghuis et al. [129, 89, 88, 128] applied the competence iceberg, see Figure 36, taken from Bergenhenegouwen [8] to the field of IT architecture.

Figure 36. The competence iceberg (based on [8])

At the top of the iceberg, we find the observable professional competences that are typically required to exercise a profession. For example, an IT architect would be required to have knowledge of the business domain and the IT domain. Professionals typically acquire this sort of knowledge and skills by formal schooling and on the job training. The presence/absence of these competences can be observed relatively easily. Lower down the iceberg, we find more knowledge, skills and attitudes, that are increasingly harder to teach and increasingly difficult to observe. This situation is also what lends the iceberg model its name, as a large part of the required competences may actually be hard to observe and/or train, and as such remains below the surface.

The use of the iceberg model for IT architects provides valuable insights into the competencies of IT architects, as summarized in [129], however, the iceberg model does not make an explicit connection between the various tasks that are to be performed by an architect, and the personal characteristics that are a prerequisite for conducting these tasks. This makes it difficult to make the various roles within the enterprise architecture function explicit. This is where we turn to the competence matrix of Luken [50].

The competence matrix model was developed by the NOA (www.noa-vu.nl) group at the Free University of Amsterdam. It is used in the development of several training/ schooling programmes in the Dutch speaking community, including MSc and BSc programmes. It identifies two dimensions in the function of an enterprise discipline:
Task areas – identifying the task (domains) of the role for which the competencies are to be described.
Competences – The competences needed to (successfully) perform the tasks.

The competence matrix model is based on the more general purpose/resource matrix of Seligmann [80]. The competence matrix model fits well with our needs: architects in the enterprise architecture function should not only have the right knowledge, insights, attitudes and behavioural skills, but they also have to be able to apply these to the tasks needed in an enterprise architecture function. In this way, variations can be identified in terms of the relative importance of knowledge and understanding, attitude and skills for the different tasks.

To fill the competence matrix of the enterprise architecture function, the following three surveys were carried out and/or used:
1) A survey was conducted by the core team of our research programme among eleven enterprise architects at Ordina’s enterprise architecture centre of excellence.
2) A survey was conducted by the core team of our research programme among nine members of our research programme.
3) A survey on the characteristics of the good architect was conducted by the architecture working group of the Dutch Society for Informatics (NGI).

In the context of these surveys, enterprise architecture and information architecture were defined in line with definitions as can be found in e.g. [67, 112]. More specifically, enterprise architecture was considered to be the architecture of the enterprise, ranging from the products/services offered, via the business processes and supporting information systems, to the IT needed to support/implement these information systems. The information architecture was treated as focusing on the information systems, information provisioning, needed to support the business processes of the enterprise and the IT support needed for these information systems. This makes it natural for enterprise architecture to be more broadly oriented, and closer to enterprise strategy, whereas information architecture has a more in-depth focus towards the actual design of the information systems. This is illustrated in Figure 37 and Figure 38 respectively.
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Competences – The competences needed to (successfully) perform the tasks.

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Given these ‘orthogonal’ definitions of enterprise architecture and information architecture, one would suspect there to be a difference between the competencies needed from the different architects. The three surveys therefore were designed/used to take in consideration both the competencies required for an information architecture function and those for an enterprise architecture function.

8.3 Survey 1 – Ordina’s EA centre of excellence

The first survey was held among the architects of Ordina’s architecture community of practice (In Dutch: Vakgroep). It should be noted that even though Ordina was the initiator of our research programme, this certainly did not mean that all of Or-
dina’s enterprise, information, or IT architects, are ‘GEA architects’. Ordina, being the result of several take-overs of smaller consultancy firms, represents a rich variety of architecture approaches and associated experience.

This survey was organized as a plenary session involving eleven participants. It involved two steps. First, the participants collaboratively gathered, and clustered, the competencies they considered to be relevant to enterprise architects and information architects. Then they prioritized the resulting competence cluster: for both the enterprise architect and information architect function, the participants were asked to distribute four points over the clustered competences based on the importance of the competency to the function. The two prioritizations yielded significant differences for the two different functions. More specifically, the survey resulted in the following competence clusters presented, in order of importance, in Figure 39.

<table>
<thead>
<tr>
<th>Competency</th>
<th>Points</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has a large Analytical capacity</td>
<td>12</td>
<td>27,3</td>
</tr>
<tr>
<td>Has Thinking ability</td>
<td>9</td>
<td>20,5</td>
</tr>
<tr>
<td>Has a good Listener</td>
<td>5</td>
<td>11,4</td>
</tr>
<tr>
<td>Has Knowledge</td>
<td>5</td>
<td>11,4</td>
</tr>
<tr>
<td>Has an eye for Effects</td>
<td>2</td>
<td>4,5</td>
</tr>
<tr>
<td>Is a Facilitator</td>
<td>2</td>
<td>4,5</td>
</tr>
<tr>
<td>Has useful / meaningful Instruments</td>
<td>2</td>
<td>4,5</td>
</tr>
<tr>
<td>Has Empathy</td>
<td>1</td>
<td>2,3</td>
</tr>
<tr>
<td>Monitors the Structure</td>
<td>1</td>
<td>2,3</td>
</tr>
<tr>
<td>Is Steadfast</td>
<td>1</td>
<td>2,3</td>
</tr>
<tr>
<td>Is Creative</td>
<td>1</td>
<td>2,3</td>
</tr>
<tr>
<td>Has a high Organisational sensitivity</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Has a Networker</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Has Management Skills</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Is a Facilitator</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Is Critical</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Is a Generalist</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100</td>
</tr>
</tbody>
</table>

**Figure 39. Identification and prioritization competencies architectural function to Information Architecture and Enterprise Architecture**

Note that a score of zero points for a competence cluster does not imply that this competence was not relevant. All competency clusters were considered relevant by the group as they were listed by the group in the first place. The table only shows the relative priority of the clusters. The differences between the two functions in terms of the required competences are highlighted in Figure 40, from which it can be seen that the architects of Ordina’s centre of excellence saw a significant difference between the two functions/roles.
8.4 Survey 2 – members of our research programme

The second survey was held among members of our research programme. More specifically this involved the following nine members: ANWB, Dienst Justitiële Inrichtingen van het Ministerie van Justitie, Politie Nederland, PGGM, ICTU, Rijkswaterstaat, Ordina, UWV and Nederlandse Spoorwegen. The second survey involved three major steps. First, the participating members were asked, bilaterally, to list the important competencies of enterprise/information architects. Then a plenary session, involving twelve representatives of the participating members of our research programme, was organized to cluster the identified competences. This produced a total of twenty-three competence clusters. As a third step, the clusters were prioritized by the twelve representatives. Each representative was asked to divide seven points over the twenty-three clusters. Once for the enterprise architecture function, and once for the information architecture function. With twelve representatives for nine participating members, some members had a stronger vote, however, each of the participants participated as a professional, rather than the representative of the member’s own specific interest. As a fourth step, eighteen members of Ordina’s enterprise architecture centre of excellence were also asked to provide a prioritization. This involved again the division of seven points over the clusters as identified by our research team members, for both the enterprise architecture and information architecture functions. As this centre of excellence contains architects that represent a broad range of architecture approaches, their prioritization provides a non GEA programme perspective.

Figure 40. Survey 1: Differences in competence score

![Differences in competence score EA versus IA](image-url)
To ensure that the prioritization of the eighteen members of the centre of excellence would not outnumber the prioritization of the twelve representatives of our research programme, a weighing factor was used when aggregating the different prioritizations. In doing so, the number of involved enterprises was used, leading to a 90 to 10 ratio. In other words, the votes from participants of our research programme received a 90% weight while the votes from the centre of excellence received a 10% weight: a total of: 12 x 7 x 90% + 18 x 7 x 10% = 88.2 points were divided, per enterprise/information architecture function.

The results of the second survey are as shown in Figure 41. The results show strong differences in the priorities with regards to the competences of enterprise architects versus those of information architects. More specifically, the top-10 scores for enterprise architecture competences were, see Table 18:

<table>
<thead>
<tr>
<th>Rk</th>
<th>Competence</th>
<th>Score</th>
<th>Rk</th>
<th>Competence</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organizational sensitivity</td>
<td>14.6</td>
<td>6</td>
<td>Visionary</td>
<td>5.5</td>
</tr>
<tr>
<td>2</td>
<td>Communicative</td>
<td>8.5</td>
<td>7</td>
<td>Networking</td>
<td>5.5</td>
</tr>
<tr>
<td>3</td>
<td>Persuasiveness</td>
<td>8.3</td>
<td>8</td>
<td>Professional integrity</td>
<td>4.9</td>
</tr>
<tr>
<td>4</td>
<td>Analytical ability</td>
<td>7.1</td>
<td>9</td>
<td>Decisiveness</td>
<td>4.7</td>
</tr>
<tr>
<td>5</td>
<td>Branche knowledge</td>
<td>5.9</td>
<td>10</td>
<td>Effective judgement</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Table 18. Top-10 score for enterprise architecture competences survey 2

while the top-10 score for information architecture were, see Table 19:

<table>
<thead>
<tr>
<th>Rk</th>
<th>Competence</th>
<th>Score</th>
<th>Rk</th>
<th>Competence</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analytical ability</td>
<td>14.3</td>
<td>6</td>
<td>Result driven</td>
<td>7.0</td>
</tr>
<tr>
<td>2</td>
<td>Subject knowledge</td>
<td>10.0</td>
<td>7</td>
<td>Effective judgement</td>
<td>5.9</td>
</tr>
<tr>
<td>3</td>
<td>Organizational sensitivity</td>
<td>8.0</td>
<td>8</td>
<td>Branche knowledge</td>
<td>4.9</td>
</tr>
<tr>
<td>4</td>
<td>Collaboration</td>
<td>7.8</td>
<td>9</td>
<td>Service oriented</td>
<td>4.9</td>
</tr>
<tr>
<td>5</td>
<td>Communicative</td>
<td>7.4</td>
<td>10</td>
<td>Persuasiveness</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 19. Top-10 score for information architecture competences survey 2
To ensure that the prioritization of the eighteen members of the centre of excellence would not outnumber the prioritization of the twelve representatives of our research programme, a weighing factor was used when aggregating the different prioritizations. In doing so, the number of involved enterprises was used, leading to a 90 to 10 ratio. In other words, the votes from participants of our research programme received a 90% weight while the votes from the centre of excellence received a 10% weight: a total of: 12 x 7 x 90% + 18 x 7 x 10% = 88.2 points were divided, per enterprise/information architecture function.

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<tr>
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<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organizational sensitivity</td>
<td>14.6</td>
</tr>
<tr>
<td>2</td>
<td>Communicative</td>
<td>8.5</td>
</tr>
<tr>
<td>3</td>
<td>Persuasiveness</td>
<td>8.3</td>
</tr>
<tr>
<td>4</td>
<td>Analytical ability</td>
<td>7.1</td>
</tr>
<tr>
<td>5</td>
<td>Branch knowledge</td>
<td>5.9</td>
</tr>
<tr>
<td>6</td>
<td>Visionary</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>Networking</td>
<td>5.5</td>
</tr>
<tr>
<td>8</td>
<td>Professional integrity</td>
<td>4.9</td>
</tr>
<tr>
<td>9</td>
<td>Decisiveness</td>
<td>4.7</td>
</tr>
<tr>
<td>10</td>
<td>Effective judgement</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Table 18. Top-10 score for enterprise architecture competences survey 2

while the top-10 scores for information architecture were, see Table 19:

<table>
<thead>
<tr>
<th>Rk</th>
<th>Competence</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
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<td>Communication</td>
<td>7.4</td>
</tr>
<tr>
<td>6</td>
<td>Result driven</td>
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</tr>
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<td>Service oriented</td>
<td>4.9</td>
</tr>
<tr>
<td>10</td>
<td>Persuasiveness</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 19. Top-10 score for information architecture competences survey 2

To highlight the differences between enterprise architects and information architects better, the top-10 scores are shown respectively in Figure 42 and Figure 43 and combined in the spider-diagram shown in Figure 44.

Figure 42. Top 10 competences Enterprise Architecture
In the diagram shown in Figure 44 an overall picture of fourteen competences comprising of both of the top-10 scores is provided, it shows that an overall enterprise architect can be qualified as a visionary networker and an information architect as an analysis oriented knowledge worker. It is interesting to see that both surveys 1 and 2 indicate similar distinctions between the competencies required from the enterprise architecture function and the information architecture function, see Figure 40 and Figure 45. It is the case that Ordina’s centre of excellence played a role in both surveys, however, in the second survey they only determined 10% of the weight of the prioritization. It suggests that the distinction between the enterprise architecture function and information architecture function is shared among the members of the research programme and the broad community of architects within Ordina.

The third survey involved the members of the architecture working group of the Dutch society for informatics (NGI). This survey was conducted by the NGI to understand better and develop the competences of information architects. Even though this survey was not conducted as part of the research programme for this thesis, the research team was involved in the survey. From the perspective of our purposes, this third review was used as an extra check to cross check some of the results of the earlier two reviews. Regretfully, this survey focussed only on the competencies of information architects. The survey followed a similar pattern to - 10 - 8 - 6 - 4 - 2 - 0 - 2 - 4 - 6 - 8 - 10 differences in competence score EA versus IA

Figure 43. Top 10 competences Information Architecture

Figure 44. Top 10 competences compared
In the diagram shown in Figure 44 an overall picture of fourteen competences comprising of both of the top-10 scores is provided, it shows that an overall enterprise architect can be qualified as a visionary networker and an information architect as an analysis oriented knowledge worker. It is interesting to see that both survey 1 and 2 indicate similar distinctions between the competencies required from the enterprise architecture function and the information architecture function, see Figure 40 and Figure 45. It is the case that Ordina’s centre of excellence played a role in both surveys, however, in the second survey they only determined 10% of the weight of the prioritization. It suggests that the distinction between the enterprise architecture function and information architecture function is shared among the members of the research programme and the broad community of architects within Ordina.

![Differences in competence score EA versus IA](image)

**Figure 45. Survey 2: Differences in competence score**

### 8.5 Survey 3 – NGI

The third survey involved the members of the architecture working group of the Dutch society for informatics (NGI). This survey was conducted by the NGI to understand better and develop the competences of information architects. Even though this survey was not conducted as part of the research programme for this thesis, the research team was involved in the survey. From the perspective of our purposes, this third review was used as an extra check to cross check some of the results of the earlier two reviews. Regretfully, this survey focussed only on the competencies of information architects. The survey followed a similar pattern to
that discussed for surveys 1 and 2. In other words, as a first step, the potential competencies were clustered by the organizers of this survey.

As a second step the clusters were prioritized at a plenary session of the working group, involving nineteen members. Each member was allowed to divide three points over the competences according to their priority. This resulted in the following scores, see Table 20:

<table>
<thead>
<tr>
<th>Competence</th>
<th>Points</th>
<th>Competence</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interacting</td>
<td>18</td>
<td>Knowledge</td>
<td>4</td>
</tr>
<tr>
<td>Structuring</td>
<td>12</td>
<td>Sense of proportions</td>
<td>1</td>
</tr>
<tr>
<td>Vision development</td>
<td>12</td>
<td>Experience</td>
<td>1</td>
</tr>
<tr>
<td>Communicating</td>
<td>8</td>
<td>Creativity</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 20. Scores competences information architects NGI**

As the NGI survey used a slightly different clustering, it is difficult to compare the results of this survey with the two earlier ones, however, when taking the five top priorities of the NGI survey as a starting point, and interpreting these clusters in terms of the clusters from the GEA survey, we see the following correspondences, see Table 21:

<table>
<thead>
<tr>
<th>Survey 3 – NGI</th>
<th>Survey 2 – GEA members</th>
<th>Survey 1 – GEA members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence</td>
<td>Rank</td>
<td>Competence</td>
</tr>
<tr>
<td>Interacting</td>
<td>1</td>
<td>Persuasiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational sensitivity</td>
</tr>
<tr>
<td>Structuring</td>
<td>2</td>
<td>Analytical ability</td>
</tr>
<tr>
<td>Vision development</td>
<td>3</td>
<td>Visionary</td>
</tr>
<tr>
<td>Communicating</td>
<td>4</td>
<td>Communicative</td>
</tr>
<tr>
<td>Knowledge</td>
<td>5</td>
<td>Branch knowledge</td>
</tr>
</tbody>
</table>

**Table 21. Comparison competences 3 surveys**

This comparison shows that, for information architects, the three surveys provide similar top five competency clusters, albeit with a differing order of importance. We believe this also indicates the stability of the overall results of the first two surveys, including the results for the enterprise architecture function.

### 8.6 The task areas of the EA function

Finally, to fill in a competence matrix for enterprise architects, as discussed in paragraph 2, the results of the second survey were used on the competence axis of the matrix, see Figure 46. The task areas of the enterprise architecture function were identified in a workshop with the participants of our research programme. The processes and products as already identified in the GEA results [112] formed the basis for this identification. During the workshop, the GEA processes and products were clustered using the MetaPlan technique [79]. This resulted in five key task areas: initializing & mobilizing, advisory, frame working, maintaining and


governance. The resulting task areas are shown in more detail in Table 22:

<table>
<thead>
<tr>
<th>TASK AREAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROCESSES</td>
</tr>
<tr>
<td>Initialize &amp; mobilizing</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Advisory</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Frame working</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Maintaining</td>
</tr>
<tr>
<td>Governance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 22. Task areas Enterprise Architecture Function

These results were used to fill in the task areas of the competence matrix, see Figure 46. With the two dimensions of the competence matrix in place, we were then ready to indeed fill in the matrix in terms of the relative weight a competence has towards the different tasks. In other words, the extent to which a selected competence is important to a task area. This is why, as can be seen in Figure 46, the columns in the matrix add up to 100%. A high value indicates a strong correlation between the competence and the task area. Correlations with a score higher than 15% have been highlighted. To arrive at these correlation values, all the participants in the workshop were asked to distribute five points per competency to the task areas.

Reading the figure in horizontal direction, the matrix shows for example that the tasks organising sessions, integral solutions major business issues and strategy fit analyses require the most of the high (≥ 15%) scoring competences. In a vertical direction one can for instance see that 19% of the organizational sensitivity competence is allocated to the task area analyse integral coherence. Other competences, such as collaboration and persuasiveness are more evenly distributed over the task areas.
The resulting enterprise architecture competence profile can among others be used to:

- select the right people to participate in an enterprise architecture function
- support potential candidates in their development process into a role within this function
- clearly identify, and scope, different roles within the enterprise architecture function

With regards to the last point, the results of our research programme suggest the following organization of the enterprise architecture function, see Table 23:

### Table 23. Tasks, roles and responsibilities of the EA function

<table>
<thead>
<tr>
<th>Task area</th>
<th>Role</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initializing and mobilizing</td>
<td>EA designer</td>
<td>Enterprise coherence framework design</td>
</tr>
<tr>
<td>Advisory</td>
<td>EA strategist</td>
<td>Strategic advice</td>
</tr>
<tr>
<td>Framing</td>
<td>EA programme architect</td>
<td>Architecture compliance</td>
</tr>
<tr>
<td>Maintaining</td>
<td>EA administrator</td>
<td>Actual enterprise coherence framework</td>
</tr>
<tr>
<td>Governance</td>
<td>EA manager</td>
<td>Enterprise architecture function</td>
</tr>
</tbody>
</table>

### 8.7 Conclusion and Recommendations

In this chapter we focused on the competencies needed from enterprise architects, while also relating this to the competencies required for an information architect:
because the concept of architecture applied to design enterprises originated in the field of information provision we took also the competences in the field of information provision into consideration. The results presented in this chapter are based on three surveys. The surveys confirmed that there was a fundamental difference in the competencies required from these two roles, in line with what we expected in terms of Figure 37 and Figure 38. Many of the relevant competences are enclosed at the bottom of the competence iceberg [8] and are therefore difficult or not to learn. Therefore we dare to claim: that an information architect with enterprise architecture training does not make an enterprise architect and vice versa. In practice we see that information architects obtain the role of enterprise architect without it being determined whether they have the necessary competencies. The GEA enterprise architecture competence profile can be used to conduct such a determination of competencies.

The survey’s results also showed that the all-encompassing enterprise architect does not exist. One should rather think of an enterprise architecture function, involving different roles, as suggested in this chapter. When looking at the plethora of required competencies for an enterprise architect, it is also not reasonable to expect a single person to excel in each of these. We therefore find it more realistic to see an enterprise architect as functioning in a particular role. The enterprise architecture competency matrix provides starting points to:

1) select the right mix of people needed to develop an enterprise architecture function

2) support potential candidates in their development process into a role within this function

3) identify and scope the roles within the enterprise architecture function
9 Case studies

9.1 Introduction

The following cases were selected and used to evaluate the GEA design theory:

- Professionalization of the execution of an administrative body of a ministry of the Dutch government [119].
- What is the impact of the introduction of a new law at the Dutch Dienst Justitiële Inrichtingen (agency of the Dutch Ministry of Security and Justice) [120].
- The issue of digitization of the documents flow at a Dutch ministry [114, 117].

The chosen cases were expected to offer enough practical insights into the used GEA theory in practice to evaluate and improve the theory following the multiple case study research approach of Yin [130]. The main selection criteria for the case studies were the possibilities to apply fully the ECF and ECG of GEA.

9.2 Data collection protocol

We used Yin’s [130] case-study based research approach to evaluate and improve the GEA method based on input from the different situations in which it is applied. Yin distinguishes five levels of questions:

1. questions to specific interviewees
2. questions at the level of an individual case: these are the questions in the case study protocol that need to be answered by the investigator during a single case, even when the single case is part of a larger, multiple-case study
3. questions focused on finding patterns across multiple cases
4. questions at the level of the entire research effort, for example, calling on information beyond the case study evidence and including literature or published data that may have been reviewed
5. normative questions about policy recommendations and conclusions, going beyond the narrow scope of the study

We discussed these questions in the core team, and tailored them to the research program. Below we give, for each level, these tailored questions as discussed with the core team of the research programme.

Level 1:

- At the time of the validation process of the ECF
  1. Are the guiding statements valid and up to date?
2. Do the representatives of the perspectives agree with the identified perspectives, the identified core concepts within it and the related guiding statements?

- At the time of the ECG analysis process of a major business issue
  1. Do the causes, triggers, sub problems, risks, implications, etc. of the business issue lead to change initiatives?
  2. Do the (existing) guiding statements result in additional change initiatives or restrictions, in a solution space?

Level 2:
- Are the documents at the level of purpose present and accessible?
- Does the definition of the level or purpose result in a clear understanding of the sense of purpose and design of the enterprise? That is: Do we get all the desired cohesive elements of GEA?
- Is one capable of identifying, and engaging, the right representatives for each of the perspectives? This engagement should cover both the identification and validation of the cohesive GEA elements (ECF), and the GEA analysis processes to solve the business issue.
- Are the representatives of the perspectives able to validate the ECF?
- Are the representatives of the perspectives, using the validated ECF, able to execute the analysis processes to solve major business issues?
- Does the development of the ECF lead to increase coherence?
- Does the use of GEA lead to an integral solution that contributes to the coherence of the enterprise?
- Is the enterprise able to, independently, specify a business issue that can serve as input to a GEA based analysis?
- Do the owners of the business issue succeed in specifying the business issue in such a way the representatives of the prospects can perform the complete GEA analysis and develop an integral solution?

Level 3:
- The level 3 questions about the pattern of findings across multiple cases are:
  1. What is the degree of acceptance of the GEA theory by stakeholders?
  2. What is the extent of applicability of the GEA theory?
  3. What is the extent of matching required dynamics of the enterprise by application of the GEA theory?
  4. What is the extent of compliance by applying GEA with the required integrity to resolve business issues?
  5. What is the degree of accessibility of the GEA theory by the stakeholders of the enterprise?
6. What is the degree of transferability of the GEA theory to the stakeholders of the enterprise?

7. What is the extent of balance of interests of the stakeholders by applying the GEA theory?

8. What is the degree of innovativeness of the solutions to the different problems found in the case studies and solved using GEA?

Level 4:
- Did the execution of the cases result in detectable performance improvements?
- Does the literature support the answers to the above findings?

Level 5:
- What recommendations can be made to develop further and expand the area of enterprise coherence governance?

We will respond to the level one and level two questions at the end of each case study. The level 3 questions are answered in chapter 13, where we will discuss the cross case conclusions. The level 4 and level 5 questions are answered in the chapters 14 to 18.
10 Case study Dga

10.1 Introduction

A case study of business/IT alignment, or rather enterprise coherence, at the strategic level, and situated in the Dutch public sector, involving a Dutch government agency\(^4\) (Dga) is presented in this chapter. This agency has to deal with a business issue on the subject of operational excellence and lack of management control, while managing a number of European subsidy arrangements. These subsidy arrangements cover thousands of companies that, to be eligible for these subsidies, must submit an annual application for subsidies.

About thirty internal and external parties, whose contributions are interdependent and time critical, have to collaborate for a smooth execution of all this work. Besides these collaborative challenges, the complexity of the process is increased by outsourcing factors, and factors pertaining to the communication channels used to lodge and process the actual applications. Two of the core, massively batch-oriented, processes have already been outsourced and alongside traditional paper-based subsidy applications, applications can now be lodged electronically.

The processing of these subsidies is highly exposed politically, in the sense that a flaw, or even a drop in the performance of Dga will immediately become public knowledge by way of the national press. This would cause serious damage to the reputation of the agency. Furthermore more non-compliance in the processing of subsidies with, national and EU, laws and regulations will lead to heavy financial fines.

After outsourcing the batch-oriented processes, the outsourcing party defaulted with respect to the quality of the services provided, and partly due to the fact that these services were critical to the issuing of subsidies, control was also lost of the primary processes. As a result, approximately 60\% of the client dossiers had to be returned to the applicants without proper processing, while about 20\% of the subsidy applications resulted in the clients submitting objections to how the process had been handled due to faulty processing of the subsidies. The latter also caused statutory deadlines to be exceeded, which ultimately resulted in a risk of a twenty million Euros in fine for no compliance with the deadlines.

As a result, the very existence of this government agency was put at risk, and the situation quickly raised critical question in the Dutch parliament. As a result, the business issue for which a GEA analysis of the situation was done was to determine: how the execution of the subsidy submission, evaluation, and allocation process could be made more manageable and efficient. In this regard it was also

\(^4\) We cannot disclose the specific government agency. Hence the anonymized name ‘Dga’.
argued that the failing outsourcing situation was not the only symptom of the real problem, and that more causes were at play. The case illustrates that business/IT alignment is not only a matter of aligning ‘the business’ and ‘the IT’ aspects of an enterprise. It suggests that a more refined approach is called for. More specifically, we will see how ‘the business’ was not just a single aspect that needed to be aligned to ‘the IT’, but rather that it involved many more aspects that also needed mutual alignment. This is actually why we prefer to use the term enterprise coherence rather than business/IT alignment as it more clearly expresses the fact that running a well-adjusted business is more about achieving coherence between multiple aspects, than merely aligning the business and IT aspect. The use of GEA, and the ECF as a part of GEA in particular, provides insight into these other elements and their relations and mutual influences, i.e. their coherence. This insight allowed the government agency to formulate a strategy to improve matters.

In the Dga case, just as in other cases, the GEA method was used because the GEA method was/is developed using a design science driven approach [38] in combination with case study research [130]. The different cases conducted using GEA, also provided feedback on the method. Therefore, we will explicitly discuss the feedback on the design of the method that follows from the Dga case study application of the GEA method.

10.2 The ECF for Dga

Since this was the first time that Dga had used the GEA method, it was necessary to develop an enterprise specific enterprise coherence framework (ECF). To this end, the Dga case started with intensive desk research activity, conducted by a small team of architects. This team studied the relevant policy documents from Dga, to obtain the first version of the ECF for the agency, in terms of a list of the cohesive elements and their definitions, covering both the purpose level and design level. The starting point for creating this list was the strategic documents of the agency such as its mission statement, vision notes, policy plans, business strategy and business plan. In a validation workshop this draft ECF was then validated with the major stakeholders and approved after some modifications. This validation workshop involved the executives of Dga, complemented with a number of (internal) opinion leaders and key stakeholders.

The perspectives selected by Dga are shown in Table 24, while as an example, the core concepts of five of the perspectives are listed in Table 25.
The perspectives selected by Dga are shown in Table 24, while as an example, the final opinion leaders and key stakeholders.

Workshop involved the executives of Dga, complemented with a number of inter-

The major stakeholders and approved after some modifications. This validation

and business plan. In a validation workshop this draft ECF was then validated with

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prefer to use the term enterprise coherence rather than business/IT alignment as it

more clearly expresses the fact that running a well-adjusted business is more about

Table 24. Definitions of perspectives for the Dga-organisation.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT</td>
<td>All processes, activities, people and resources for obtaining, processing and delivery of relevant information for Dga.</td>
</tr>
<tr>
<td>Chain cooperation</td>
<td>The collaboration of the parties involved in the subsidy arrangement chain.</td>
</tr>
<tr>
<td>Processes</td>
<td>A coherent set of activities needed to deliver results of Dga.</td>
</tr>
<tr>
<td>Organic structure</td>
<td>The governance and organizational structure of the DGA organisation so that desired goals are attained.</td>
</tr>
<tr>
<td>Employees</td>
<td>All persons who execute tasks or activities within the Dga-organization.</td>
</tr>
<tr>
<td>Suppliers</td>
<td>Companies or organisations that supplies or sells products and/or services at Dga.</td>
</tr>
<tr>
<td>Culture</td>
<td>Explicit and implicit norms, values and behaviours within the Dga organisation.</td>
</tr>
<tr>
<td>Services</td>
<td>All services that Dga within legal frameworks, or through agreed appointments with statutory authorities, establishes and delivers to applicants.</td>
</tr>
<tr>
<td>Customer</td>
<td>The applicant for a service of Dga.</td>
</tr>
<tr>
<td>Law &amp; regulations</td>
<td>All legal frameworks that form the basis for the task performance of Dga.</td>
</tr>
</tbody>
</table>

Table 25. Core concepts for Dga

<table>
<thead>
<tr>
<th>Organic structure</th>
<th>Customer</th>
<th>Chain cooperation</th>
<th>Processes</th>
<th>ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance</td>
<td>Applicants</td>
<td>Collaboration</td>
<td>Formal checks</td>
<td>Standardization</td>
</tr>
<tr>
<td>Political leadership</td>
<td>Third parties</td>
<td>Chain test</td>
<td>Material checks</td>
<td>Architecture</td>
</tr>
<tr>
<td>Responsibilities &amp; tasks</td>
<td>Channel selection</td>
<td>Chain parties</td>
<td>Seasonal peaks</td>
<td>Integrity</td>
</tr>
<tr>
<td>Organizational division</td>
<td>Internet</td>
<td>Chain mandate</td>
<td>Efficiency</td>
<td>Security</td>
</tr>
<tr>
<td>Employer ship</td>
<td>Supply coordination</td>
<td>Service level agreements</td>
<td>Effectiveness</td>
<td>Facilities</td>
</tr>
<tr>
<td>Policy cores</td>
<td>Objections</td>
<td>Chain management</td>
<td>Predictability</td>
<td>information</td>
</tr>
<tr>
<td>Program management</td>
<td>Switchers</td>
<td>Transparency</td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Scaling up</td>
<td>Planning</td>
<td></td>
<td>Planning</td>
<td>Systems</td>
</tr>
<tr>
<td>Combined arrangements</td>
<td>Procedures</td>
<td>Ownership</td>
<td>Regulators</td>
<td>Storage</td>
</tr>
<tr>
<td>Works Council</td>
<td>Regulators</td>
<td></td>
<td>Regulators</td>
<td></td>
</tr>
</tbody>
</table>
According to the GEA method, at the start of this workshop the owner(s) of the organisation, i.e. not just the documentation, of that perspective.

During the workshop, each of the ten perspectives of Table 24 had an explicit representative with clear (delegated) ownership of the cohesive elements, in the real organisation, i.e. not just the documentation, of that perspective.

According to the GEA method, at the start of this workshop the owner(s) of the business issue gave a thorough introduction of the issue in terms of causes, degree of urgency, degree of interest, implications, risks, etc. This introduction gave the representatives of the perspectives a deeper insight into the associated issues of this business issue, enabling them to make a translation of the issue to their own perspective. Consequently, the representatives of the perspectives were able jointly to determine, which perspectives were most affected by/related to the business issue at hand. This resulted in the identification of the dominant and sub-ordinate, for the issue at hand, perspectives.

The core business issue: ‘How could the execution of the subsidy submission, evaluation, and allocation process be made more manageable and efficient?’ was then addressed in terms of four questions, leading to four sub-analyses of the business issue:

1. determine the impact of the business issue on the dominant perspectives
2. determine the impact of the business issue on the sub-ordinate perspectives
3. determine the solution space for the business issue from the dominant perspectives
4. determine the solution space for the business issue from the sub-ordinate perspectives

Table 26. Guiding statements relevant to the processes perspective

### 10.3 The process followed in the case study

With the ECF in place, the next step was to organize a workshop, where the business issue at hand was placed centrally and analysed in terms of four questions. During the workshop, each of the ten perspectives of Table 24 had an explicit representative with clear (delegated) ownership of the cohesive elements, in the real organisation, i.e. not just the documentation, of that perspective.

According to the GEA method, at the start of this workshop the owner(s) of the business issue gave a thorough introduction of the issue in terms of causes, degree of urgency, degree of interest, implications, risks, etc. This introduction gave the representatives of the perspectives a deeper insight into the associated issues of this business issue, enabling them to make a translation of the issue to their own perspective. Consequently, the representatives of the perspectives were able jointly to determine, which perspectives were most affected by/related to the business issue at hand. This resulted in the identification of the dominant and sub-ordinate, for the issue at hand, perspectives.

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1. determine the impact of the business issue on the dominant perspectives
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3. determine the solution space for the business issue from the dominant perspectives
4. determine the solution space for the business issue from the sub-ordinate perspectives

Table 26. Guiding statements relevant to the processes perspective

<table>
<thead>
<tr>
<th>Processes</th>
<th>Execution of the subsidy arrangements should be compliant to legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All sub-processes should contribute to sustainability</td>
</tr>
<tr>
<td></td>
<td>All processes must be described and provided with work instructions</td>
</tr>
<tr>
<td></td>
<td>Of all the processes timely progress reports have to be delivered to the control department</td>
</tr>
<tr>
<td></td>
<td>Processes should be implemented more cost efficient</td>
</tr>
<tr>
<td></td>
<td>Our aim for Dga is an agile, transparent and fast operation</td>
</tr>
<tr>
<td></td>
<td>Factory work as data entry and scanning of maps are outsourced</td>
</tr>
<tr>
<td></td>
<td>All process activities must be performed within the statutory time limits</td>
</tr>
<tr>
<td></td>
<td>Parallel to the 3rd main process ‘judge’, the initialization activities of the new subsidy year should start</td>
</tr>
<tr>
<td></td>
<td>The processes of the various partners must connect seamlessly</td>
</tr>
<tr>
<td></td>
<td>Also determined by the number of subsidy applications received, we aim to compile an optimal size of batches to be processed</td>
</tr>
<tr>
<td></td>
<td>Batches of subsidy applications may only move to the next procedure after approval through formal and material checks</td>
</tr>
<tr>
<td></td>
<td>Objections should as much as possible be prevented by means of an active application of the possibility of administrative modification</td>
</tr>
<tr>
<td></td>
<td>As a result of far-reaching expected changes in European legislation, only the most needed process improvements should be performed.</td>
</tr>
</tbody>
</table>
The first two sub-analyses started from the business issue. This resulted in identification of the potential impact and the necessary change initiatives, originating from the different perspectives, to solve the business issue. The last two sub-analyses were conducted using the guiding statements from the different perspectives as a starting point. This resulted in an identification of the possible/necessary change initiatives, and possible limitations, e.g. as a result of principles of the enterprise, with respect to the solution of the business issue. This was then used as a base to synthesize possible solution scenario’s that would fit within the context, as captured in the cohesive elements, of the enterprise. An explanation is given for each of the 4 determinations using practical examples, see Figure 47, Figure 48, Figure 49 and Figure 50 with the accompanying explanations. Conversely, the insights gleaned from this exercise also made clear which cohesive elements should be adjusted to continue giving direction to the further evolution of the enterprise. The synthesis of the results from these sub-analyses was then used to form the integral solution and preferred approach to use to meet the business issue at hand.

The results of the four sub-analyses are given in Table 27, Table 28, Table 29 and Table 30 respectively. As a start, consider Table 27 and Table 28. The second column ‘Problem’ shows the sub problems that are expressed by the problem owners. The third column ‘Perspective’ shows the perspectives, which the representatives perceived as most relevant to a sub-problem. The impact on this perspective is expressed in terms of new or modified guiding statements in the adjacent column ‘Guiding statement’ (column 4). The impacts resulting from this sub-problem on other possible perspectives (column 5 and 7) are expressed adjacently in terms of guiding statements (column 6 and 8). The last column shows the formulated solutions of the sub-problems in which the representatives reached consensus as part of the integral solution.

133
### Table 27: Sub-analysis 1: impact on the dominant perspectives

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Problem</th>
<th>Perspective</th>
<th>Guiding statement (GS)</th>
<th>Perspective</th>
<th>Guiding statement</th>
<th>Elements of the integral solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Many complaints from customers about not knowing the state of progress</td>
<td>Customer</td>
<td>New GS: status of progress file logistics must always be visible to customer</td>
<td>Processes</td>
<td>New GS: transparency per file in massive processing</td>
<td>Automate logistics on file level</td>
</tr>
<tr>
<td>2</td>
<td>Many discussions and problems with suppliers on their payments</td>
<td>Supplier</td>
<td>New GS: No deals with operational staff</td>
<td>Processes</td>
<td>New GS: Manage suppliers by supply management.</td>
<td>Organize professional supply management</td>
</tr>
<tr>
<td>3</td>
<td>Major problems due to file loss</td>
<td>Processes</td>
<td>New GS: file loss at all times avoid</td>
<td>Suppliers</td>
<td>New GS: File loss sanction</td>
<td>Develop SLA’s and sanctions</td>
</tr>
<tr>
<td>4</td>
<td>Inadequate cooperation of chain parties led to a lot of money, quality and time loss.</td>
<td>Chain cooperation</td>
<td>New GS: We carry out chain management</td>
<td>Org. structure</td>
<td>New GS: We have the mandate chain management</td>
<td>Organize chain management including chain mandate and development of a chain-test.</td>
</tr>
<tr>
<td>5</td>
<td>Execution costs too high</td>
<td>Processes</td>
<td>New GS: Recovery and failure costs are from now in line with the market</td>
<td>Processes</td>
<td>New GS: Checks as early as possible in the process</td>
<td>Redesign the primary processes</td>
</tr>
<tr>
<td>Nr. Problem</td>
<td>Perspective</td>
<td>Guiding statement</td>
<td>Guiding statement (GS)</td>
<td>Persuasive evidence</td>
<td>Sub-analysis 2: impact on the sub-ordinate perspectives</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------------</td>
<td>------------------------</td>
<td>---------------------</td>
<td>------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Awareness of low change ability towards the necessary interventions.</td>
<td>Org structure</td>
<td>New SS: The change must continually adjust our ambitions.</td>
<td>New SS: The change should be carried out at the place of execution by authorized officials.</td>
<td>Remove the outsourcing parties and outsourcing contracts and revalidate them on legal regulations.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Execution is insufficient compliant with international laws.</td>
<td>Laws &amp; regulations</td>
<td>Existing SS: The execution should be compliant to legislation.</td>
<td>New SS: ICF must support the entire chain.</td>
<td>Picture the life exchange. Organize multi-channel support.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ICF support is insufficient.</td>
<td>ICF</td>
<td>New SS: Communication only by mail, telephone and internet.</td>
<td>New SS: The outsourcing parties and outsourcing contracts and revalidate them on legal regulations.</td>
<td>New SS: We communicate only by mail, telephone and internet.</td>
<td></td>
</tr>
</tbody>
</table>

Table 28. Sub-analysis 2: impact on the sub-ordinate perspectives
We continue with an explanation of Table 29 and Table 30. In the column ‘Solution idea’, ideas are expressed which emerged when determining the solution space. In the third column ‘Perspective’ the perspectives are shown the representatives in the session perceived as most relevant to the solution idea. In the adjacent columns the guiding statements are shown that form the framework for the idea in terms of possibilities and impossibilities. Newly developed guiding statements are also listed here. In the last column the solutions toward the ideas are expressed for which the representatives reached consensus.
We continue with an explanation of Table 29 and Table 30. In the column 'Solution idea', ideas are expressed which emerged when determining the solution space. In the third column 'Perspective', the perspectives are shown the representatives in the session perceived as most relevant to the solution idea. In the adjacent columns the guiding statements are shown that form the framework for the idea in terms of possibilities and impossibilities. Newly developed guiding statements are also listed here. In the last column the solutions toward the ideas are expressed for which the representatives reached consensus.

Table 29. Sub-analysis 3: exploring solution space from the dominant perspectives

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Solution idea</th>
<th>Perspective</th>
<th>Guiding statement (GS)</th>
<th>Perspective</th>
<th>Guiding statement</th>
<th>Perspective</th>
<th>Guiding statement</th>
<th>Elements of the integral solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Applications only via Internet in order to reduce number of objections.</td>
<td>Customer</td>
<td>Existing GS: The customer has free choice of channels.</td>
<td>Services</td>
<td>New GS: Applications preferably via the Internet.</td>
<td></td>
<td></td>
<td>Encourage internet channel, maintaining freedom of choice of channels. Redevelop Internet application.</td>
</tr>
<tr>
<td>2</td>
<td>Unbundle the combined subsidy arrangement into 3 separate arrangements to reduce complexity</td>
<td>Customer</td>
<td>Existing GS: Approach the customer as little as possible for gathering data</td>
<td>Processes</td>
<td>Existing GS: 3 subsidy arrangements via one application.</td>
<td>Services</td>
<td>Existing GS: Combine gathering data from multiple arrangements</td>
<td>Proposed unbundling is not accepted, and the status quo maintained.</td>
</tr>
<tr>
<td>3</td>
<td>Fill in on beforehand previously known information from applicants to reduce many complaints</td>
<td>Customer</td>
<td>New GS: Once gathering, multiple use.</td>
<td>Services</td>
<td>New GS: The applicant receives pre-completed forms and a personalized web site.</td>
<td>Processes</td>
<td>New GS: Forms including logos, etc. are completely printed.</td>
<td>Insert pre-filled forms and complete printing solution at the solution &quot;Redesigning primary processes&quot;. Insert personified web site solution at the solution &quot;redevelop internet application&quot;.</td>
</tr>
</tbody>
</table>
To appreciate the results of the sub-analysis better, we will now discuss a concrete example. Consider Figure 47, as an illustration for problem number 4 from sub-analysis 1:

'The non-cooperative attitude of many parties in the chain resulted in a loss of money, quality and time'.

Experience has shown that working together seamlessly with twenty-eight partners, is no simple task. Many of the problems were related to this aspect. Examples include misunderstandings between the parties, not delivering on time, not being able to read each other's file formats, etc.

The discussion provided the perspective 'Chain cooperation' with a new guiding statement 'we carry out chain management'. The effect on the perspective 'Processes' was the addition of the guiding statement 'carry out a chain test prior to the execution', and on the perspective 'Organization structure' the addition of the guiding statement, 'we have the mandate on chain management'. The reached solution for this problem was: 'organize chain management including a clear mandate, and develop a chain integration test'. When the mandate for the chain authority had been arranged, all the activities in the chain could be governed in a coherent way. An important consequence of the introduction of a clearer chain authority was the development and execution of a comprehensive test programme to test the integrity of the chain. Many problems regarding the required collaboration of the involved parties, especially in the area of data exchange, could be avoided as a result of having done this test.

Figure 47. Sub-analysis nr 1, problem nr 4

---

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Solution idea</th>
<th>Perspective</th>
<th>Guiding statement(GS)</th>
<th>Perspective</th>
<th>Guiding statement</th>
<th>Perspective</th>
<th>Guiding statement</th>
<th>Elements of the integral solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Work with multiple work shifts to meet the legal deadlines for the subsidy arrangements.</td>
<td>Culture</td>
<td>Existing GS: We will respectful to the interests of our employees.</td>
<td>Processes</td>
<td>New GS: Overtime or multiple shifts only in exceptional circumstances and after approval of the works council.</td>
<td></td>
<td></td>
<td>Working in multiple shifts was no longer seen as a solution.</td>
</tr>
<tr>
<td>2</td>
<td>No longer outsourcing of massive routinely sub processes, but carry out these processes themselves to hold more control.</td>
<td>Culture</td>
<td>Existing GS: We will respectful to the interests of our employees.</td>
<td>Processes</td>
<td>New GS: Highly skilled employees carry out highly skilled work.</td>
<td></td>
<td></td>
<td>Maintain the outsourcing, and govern the outsourcing professional.</td>
</tr>
</tbody>
</table>
To appreciate the results of the sub-analysis better, we will now discuss a concrete example. Consider Figure 47, as an illustration for problem number 4 from sub-analysis 1: ‘The non-cooperative attitude of many parties in the chain resulted in a loss of money, quality and time’. Experience has shown that working together seamlessly with twenty-eight partners, is no simple task. Many of the problems were related to this aspect. Examples included misunderstandings between the parties, not delivering on time, not being able to read each other’s file formats, etc. The discussion provided the perspective ‘Chain cooperation’ with a new guiding statement ‘we carry out chain management’.

The effect on the perspective ‘Processes’ was the addition of the guiding statement ‘carry out a chain test prior to the execution’, and on the perspective ‘Organization structure’ the addition of the guiding statement, ‘we have the mandate on chain management’. The reached solution for this problem was: ‘organize chain management including a clear mandate, and develop a chain integration test’. When the mandate for the chain authority had been arranged, all the activities in the chain could be governed in a coherent way. An important consequence of the introduction of a clearer chain authority was the development and execution of a comprehensive test programme to test the integrity of the chain. Many problems regarding the required collaboration of the involved parties, especially in the area of data exchange, could be avoided as a result of having done this test.

Figure 47. Sub-analysis nr 1, problem nr 4
As a second example, consider sub-analysis 2, problem number 2: ‘The execution was not sufficiently compliant with international laws’, as illustrated in Figure 48. Every year, a number of checks are conducted by European officials regarding the degree of compliance with European laws and regulations by its member states. There was a need for better anticipation of these checks. This provided a further confirmation of the existing guiding statement at the perspective ‘Laws and regulations’: ‘the execution should be compliant to international law’. In addition, a new guiding statement was created at the perspective Processes ‘the checks have to be carried out at the place of execution by authorized officials’. Finally, a new guiding statement to the perspective ‘Suppliers’ was added, ‘all outsourced activities shall be performed in the Netherlands’. The reached solution for this problem was: ‘Renew outsourcing parties and outsourcing contracts and refocus them on the legal regulations’. This solution meant that the involved suppliers could not re-outsource the activities to a lower wage country and that the outsourced processes could be monitored in an easier way.

Figure 48. Sub-analysis nr 2, problem nr 2

As a third example, consider sub-analysis 3, solution idea number 2: ‘Unbundle the combined subsidy arrangement into three separate arrangements to reduce complexity’, as illustrated in Figure 49. To try to reduce the overall complexity of the enterprise, some representatives suggested ceasing the current situation in which three, very different, subsidy arrangements were bundled in one application. This
would imply that the applicants should be approached three times with subsidy forms. The existing principle from the perspective ‘Customer’: ‘approach the customer as little as possible for gathering data’ persisted. From the perspective ‘Processes’ the guiding statement: ‘execute three subsidy arrangements through one application’ also remained, as well as the principle from the perspective ‘Services’: ‘combine gathering data from multiple arrangements’. Maintaining the guiding statements here means a limitation of the solution space. The idea to cease combining three subsidy arrangements in one application was not accepted and the final decision for this solution idea was: ‘proposal unbundling is not accepted, and the status quo will be maintained’.

**Figure 49. Sub-analysis nr 3, problem nr 2**

As a final example, consider sub-analysis 4, solution idea number 2: ‘No longer outsource massive routine sub processes, but carry out these processes in-house to remain more in control’, as illustrated in Figure 50. This discussion concerned the consideration to, given the bad experiences, stop outsourcing critical sub-processes. This situation was rejected based on the principle ‘We show respect for the interests of our employee’ from the perspective ‘Culture’. Apparently there was a mismatch between the fact that the initially outsourced activities had a massive and routine character, while the employees were generally highly educated. This understanding resulted in a new principle in the perspective ‘Processes’: ‘highly skilled
employees carry out highly skilled work’. The final outcome for this solution idea was: ‘continue to outsource, but govern this professionally’. The choice for outsourcing was maintained and in conjunction with supply management properly governed.

Figure 50. Sub-analysis nr 4, problem nr 2

10.4 Results of the Dga case study

As a first step in the synthesis process that followed, the participants clustered the sub-solutions that logically belonged together of the four sub-analyses, see the right side of Table 31 that corresponds to the elements of the integral solution shown in Table 27 to Table 30, into clusters of the integral solution and choice of approach of the business issue at hand, see the left side of Table 31. During this synthesis process, the participants could add sub-solutions. These additions were based on the new established guiding statements, and on the overall insight of the integral solution and choice of approach. Some examples of added sub-solutions to the clusters ‘renew outsourcing’ and ‘govern the chain’ are given in Table 32.
As a first step in the synthesis process that followed, the participants clustered the sub-solutions that logically belonged together of the four sub-analyses, see the right side of Table 31 that corresponds to the elements of the integral solution shown in Table 27 to Table 30, into clusters of the integral solution and choice of approach of the business issue at hand, see the left side of Table 31. During this synthesis process, the participants could add sub-solutions. These additions were based on the new established guiding statements, and on the overall insight of the integral solution and choice of approach. Some examples of added sub-solutions to the clusters 'r
renew outsourcing' and 'govern the chain' are given in Table 32.

### Table 31. Clustering sub-solutions

<table>
<thead>
<tr>
<th>Clusters of the integral solution</th>
<th>Sub-solutions from subanalyses</th>
<th>Sub-solutions added during synthesis process based on overall insight</th>
<th>Sub-solutions added during synthesis process based on new Guiding Statements (GS)</th>
</tr>
</thead>
</table>
| Organize supply management       | • Organize professional supply management  
• Develop SLA's and sanctions |                                                                     |                                                                      |
| Govern the chain                 | • Remove the steering from the line organization and bring it in under program control.  
• Organize program management.  
• Organize chain management including chain mandate and development of a chain-test. |                                                                     |                                                                      |
| Redesign processes               | • Redesign the primary processes  
• Insert pre-filled forms and complete printing solution at the solution "Redesigning primary processes".  
• Organize multi-channel support.  
• Automate logistics on file level |                             |                                                                      |
| Renew outsourcing:               | • Renew the outsourcing parties and outsourcing contracts and refocus them on legal regulations.  
• Maintain the outsourcing, and govern the outsourcing professional. |                                                                     |                                                                      |
| Govern file exchange             | • Picture the file exchange and govern this exchange. |                                                                     |                                                                      |
| Renew internet application       | • Redevelop Internet application.  
• Encourage internet channel, maintaining freedom of choice of channels.  
• Insert personified web site solution at the solution "redevelop internet application". |                                                                     |                                                                      |
| Remain combined data gathering   | • Proposed unbundling is not accepted, and the status quo maintained  
• Working in multiple shifts was no longer seen as a solution |                                                                     |                                                                      |

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143


### Table 32. Added sub-solutions from the synthesis process

### 10.5 Evaluation of the case

At the end of the synthesis process the members of the core team of the research programme for this thesis evaluated the GEA approach based on the criteria as set up in chapter 3.2.3 Design data collection protocol for level 1 and level 2. See Table 33.

<table>
<thead>
<tr>
<th>Levels of questions</th>
<th>Nr.</th>
<th>Question</th>
<th>Score</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1</td>
<td>Are the guiding statements valid and up to date?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Do the representatives of the perspectives agree with the identified perspectives, the identified core concepts within it and the related guiding statements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Do the causes, triggers, sub problems, risks, implications, et cetera of the business issue lead to change initiatives?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Do the (existing) guiding statements result in additional change initiatives or restrictions, the solution space?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td>1</td>
<td>Are the documents at the level of purpose present and accessible?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Does the definition of the level or purpose result in a clear understanding of the sense of purpose and design of the enterprise? Do we get all the desired cohesive elements of GEA?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Is one capable to identify, and engage, the right representatives for each of the perspectives? This engagement should cover both the identification and validation of the cohesive GEA elements (ECF), and the GEA analysis processes to solve the business issue.</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Are the representatives of the perspectives able to validate the ECF?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Are the representatives of the perspectives, using the validated ECF, able to execute the analysis processes to solve major business issues?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Does the development of the ECF lead to increase coherence?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Does the use of GEA lead to an integral solution that contributes to the coherence of the enterprise?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Is the enterprise able to, independently, specify a business issue that can serve as</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

The overall conclusion of this evaluation led to the following insight: the necessary documents at the level of purpose were not easy to obtain, but after obtaining those documents the representatives of the perspectives were perfectly capable of creating an ECF and performing the analysis processes.

The elaboration of the solution and the associated implementation approach resulted in a program start architecture (PgSA) for controlling the subsequent change program. A PgSA is a GEA product that is produced to control a change program from an architectural point of view. It is produced after a positive decision on the integral solution and approach is obtained. In the PgSA the integral solution and choice of approach is included, and the cohesive elements of the ECF relevant for the change program. Finally the PgSA is supplemented by the enterprises accepted norms and standards for relevant aspects of the change program such as e.g. norms and standards in the areas of security, process design, et cetera. Such a PgSA formed the first part of the contract with the designated program manager. The execution of the change program according to the PgSA led to the following results and associated benefits:

- the execution of the subsidy arrangement is now conducted within the set time limits, and agreed budget
- the return of application forms due to application errors was reduced from 62% to 35%, and now falls within the error tolerance
- the number of objections was reduced from 22.000 to 7.000 with corresponding reduction in associated costs
- the Internet based participation of applicants rose from 0.5% to 6%
- the European supervisory authority and the Dutch parliament were satisfied about the results and answers on their submitted questions with regard to the new outsourcing parties:
  - their performance was in line with the agreed quality, time and budget
  - not one client dossier has been lost
  - given the good performance all contracts were subsequently prolonged
At the end of the synthesis process the members of the core team of the research programme for this thesis evaluated the GEA approach based on the criteria as set up in chapter 3.2.3 Design data collection protocol for level 1 and level 2. See Table 33.

### Table 33. Evaluation of the GEA approach Dga level 1 and level 2 questions

<table>
<thead>
<tr>
<th>nr.</th>
<th>question</th>
<th>score</th>
<th>remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are the guiding statements valid and up to date?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Do the representatives of the perspectives agree with the identified perspectives, the identified core concepts within it and the related guiding statements?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Do the causes, triggers, sub problems, risks, implications, et cetera of the business issue lead to change initiatives?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Do the (existing) guiding statements result in additional change initiatives or restrictions the solution space?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are the documents at the level of purpose present and accessible?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Does the definition of the level or purpose result in a clear understanding of the sense of purpose and design of the enterprise?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Is one capable to identify, and engage, the right representatives for each of the perspectives? This engagement should cover both the identification and validation of the cohesive GEA elements (ECF), and the GEA analysis processes to solve the business issue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Are the representatives of the perspectives able to validate the ECF?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Are the representatives of the perspectives, using the validated ECF, able to execute the analysis processes to solve major business issues?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Does the development of the ECF lead to increase coherence?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Does the use of GEA lead to an integral solution that contributes to the coherence of the enterprise?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Is the enterprise able to, independently, specify a business issue that can serve as input to a GEA based analysis?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Do the owners of the business issue succeed in specifying the business issue in such a way the representatives of the prospects can perform the complete GEA analysis and develop an integral solution?</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

The overall conclusion of this evaluation led to the following insight: the necessary documents at the level of purpose were not easy to obtain, but after obtaining those documents the representatives of the perspectives were perfectly capable of creating an ECF and performing the analysis processes.

The elaboration of the solution and the associated implementation approach, resulted in a program start architecture (PgSA) for controlling the subsequent change program. A PgSA is a GEA product that is produced to control a change program from an architectural point of view. It is produced after a positive decision on the integral solution and approach is obtained. In the PgSA the integral solution and choice of approach is included, and the cohesive elements of the ECF relevant for the change program. Finally the PgSA is supplemented by the enterprises accepted norms and standards for relevant aspects of the change program such as e.g. norms and standards in the areas of security, process design, et cetera. Such a PgSA formed the first part of the contract with the designated program manager. The execution of the change program according to the PgSA led to the following results and associated benefits:

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- the number of objections was reduced from 22,000 to 7,000 with corresponding reduction in associated costs
- the Internet based participation of applicants rose from 0.5% to 6%
- the European supervisory authority and the Dutch parliament were satisfied about the results and answers on their submitted questions
- with regard to the new outsourcing parties:
  - their performance was in line with the agreed quality, time and budget
  - not one client dossier has been lost
  - given the good performance all contracts were subsequently prolonged
10.6 Discussion and conclusions towards the GEA method

The Dga case study brought us the following insights on the application of GEA.

- The initial investment by making the enterprise coherence explicit in terms of the ECF is repaid in terms of a better understanding of the enterprise’s environment, the stimulation of innovation within, and beyond, the boundaries of the enterprise and a vast improvement of the collaboration of all parties involved.

- Application of GEA leads to achievable and high quality solutions. The execution of the subsidy arrangements was within time and within the agreed budget, while substantial savings in operating costs were achieved. More specifically, in the Dga case, a reduction from 22,000 to 7,000 applications, with an average of 10 hours spent per application by lawyers, resulted in a saving of millions of Euros.

- Application of GEA implies the involvement of the key social forces in an enterprise and redirects these into a valuable business asset. More specifically, the key players of the enterprise, the representatives of the perspectives in this case, came to know and trust each other more during the design of the GEA framework, and gained a better insight into and understanding of each other's domains. The existing mutually distrustful atmosphere was changed in the GEA sessions as they led to much more insight and understanding of each other's work practices on behalf of the participants. The participants were also willing, at the end of sub analysis 1, to transfer the responsibility and the associated power to a chain program manager. Finally the decision on the proposed solution, could be made because the decision makers knew that these decisions were developed integrally and supported by all the parties involved.

- The process of bringing and keeping the key players together in the workshop sessions requires strong and competent facilitators, enterprise architects.

- The level of quality at which the business issue in all its facets is introduced determines the quality of the integrated solution. The business issue at hand was thoroughly analysed by the problem owners prior to the impact analysis sessions in terms of causes, degree of urgency and importance, and was presented clearly at the beginning of the impact analysis sessions. Based on this presentation the perspective-owners were able to make a translation to their own part of the enterprise environment.

- A major business issue can perturb enterprise coherence in all its facets at the moment an enterprise decides to react on it. This means that all the preserved, newly added, eliminated and modified cohesive elements must be established in a new actual state of the enterprise coherence at the moment the decision to adopt an integral solution is made. In doing this, the enter-
prise becomes ready to develop an integral solution for a next business issue.

- In the future, during further development of GEA, we should pay more attention to the following lessons.
  1. Application of GEA leads to a strong increase in transparency. Not all managers are equally happy about this as this offers the possibility for criticizing others on their functioning.
  2. Success resulting from the application of GEA is used up quickly, the acquisition of working methods according to GEA requires more effort. The agency felt back, relatively soon, into old inefficient behaviours after our departure.

In summary, we conclude that the case study shows that an incoherent, chaotic situation after application of the enterprise coherence governance instrument GEA, was transformed into a coherent, regulated enterprise. The presented case study demonstrated that with the application of GEA substantial performance improvements can be achieved. In this, real world case study, a totally derailed enterprise was brought back in control within a single year, while also making substantial savings, however, these gains are difficult to maintain in reality.
11 Case study DJI

11.1 Introduction

The case study concerned the introduction of a new law at the Dienst Justitiële Inrichtingen (DJI). The DJI is an agency of the Dutch Ministry of Security and Justice. The DJI is, on behalf of the Dutch Minister of Security and Justice, responsible for the enforcement of fines and custodial measures, following a decision imposed by a judge. With over one hundred locations across the country and some 17,000 employees the DJI is one of the largest enterprises in the Netherlands. The DJI yearly hosts for shorter or long periods about 70,000 ‘guests’ at any one time. Detention of persons takes place in several different types of establishments, such as in prisons and detention facilities for adults, respectively called penitentiary institutions (PI), but also in special facilities for the youth, the youth custodial institutions, for patients submitted to detention under government section there are forensic psychiatric centres (FPC) and for foreigners DJI makes use of detention and deportation centres. Since DJI is an agency, this means that DJI has a certain degree of autonomy. A yearly budget is allocated to DJI by the Dutch ministry of Security and Justice and agreements are made on the DJI deliverables.

The case concerns the introduction of a new law on early release of prisoners, the law of ‘conditional release’.

In the case, two key questions needed to be answered: (1) What are the effects of the introduction of this new law on our enterprise?, and (2) What are the best choices in terms of solution direction and approach?

A series of workshops was conducted at DJI, in the first half of 2007, with the aim of formulating/identifying the relevant cohesive elements in terms of the DJI specific enterprise coherence framework.

Using this framework, on July 2, 2007, the GEA-process ‘develop integral solution’ was performed with the aim of solving the aforementioned business problem. The main objective was to provide a founded recommendation with regards to the desired future direction, and general approach to achieve this, to the senior management of DJI. Part of the enterprise coherence framework and the results of this day session are included in this chapter.

A report of this case in terms of: (1) the development of a part of the DJI enterprise coherence framework, (2) the results achieved to solve the business problem related to the new law of ‘conditional release’, (3) recommendations regarding the implementation of the GEA approach at DJI and (4) insights in favour of the GEA theory is provided in this chapter.
11.2 The ECF for the DJI

A number of intensive workshops was held at the start of the development of an enterprise coherence framework for the DJI. These workshops involved the executives of the agency, complemented with a number of opinion leaders and key stakeholders. These MetaPlan workshops [79], resulted in a list of the cohesive elements and their definitions, covering both the purpose level and design level of the DJI enterprise. The starting point for creating this list was the strategic documents of the enterprise such as the mission statement, vision notes, policy plans, business strategy and business plan. Using these data a first draft was made of the enterprise coherence framework. Within this framework the set of enterprise specific perspectives, i.e. the angles from which to govern the enterprise and its transformations, was determined. This set of eleven perspectives and their core concepts is depicted in Table 34. The definitions of the perspectives for the DJI are shown in Table 35. Discussing the formulation of all the guiding statements would go beyond the purpose of this paper, however, the main guiding statements for the perspective Processes are shown in Table 36.

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Services</th>
<th>Processes</th>
<th>Stakeholders</th>
<th>Culture</th>
<th>Security</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core concepts</td>
<td>Customer (Police, etc.)</td>
<td>Result</td>
<td>Detainees</td>
<td>Leadership Style</td>
<td>Personal protection</td>
<td>Paymen</td>
</tr>
<tr>
<td>Service level</td>
<td>Effect</td>
<td>Chain partners</td>
<td>Values</td>
<td>Information security</td>
<td>Working conditions</td>
<td></td>
</tr>
<tr>
<td>Production asset</td>
<td>Means</td>
<td>Society</td>
<td>Behavior</td>
<td>Fire protection</td>
<td>Trade unions</td>
<td></td>
</tr>
<tr>
<td>Design/Specifications</td>
<td>Control</td>
<td>Politics</td>
<td>Standard</td>
<td>Security level</td>
<td>Competencies</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Organization</td>
<td>Principal</td>
<td>Employee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Law &amp; regulations</td>
<td>Standard (NEN definition)</td>
<td>Employee</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment requirements</td>
<td>Supervisory authority</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 34. Perspectives and Core concepts of DJI’s ECF

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>All results produced by DJI within the context of legal frameworks, or through agreements with statutory authorities, and that are delivered to customers.</td>
</tr>
<tr>
<td>Processes</td>
<td>A coherent set of activities needed to deliver results of DJI, products, services, support.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Legal entities or persons for whom the activities of DJI are important.</td>
</tr>
</tbody>
</table>
### Definitions of perspectives of the Enterprise Coherence Framework DJI

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>Explicit and implicit norms, values and behaviours within the DJI organization.</td>
</tr>
<tr>
<td>Security</td>
<td>The way in and degree of control for DJI relevant risks.</td>
</tr>
<tr>
<td>Employees</td>
<td>All persons who execute tasks or activities within the DJI organization in the broad sense.</td>
</tr>
<tr>
<td>Detainees</td>
<td>A natural person in respect of whom at any time, based on a valid title, the execution of a custodial sentence or detention order has been imposed under the responsibility of the DJI.</td>
</tr>
<tr>
<td>Governance</td>
<td>The influencing of the organization so that a desired goal is attained.</td>
</tr>
<tr>
<td>Information provision</td>
<td>All processes, activities, people and resources for obtaining, processing and delivery of relevant information.</td>
</tr>
<tr>
<td>Finance</td>
<td>The planning, acquisition, management and accountability of funds DJI.</td>
</tr>
<tr>
<td>Organisational structure</td>
<td>Describes the organizational form and operation of the organization and consists of three subsystems: function structure, personnel structure and organisational structure.</td>
</tr>
</tbody>
</table>

#### Table 35. Definitions of perspectives of the Enterprise Coherence Framework DJI

<table>
<thead>
<tr>
<th>Guiding Statement</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes need to work together, prevent sub optimization and inconsistencies, do not pursue conflicting goals, both in internal and external chains.</td>
<td>Principle</td>
</tr>
<tr>
<td>Effectiveness comes before efficiency, security is not to explain in monetary terms.</td>
<td>Principle</td>
</tr>
<tr>
<td>For each process one supporting application system instead of multiple systems, de-duplication.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>Work towards standardization, uniformity, et cetera.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>Standardization of work processes.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>The primary process must be scalable, DJI ensures timely availability of capacity where needed, which is unpredictable</td>
<td>Principle</td>
</tr>
<tr>
<td>Guiding Statement</td>
<td>Type</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>and whose requirements may not be clear.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>The target group layout of our prisoners, imprisoned psychiatric patients and, underage delinquents, pupils is a decisive criterion for process design and process implementation.</td>
<td>Principle</td>
</tr>
<tr>
<td>Outsourcing is subject to safety criteria, commercial interests should not negatively affect safety.</td>
<td>Principle</td>
</tr>
<tr>
<td>Improve the detainees flow through the different detention types.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>Processes must be verifiable, make results explicit, visible, measurable, and deliver results according to desired specifications, make DJI contribution explicit to objectives.</td>
<td>Principle</td>
</tr>
<tr>
<td>Primary processes should be organized integrally, in conjunction, seamlessly and both manual and automated operations should also be modelled integrally. The focus is primarily focused on optimizing the processing flow.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>Business strategists, enterprise architects, process analysts and IT experts, should work jointly on the modelling of the primary process.</td>
<td>Policy statement</td>
</tr>
<tr>
<td>DJI aims for a common business process model.</td>
<td>Principle</td>
</tr>
<tr>
<td>Process improvement and redesign makes use of the common business model, various efficiency goals, less IT, interoperability, standardization, et cetera.</td>
<td>Principle</td>
</tr>
<tr>
<td>The processes should be clearly described and up to date.</td>
<td>Principle</td>
</tr>
</tbody>
</table>

Table 36. Guiding statements for the processes perspective

### 11.3 The process followed in the case study

With the ECF in place, the next step was to organize a workshop with representatives of the perspectives of DJI's enterprise coherence framework. In this workshop, the business issue at hand was placed centrally and analysed in terms of two questions according to the GEA method. During the workshop, the representatives of the perspectives had, delegated, ownership for ‘their’ perspective, including its cohesive elements, in the real enterprise, i.e. not just the documentation. At the start of this workshop, the owner of the business issue gave a thorough introduction to the issue in terms of causes, degree of urgency, degree of interest, differences between the existing and new law, implications, risks, etc. This introduction gave the representatives of the perspectives a deeper insight into the associated issues of this business issue, enabling them to make a translation of the issue to their own
perspective. Now the representatives of the perspectives were able to determine jointly, which perspectives were most affected by/related to the business issue at hand. These perspectives are called dominant, for the issue at hand, and the others subordinate. In this case the perspectives Processes, Services and Stakeholders were addressed as dominant and the rest of the perspectives as subordinate. The business issue: ‘effects of the new law on conditional release’ was then addressed in terms of two questions, leading to two sub-analyses of the business issue.

1. Determine the impact of and the solution space for the business issue on the dominant perspectives.
2. Determine the impact of and the solution space for the business issue on the sub-ordinate perspectives.

11.3.1 Sub analysis on the dominant perspectives

All the participants got an opportunity to indicate for the dominant perspectives what they considered to be the most important guiding statements. Twelve guiding statements were highlighted within the three dominant perspectives. These guiding statements provide, most strongly, either direction, or a restriction on the solution direction and choice of approach to the business problem. Below we show, for the three dominant perspectives, the most relevant guiding statements, the resulting insights and recommendations on decision-making for the management of DJI, see Table 37.
In this case the perspectives Processes, Services and Stakeholders were addressed subordinate. These perspectives are called dominant, for the issue at hand, and the others regarding the execution of the new law on conditional release the same businesses process model should be used as in the projects RR and PP. There threatens to fail cohesion; the main themes of detention and resocialisation are likely to be treated separately, through conducting three projects. This can lead to non-ordinated process modification and / or unnecessary duplication of IT systems.

Guiding Statement (GS)

<table>
<thead>
<tr>
<th>Perspective</th>
<th>GS</th>
<th>Insights</th>
<th>Elements of the integral solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes</td>
<td>1</td>
<td>Processes need to work together, (present sub optimization and inconsistencies, do not pursue conflicting goals, both in internal and external chains)</td>
<td>There are linkages to existing projects within DJI, such as RR (Reducing Recidivism) and PP (Programme Penitentiary). Integrate the relevant projects into one resocialisation programme and set a chain-wide process model to identify and support the mutual cooperation of processes.</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Process improvement and redesign makes use of the common business model (various efficiency goals, less IT, interoperability, standardization, ...).</td>
<td>Regarding the execution of the new law on conditional release the same businesses process model should be used as in the projects RR and PP.</td>
</tr>
<tr>
<td>Services</td>
<td>2</td>
<td>We check regularly whether the social effects of our products and services correspond with our goals (we want to know if the frameworks of functional execution objectives are met, namely encouraging security)</td>
<td>This guiding statement states that concerning the 'new law on conditional release' objectives should be clear in order DJI can examine if their products and services contribute effectively to the objectives of the new law. Adjust the objective of the implementation program of this new law.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>We make agreements about the quality of our service and we regularly test if we met these agreements laid down in service levels. (continuous pursuit of enhance customer satisfaction and product development)</td>
<td>This guiding statement indicates that products and services, such as term calculations and reports on detainees, should be tuned with stakeholders (including Public Prosecutor) about what the quality can and should be and what product development is needed. Product development is necessary to establish measurement points about indications of Detainees under this new law to increase customer satisfaction (with the society as a client), and the added value of DJI can be indicated.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>For cell capacity we never sell no (politically / socially unacceptable).</td>
<td>The guiding statement indicates that in fact any amendment of the law finally will be executed while high performance and cost implications are accepted. The introduction of the &quot;new law&quot; would lead to capacity adjustments. Probably, the introduction of this new law is a good moment to transfer the cell capacity forecast at the Public Prosecution where DJI, like all the other chain partners, provides this data. Let the chain partners forecast the impact on the cell capacity and determine whether the execution of the cell capacity forecast and the term calculation can be transferred to the Public Prosecution.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>The degree in which objectives are achieved is largely determined by staff and the social interactions between staff and Detainees (many objectives as reducing recidivism can only be achieved through social and psychological processes)</td>
<td>The guiding statement clearly indicates that the quality of products and services are largely determined by staff in interaction with Detainees and raises the questions what would be changed in the interactions in the treatment of Detainees and what are the necessary changes in the competencies of employees by implementing this new law. Investigate the necessary changes in the interactions with Detainees and competencies of employees.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>2</td>
<td>DJI operates transparently to all stakeholders as far as legislation permits (to achieve best collaboration and to contribute to efficiency and effectiveness with these stakeholders)</td>
<td>The guiding statement indicates that it is desirable DJI specifies very clear the tasks, responsibilities and authorities to all stakeholders concerning the implementation of this new law. More transparent collaboration and more visibility in what DJI does. It is stated however that this guiding statement is not always respected; there is a tendency for each chain partner to prioritize its own interests above the chain interest, while the opposite should be: &quot;Chain interests is beyond partner interest&quot;. Know from all chain partners their requirements with regard to effectiveness and efficiency, formulate the DJI contribution to this and communicate new tasks and responsibilities to all stakeholders in which chain interests is beyond partner or service interest.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>DJI operates to stakeholders as one company (uniformity in appointments is required on strategic, tactical and operational level)</td>
<td>In the context of the execution of this new law it is also important to appoint all internal parties to let them timely collaborate and then make sure to come forward as one company, so that stakeholders get a (more) clear clue where DJI stands for. DJI has to come forward as one company at all stakeholders, so the stakeholders know where DJI stands for.</td>
</tr>
</tbody>
</table>

Table 37. Impact of and the solution space for the business issue on the dominant perspectives

11.3.2 Sub analysis on the sub dominant perspectives

The guiding statements pertaining to the sub-ordinate perspectives can also provide insights into possible solutions and choices of approach. This is shown for the perspectives Governance, Information provision, Detainees and Finance respectively in Table 38.
### Sub analysis 2: Impact of and the solution space for the business issue on the sub dominant perspectives

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Guiding statement (GS)</th>
<th>Insights</th>
<th>Elements of the integral solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance</td>
<td>DJI is responsible for the translation of ministerial policies into tactical and operational goals and achieves them in a way clear and transparent to all stakeholders.</td>
<td>This guiding statement provides the insight of the need to determine the objectives of the “new law on conditional release”, to incorporate these into the programme plan and to communicate them to stakeholders.</td>
<td>Define the implementation process of the “new law on conditional release” and ensure consistency with the strategy and objectives.</td>
</tr>
<tr>
<td></td>
<td>DJI ensures that the target with respect to capacity, as defined in the judiciary budget and any supplement thereto timely, fully and efficiently will be realized.</td>
<td>This guiding statement provides the insight that the uncertainty in capacity requirements of the “new law on conditional release” must be included in the capacity calculation.</td>
<td>Adjust the capacity calculation in line with the “new law on conditional release”.</td>
</tr>
<tr>
<td></td>
<td>DJI takes maximum advantage of the opportunities for synergy which occur within the organization.</td>
<td>This guiding statement leads to the observation that all projects that deal with reintegration must be combined.</td>
<td>Bundle the implementation of the “new law on conditional release” with the existing projects RR and PP into one change programme.</td>
</tr>
<tr>
<td>Information provision</td>
<td>Project Coordination: All (business) projects involving IT solutions, will be monitored by a central project coordination point and all the major and important projects will be submitted to the Executive Board for approval.</td>
<td>The implementation programme “new law on conditional release” meets the criteria large and important.</td>
<td>Apply the implementation programme “new law on conditional release” to the central project coordination point, so that on that level consistency with other projects can be monitored.</td>
</tr>
<tr>
<td></td>
<td>Project Management: All projects are judged by the project coordination process to ensure that they have a suitable sponsor, business case and approach.</td>
<td>All projects, including the implementation program “new law on conditional release”, are obliged to conform to the latest DJI Project Management Guidelines.</td>
<td>Identify the consequences the DJI Project Management Guidelines represent for the implementation programme “new law on conditional release”.</td>
</tr>
<tr>
<td></td>
<td>Purchase and procurement: Where common standards exist for services and/or technologies, a set of common (out) sourcing solutions and purchase agreements are used. Faculties are bound to these rules unless there are reasonable grounds for not doing so. In this case permission is required of the Executive Board.</td>
<td>The implementation programme “new law on conditional release” must be synchronized and that the re-integration issue should be considered from a process point of view.</td>
<td>The implementation programme “new law on conditional release” must be synchronized with the same businesses process model as the projects RR and PP and partial solutions are to be synchronized with other existing or yet to develop solutions.</td>
</tr>
<tr>
<td>Detainees</td>
<td>1 DJI will ensure the best possible return of the Judicial to society.</td>
<td>This is the principle of rehabilitation that involves collaboration with third parties including the social rehabilitation service. In the context of the “new law on conditional release”, this cooperation should be intensified in order to meet the goals of this new law. Think about drafting of opinions on specific conditions. Sideline here is the relatively small number of expected Detainees that qualifies for the new law.</td>
<td>Intensify the collaboration with third parties in the context of the new law on conditional release in order to meet the desired goals.</td>
</tr>
<tr>
<td></td>
<td>6 DJI pursues a high quality of term calculation</td>
<td>The term calculation is an issue of concern; this would be the responsibility of the Public Prosecution. They should ensure the organization of the right information management system. DJI would like to be one of the partners obliged to supply information for input.</td>
<td>Investigate if the execution of the forecast capacity requirement and the term calculation could be transferred to the Public Prosecution.</td>
</tr>
<tr>
<td>Finance</td>
<td>4 DJI aims for a transparent financial accountability</td>
<td>For the “new law on conditional release” it means the requirements of transparency may be reviewed (audit), eg by the internal audit department of DJI. Furthermore, implementation of this new law as a project makes the implementation sooner and better measurable.</td>
<td>Audit periodically and independently the transparency of the term calculation.</td>
</tr>
<tr>
<td></td>
<td>5 In the context of responsible financing DJI pursues a multiyear budget vision, to make correct long-term investments, ie to become more flexible in the deployment of capacity.</td>
<td>Due to the issue of the “new law on conditional release” the project (also) must provide financial projections for the long term.</td>
<td>Incorporate a long-term prognosis and translate it into a multi-annual investment plan.</td>
</tr>
</tbody>
</table>

Table 38. Impact of and the solution space for the business issue on the sub dominant perspectives
11.4 Results of the DJI case study

The synthesis of the two conducted sub-analyses resulted in an integral solution and associated realisation strategy. The core advice to the management of the DJI was:

*Opt for one integrated approach. Integrate the relevant projects into one rehabilitation program, Processes GS 1 and Governance GS 6. Let central project coordination monitor for coherence, Information provision GS 5, in view of the supposed coherence with the projects Reducing Recidivism (RR) and Penitentiary Programme (PP), and the running chain processes.*

See Table 37 and Table 38 for the referenced guiding statements (GS).

Additional recommendations included:

- investigate if the execution of the forecast capacity requirement and the term calculation can be transferred to public prosecution. Nevertheless, periodically and independently, audit the transparency of the term calculation, Finance GS 4.
- develop a programme plan from the DJI point of view, including the translation into objectives. Specify the associated costs and benefits for DJI, Services GS 2, Governance GS 1. Check whether the efforts outweigh the benefits. Incorporate a long-term prognosis and translate this into a multiannual investment plan, Finance GS 5.
- define a chain-wide process model to identify and support the mutual cooperation of processes, Processes GS 1 and treat re-integration issues from a process point of view, Information provision GS 7.
- let the chain partners forecast the impact on cell capacity, while taking greater uncertainties into consideration, and possible impacts of the decisions of judges, Services GS 4.
- investigate the necessary changes in the interactions with detainees, and the needed competencies for employees, Services GS 6.
- more clearly position the role and task of DJI in the programme ‘new law of conditional release’. Outwardly communicate with one clear message to all chain partners ‘chain interest goes beyond partner interest or service interest’, Stakeholder GS 2 and 3.
- ensure that we know the requirements of all of our chain partners with regard to effectiveness and efficiency, and formulate DJI’s contribution to this, Stakeholder GS 2.
- develop a measurement instrument to visualize the added value of DJI and the impact of the new law; develop this instrument along with the social rehabilitation service and other chain partners, Services GS 3.
11.5 Evaluation and conclusions

In this chapter, we discussed a real world case study involving the use of the GEA method. In an evaluation session, the participants in the workshop shared what they found positive about the GEA approach, and what could be improved.

Positive aspects:
- with the DJI-framework, and the right people involved, it only took one day to achieve remarkable results. It even produced quick wins that could lead to short term improvements.
- the most relevant guiding statements were quickly addressed, while also offering guidance during the elaboration of the business issue at hand.
- the insights and sub-solutions were identified swiftly using the coherence framework.
- the GEA approach stimulates considerations about impacts and approaches, while not forcing/inviting thinking in terms of specific solutions too early.
- the DJI framework is a good testing framework, it provides immediately useful results. The discussions aid in making the framework come to ‘life’.
- a separate project with all the additional costs was avoided because the GEA method was used.

What could be improved:
- relevant relationships were not explicitly named. Having these available would have made it easier to detect the full impact on the perspectives.
- in future more input is needed from the line organization. In the current situation, DJI’s, GEA based, coherence framework was too much the instrument of corporate staff.
- because of scheduling problems it was not possible to involve all the representatives of the perspectives on a single day. To complete a comprehensive picture, this is additionally required, and should bring further, important, new insights and recommendations.

At the end of the synthesis process the members of the core team of the research programme for this thesis evaluated the GEA approach based on the criteria as set up in chapter 3.2.3 Design data collection protocol for level 1 and level 2. See Table 39.

The overall conclusion of this evaluation led to the following insight: the required documents at the level the purpose were not easy to obtain and setting up the ECF was a lengthy and time-consuming task, but after creating the ECF the representatives of the perspectives were perfectly capable of performing the analysis processes. The long time it took to set up the ECF was mainly a result of the culture of
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### Evaluation of the GEA approach at DJI

<table>
<thead>
<tr>
<th>Levels of questions</th>
<th>Nr.</th>
<th>Question</th>
<th>Score</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1</td>
<td>Are the guiding statements valid and up to date?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Do the representatives of the perspectives agree with the identified perspectives, the identified core concepts within it and the related guiding statements?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Do the causes, triggers, sub problems, risks, implications, etcetera of the business issue lead to change initiatives?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Do the (existing) guiding statements result in additional change initiatives or restrictions, the solution space?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Level 2</td>
<td>1</td>
<td>Are the documents at the level of purpose present and accessible?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Does the definition of the level of purpose result in a clear understanding of the sense of purpose and design of the enterprise? Do we get all the desired cohesive elements of GEA?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Is one capable of identifying, and engaging, the right representatives for each of the perspectives? This engagement should cover both the identification and validation of the cohesive GEA elements (ECF), and the GEA analysis processes to solve the business issue.</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Are the representatives of the perspectives able to validate the ECF?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Are the representatives of the perspectives, using the validated ECF, able to execute the analysis processes to solve major business issues?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Does the development of the ECF lead to increase coherence?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Does the use of GEA lead to an integral solution that contributes to the coherence of the enterprise?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Is the enterprise able to, independently, specify a business issue that can serve as input to a GEA based analysis?</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Did the owners of the business issue succeed in specifying the business issue in such a way that the representatives of the prospects could perform the complete GEA analysis and develop an integral solution?</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Table 39. Evaluation of the GEA approach DJI level 1 and level 2 questions
We were not involved in the follow up of this case, however immediately following this case the recommendations led to the start of an improvement project for the architecture function at DJI.

### 11.6 Experiences and insights for improving GEA

The DJI case study yielded the following insights into GEA:

- the initial investment involved in making the enterprise coherence explicit in terms of the ECF is repaid well by a better understanding of the environment, the stimulation of innovation within the company’s boundaries or even beyond and a vast improvement of the collaboration of all parties involved.
- the application of GEA leads to achievable and high quality solutions.
- application of GEA implies the involvement of the key social forces in an enterprise and redirects these into ‘a valuable business asset’. More specifically, the key players of the enterprise, the representatives of the perspectives in this case, got to know and trust each other more during the design of the GEA framework, and gained a better insight into and understanding of each other’s domains.
- the process of bringing and keeping the key players together in the workshop sessions requires strong and competent facilitators, enterprise architects.
- the quality with which the business problem in all its facets is introduced determines the quality of the integrated solution.
- a major business issue can perturb an enterprise’s coherence in all its facets at the moment an enterprise decides to react to this. This means that all the preserved, newly added, eliminated and modified cohesive elements must be established in a new actual state of the enterprise coherence at the moment the decision to adopt an integral solution is made. In doing this, the enterprise becomes ready to develop an integral solution for its next business issue.
- there are several ways to create an ECF. In this case it was almost entirely done by the representatives of the perspectives. In other cases, the facilitators mainly developed the ECF after which the representatives of the perspectives the ECF established its validity in a validation session. The first method requires more processing time but has the advantage that the ECF becomes more ‘enterprise-own’ and owned. The latter approach allows for a faster start to an impact analysis of a business case and thus allows faster tangible results.

As discussed in the introduction, in the case of the DJI of the Dutch Ministry of Security and Justice, the GEA method was a given, however, as also indicated, the GEA method is being continuously developed using a design science rhythm. The lessons learned, as listed in the previous section, have already lead to further improvements of the GEA method.
As discussed in the introduction, in the case of the DJI of the Dutch Ministry of Security and Justice, the GEA method was a given, however, as also indicated, the GEA method is being continuously developed using a design science rhythm. The lessons learned, as listed in the previous section, have already lead to further improvements of the GEA method.
12 Case study SAE

12.1 Introduction

An application of the GEA method in the Dutch public sector, more specifically involving the Dutch Ministry of Social Affairs and Employment (SAE) is described in this chapter. The overall goal of this Ministry is to strengthen the social and economic fabric of the Netherlands. More specifically it aims to do so by ensuring work and secure incomes for the inhabitants of the Netherlands. The Ministry is therefore responsible for Dutch labour market policy, including themes such as: migration and free movement of employees, allowances and reintegration, income policy, the combination of work and care, working conditions and subsequent inspections. A short version of the SAE case has been published in [114]. This case is discussed in more detail in the current chapter, in particular in terms of the GEA method and the way in which it was actually used at the Ministry of SAE [117].

The actual case concerns the introduction of a new system for the creation of a digital document/dossier flow. The introduction of this system came as a direct consequence of a government decision to automate these document processes by 2015. It was decided by the Ministry to re-use a system that was designed, and built to support similar processes at another Ministry, the Dutch Ministry of Internal Affairs and Kingdom Relationships. Therefore, the focus of the case was not so much the creation of a new solution, but rather on determining the impact on an existing enterprise of using an existing solution. The specific business questions addressed in the case were:

1. What are the necessary change initiatives needed for the introduction of this new system?
2. What are the best choices in terms of solution direction and approach?

The SAE case will also illustrate that business/IT alignment is not only a matter of aligning ‘the business’ and ‘the IT’ aspects of an enterprise. The case suggests that a more refined perspective is called for. More specifically, we will see how ‘the business’ is not just a single aspect that needs to be aligned to ‘the IT’, but rather it involves many more aspects that need mutual alignment. This is also why we prefer to use the term enterprise coherence. It more clearly expresses the fact that alignment is more about achieving coherence between multiple aspects, rather than merely aligning the business and IT aspect. This was also one of the drivers for developing the GEA method as used in this case.
12.2 The ECF for the Ministry of SAE

Since this was the first time that the Dutch Ministry of SAE had applied/used the GEA method, it was necessary first to develop an enterprise specific enterprise coherence framework (ECF). To this end, the case started in August 2010 with intensive desk research activities, conducted by a small team of architects. This team studied the relevant policy documents from the Ministry of SAE, and produced the first version of the ECF for the Ministry, in terms of a list of the cohesive elements and their definitions, covering both the purpose and the design level. The starting point for creating this list was the strategic documents of the enterprise such as the mission statement, vision notes, policy plans, business strategy and business plan.

In a workshop, conducted in September 2010, this draft ECF was then validated with the major stakeholders, and finally approved after some modifications. This validation workshop involved the executives of the Ministry, complemented with (internal) opinion leaders and key stakeholders. The perspectives that were selected by the Ministry of SAE are shown in Table 40, while the core concepts of four of the perspectives are listed in Table 41.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information provision</td>
<td>All processes, activities, people and resources for obtaining, processing and delivery of relevant information for SAE.</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Collaboration needed to contribute to a common result on the team, entity or organization levels.</td>
</tr>
<tr>
<td>Processes</td>
<td>A coherent set of activities needed to deliver results of SAE.</td>
</tr>
<tr>
<td>Governance</td>
<td>The influencing of the SAE organization so that a desired goal is attained.</td>
</tr>
<tr>
<td>Employees</td>
<td>All persons who execute tasks or activities within the SAE organization.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Legal entities or persons for whom the activities of SAE are important.</td>
</tr>
<tr>
<td>Culture</td>
<td>Explicit and implicit norms, values and behaviour within the SAE organization.</td>
</tr>
<tr>
<td>Services</td>
<td>All services that SAE within legal frameworks, or through agreed appointments with statutory authorities, establishes and delivers to customers.</td>
</tr>
<tr>
<td>Finance</td>
<td>The planning, acquisition, management and accountability of funds SAE.</td>
</tr>
<tr>
<td>Customers</td>
<td>Customers of a service of SAE.</td>
</tr>
<tr>
<td>Law &amp; regulations</td>
<td>All legal frameworks that form the basis for the task performance of SAE.</td>
</tr>
<tr>
<td>Communication</td>
<td>An active process in which information is exchanged between two or more parties or persons, regardless of how that is achieved.</td>
</tr>
</tbody>
</table>

Table 40. Definitions of perspectives for the Ministry of SAE
During the desk research phase 219 guiding statements were derived from the aforementioned policy documents. Presenting all 219 guiding statements goes beyond the purpose of this chapter, therefore, only the guiding statements that turned out to be relevant to the processes perspective are shown in Table 42.

Table 41. Core concepts for the Ministry of SAE

This set of perspectives also illustrates the need to align more aspects of an enterprise rather than just business and IT. Several of the perspectives may cause requirements towards IT support, information provisioning followed by communication being the dominant ones in this sense, however, the chosen set of perspectives shows that when it comes to alignment, the stakeholders did not think in terms of business/IT alignment, but rather in a more refined web of aspects that needed alignment.

During the desk research phase 219 guiding statements were derived from the aforementioned policy documents. Presenting all 219 guiding statements goes beyond the purpose of this chapter, therefore, only the guiding statements that turned out to be relevant to the processes perspective are shown in Table 42.

<table>
<thead>
<tr>
<th>Information provision</th>
<th>Processes</th>
<th>Governance</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitization</td>
<td>Time and place independent</td>
<td>Policy cores</td>
<td>Labour market</td>
</tr>
<tr>
<td>Integrity</td>
<td>Selection policy</td>
<td>Programs</td>
<td>Municipalities</td>
</tr>
<tr>
<td>Security</td>
<td>Efficiency</td>
<td>Scaling up</td>
<td>Labour force</td>
</tr>
<tr>
<td>Standardization</td>
<td>Actor</td>
<td>Collectivity</td>
<td>Employers</td>
</tr>
<tr>
<td>Facilities</td>
<td>Effectiveness</td>
<td>Mission/assessment</td>
<td>Unions</td>
</tr>
<tr>
<td>Information</td>
<td>Predictability</td>
<td>Employer ship</td>
<td>Employee Unions</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Planned</td>
<td>Themes and tasks</td>
<td>Other Ministries</td>
</tr>
<tr>
<td>Systems</td>
<td>Procedures</td>
<td>Functioning</td>
<td>Funds</td>
</tr>
<tr>
<td>Ownership</td>
<td>Organization</td>
<td></td>
<td>Independent administrative bodies</td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
<td>Society</td>
</tr>
<tr>
<td>Architecture</td>
<td></td>
<td></td>
<td>Social and Economic Council</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Research agencies</td>
</tr>
</tbody>
</table>

Table 42. Guiding statements relevant to the processes perspective

<table>
<thead>
<tr>
<th>Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A dual situation in which paper and digital systems or more systems are used in parallel, should where possible be avoided.</td>
</tr>
<tr>
<td>SAE is based on the tenet that the entire work of staff and process flow of documents goes digital.</td>
</tr>
<tr>
<td>The concept of flexible working means customization, instead of one size fits all.</td>
</tr>
<tr>
<td>Existing paper-based processes of SAE are as much as possible adjusted to the features of the automated document management system.</td>
</tr>
<tr>
<td>Integral approach: It is important to think about sustainability already at the ‘front’ of the information chain.</td>
</tr>
<tr>
<td>Selection policy must play a fully involved role at the beginning of the ‘information creation’.</td>
</tr>
<tr>
<td>The coming years it is expected that firm pressure will be on the business operations and IT to operate cost-efficiently.</td>
</tr>
<tr>
<td>Working smarter with fewer people.</td>
</tr>
<tr>
<td>We aim to ensure the government can operate decisively, transparently and fast.</td>
</tr>
<tr>
<td>We involve at the front of the process the external actors in the issues and developments we are working on.</td>
</tr>
<tr>
<td>We must have more attention to the process.</td>
</tr>
<tr>
<td>In 2012, our work is supported by a modern work environment and we as professionals SAE are equipped to let this environment operate as optimal as possible for us.</td>
</tr>
<tr>
<td>We want better performing processes, more efficient and effective.</td>
</tr>
<tr>
<td>We want more predictability in our processes</td>
</tr>
<tr>
<td>It must be clear how processes flow through the organization and who has which responsibilities.</td>
</tr>
</tbody>
</table>

162
12.3 The process followed in the case study

With the ECF in place, the next step was to organize a workshop with the key
stakeholders. In this workshop, the business issue at hand, *the introduction of a
new system for the digitization of the flow of dossiers*, was positioned in relation to
the ECF of the Ministry of SAE, and analyses in terms of the two questions:

1. *What are the necessary change initiatives needed for the introduction of
   this new system?*
2. *What are the best choices in terms of solution direction and approach?*

During the workshop, each of the twelve perspectives outlined in Table 40 was
represented by one or two participants who had (delegated) ownership of that per-
spective, including the other associated cohesive elements, in the real enterprise,
i.e. not just the documentation. At the start of the workshop, the owner of the busi-
ness issue gave a thorough introduction to the issue in terms of causes, degree of
urgency, degree of interest, implications, risks, etc. See Table 43, these lists were
also handed out to the participants at the start of the workshop.

This introduction gave the representatives of the perspectives a deeper insight into
the associated aspects of the business issue, enabling them to make a translation of
the issue to their own perspective. This enabled the representatives of the different
perspectives to determine jointly, which change initiatives were required to solve
the business issue at hand. The business issue: ‘the impact of the implementation of
a digitization solution’ was then addressed in terms of two tasks:

1. *determine the necessary change initiatives based on the analysis of the
   business issue.*
2. *determine the necessary change initiatives based on the solution space dic-
   tated by the guiding statements of the ECF of the Ministry, such as for ex-
   ample shown in Table 42.*
Causes to adopt a digitization solution

2. Government wants rapidly resolve many issues in the field of archives, digital information and cultural heritage:
   - a. No view on growth, size and cost of archiving.
   - b. Issues are already playing for three decades.
3. Interdepartmental cooperation
4. In the field of archiving:
   - a. Many copies and versions.
   - b. Many documents are missing.
   - c. Rules and compliance are inadequate in the field of digitization.
   - d. Digitization is focused on storage and not to reuse.
5. In the field of processing, dossier flow:
   - a. Not timely delivery, including emergency notes, pieces of Ministers.
   - b. Many errors in submission, registration and also in the content.
   - c. Ambiguous differentiation of dossiers, name, address, city
   - d. The author of a document is difficult to reach, especially with emergency items.
   - e. Errors far too late in the process discovered.
   - f. Lack of adequate information and proper use.
6. One organization-wide environment for the dossier flow.
7. All documents in dossiers accessible to everyone, unless ...
8. Managers will be active users by digitally agreeing.
9. The entire process is visible to everyone.
10. The initial line will be standardized within the own organizational unit.
11. There shall be no “co initials” anymore.
12. Employees will carry out all work with documents by using the digitization system, except inspection and legislation.

Implications of the digitization solution

1. The employee gets a central position.
2. Incoming physical mail digitized and only processed digitally.
3. Office Documents in digitizing system created and to use by colleagues.
4. Other media, e-mail, sound, photographs, video, are stored.
5. Never, older, texts lost.
6. One organization-wide environment for the dossier flow.
7. All documents in dossiers accessible to everyone, unless ...
8. Managers will be active users by digitally agreeing.
9. The entire process is visible to everyone.
10. The initial line will be standardized within the own organizational unit.
11. There shall be no “co initials” anymore.
12. Employees will carry out all work with documents by using the digitization system, except inspection and legislation.

Risks by implementing the digitization solution

1. Low acceptance of the user, because too much from the ICT is argued.
2. No conscious guidance on quantitative benefits, because the business case does not give this insight.
3. Subjective assessment of the results by no clear purpose.
4. Errors by improper use.
5. Errors due to complex procedures, due to many exception rules.
6. Not a good government of the dossier flow by confusion of responsibilities and no control.
7. Not learning from mistakes by taking over behavior.
8. Not learning from mistakes by not wanting to be addressed.
9. Final results of the dossier flow are not achieved due to the gap between directors and senior staff.
10. Employees do not account each other for errors due to lack of management support.
11. Suboptimal solution by limited, financial, resources.
12. Additional customization because specific management steps do not fit together.
13. No broad accessibility and standardization by different solutions for the same functionalities
14. Low commitment and support due to poor communication to stakeholders
15. Project failure due to lack of management attention.

Table 43. Part of the analysis of the business issue in terms of causes, implications and risks

Prior to this workshop, all 22 representatives of the perspectives received a copy of:
1. an overview of all the perspectives and core concepts, see Table 40, and their definitions
2. an overview of the 219 guiding statements including the perspectives they were connected to
3. a list of guiding statements on each perspective, see example Table 42
4. a summary of the business issue at hand, see Table 43
In addition, two input forms were issued for the two of the tasks that would need to be performed during the workshop, see Table 45 and Table 46. After the introduction of the business issue by the problem owners, the group of 22 persons was split into four subgroups balanced in proportion to the number of guiding statements and the grouping of perspectives with strong mutual relevant resemblances, see Table 44.

<table>
<thead>
<tr>
<th>Group</th>
<th>Clusters</th>
<th>Guiding statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Information provision</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>Governance</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>Finance</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>Services</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>219</strong></td>
</tr>
</tbody>
</table>

### Table 44. Group setup of workshop

The groups were located in different project rooms and asked to give a plenary wrap up by discussing their three major change initiatives after carrying out the three following tasks:

1. **Change initiatives based on the analysis of the business issue**
   This task involved the completion of, a digital version of the form as shown in Table 45. The group was asked to use the causes, implications and risks as identified in Table 43, to list the necessary change initiatives in their perspective. The participants had to list the change initiatives in the column ‘Necessary change initiatives’, while indicating in the column ‘Business issue aspect’ the type and number of aspect, cause, implication or risk, that formed the basis for this change initiative. Furthermore, they were requested to list the numbers of the guiding statements which underpin this change initiative in the column ‘Supporting guiding statements’. As it was also possible that existing guiding statements prohibited a certain change initiative, the participants had the option of providing a modified guiding statement, that would indeed support this change initiative, in the ‘Remarks’ field.

<table>
<thead>
<tr>
<th>Business issue aspect</th>
<th>Number</th>
<th>Necessary change initiatives</th>
<th>Supporting GS’s Nr. (max. 3)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect type</td>
<td>Number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.....</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 45. Form ‘Change initiatives based on the analysis of the business issue’

2. **Change initiatives based on the guiding statements**
   This task involved the completion of, a digital version of, the form as shown in Table 46. The participants were asked to, from the guiding state-
ments point of view, list those change initiatives that could/would have to be carried out to solve/mitigate aspects of the business issue. From this angle, the participants were asked to explore the space of solutions provided by the guiding statements. Given the fact that the guiding statements were embedded in the enterprise’s coherence framework, the change initiatives formulated from this perspective should have a positive effect on the enterprise’s coherence.

<table>
<thead>
<tr>
<th>Change initiatives based on the guiding statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating GS’s</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>......</td>
</tr>
</tbody>
</table>

Table 46. Form ‘Change initiatives based on the guiding statements’

3. Prepare for plenary wrap-up
   After performing both tasks, each group was asked to identify the three major change initiatives, and prepare a presentation of these initiatives as input to the next plenary part of the workshop.

12.4 Results of the SAE case study

The workshop resulted in 98 change initiatives of which 15 were prioritized as most important. In the last plenary session of the workshop these major change initiatives were presented and all the attendees were offered the opportunity to comment on them. The four most important initiatives are presented in Table 47. The workshop results were presented as an advisory report to the management of SAE, to decide on the proposed solution and approach. Based on this report the SAE management gave, within two weeks, permission to start the transition. In addition to obtaining an integral solution, a long-term decision-making process of more than one year was broken within a few weeks by using GEA.
Management commitment determines the success

- Organize a specific communication strategy in which managers as a specific target group get attention next to ministers, secretaries, and others.
- Make also clear the benefit to those groups: "What's in it for me?"
- Besides advantages for the own organization also the interests of the larger whole should be communicated, in particular the chain parties.
- Consideration is that the communication should include a consistent series of messages that must be properly timed. All statements, both planned, through newsletters, house institutions, bulletins, banners, websites, etc., and informal, unplanned communication by all program participants should be consistent.
- Formulate management strategy, for example, quality and support is more important than time and money.
- Start a decision making programme for digitally initializing the entire process up to and including board members SAE.
-Celebrate success.
- Promote an active and visible role of management and board members and include this role in the management assessment.
- Promote an active role for the employees themselves to give toward management the proper digital example.
- Prevent adverse affects of digitization as impoverishment of social awareness at peer contact.
- Involve managers directly in the Steering Committee.

Management Philosophy is theme driven: New Way of Working, initial and discipline

- Formulate explicitly and communicate the management philosophy underlying the digitally new way of working within SAE. This philosophy is very important for the transformation SAE has to go through. Give special attention to aspects as core values, orientation on results, level of disciplined work, leadership and management style.
- The management philosophy should characterize the transformation in terms of the current philosophy and the philosophy required. The current management philosophy is partly based on initialing and states: "All stakeholders have commented on the dossier, it is a mortal sin if somebody is forgotten". In the today's management philosophy the unity of government is the board. The new, desired management philosophy remains to be determined. Attention will be needed for the interdepartmental and thematic nature of cooperation versus the organizational format now. The thematic nature makes SAE more resistant to reorganizations. Meanwhile this management philosophy has been realized by the change program 'Development Agenda'.
- Collaboration requires accessibility of documents. This refers to a classification of documents that indicates the confidentiality of a document. Prudence is advised. Applying the principle "transparency, unless" within another organization resulted into protection of 50% of the documents under the term "confidential". Clear guidelines are necessary to determine if a dossier belongs to the category "unless" and also the management and compliance of these guidelines.
- Finally the organization will find a way into what is feasible within the limits.

Employees must understand the profit concerning information provision by actively participating

- Establish a user panel before, during and after the introduction of the new digitization system.
- In this panel all major stakeholders involved in the digitization are represented. The panel members have the necessary mandate and authority to take decisions.
- Check out at the front the needs of users. Set pilot / model offices collect the reactions of users.
- Research the possibilities to operate the new digitization system as a knowledge system in which for example knowledge of policy processes is included. This makes the organization less dependent on implicit knowledge in the heads of a (limited) number of employees.

Reliability (current ICT is unsuitable)

- More attention to ICT will be needed. Think of backup and recovery.
- Extra attention is needed for availability, reliability and performance including network speed due to transporting large volumes of data, sounds, images. In addition, even safety regulations can provide for delay in transport.
- Try the vulnerability of the IT infrastructure, think of uptime, mean time between failure (MTBF) and amenities such as emergency generators to solve this problem.
- The adoption of the new digitization system introduces a new IT supplier dependence. SAE must decide how to manage this dependency. Think of service level agreements.

Table 47. Elaboration on the four most important change initiatives
12.5 Evaluation of the programme

In an evaluation session, the participants in the workshop shared the following observations:

1. the participants of the workshops already knew the key architecture principles of their enterprise, however, the confrontation of these principles with the objectives of the change program, and the discussions about this were regarded as useful. It provided more awareness and a more complete picture, while also evoking more management commitment.

2. an acceleration of the decision-making process and the creation of support at the board level.

3. a much more holistic approach to the business issue at hand compared to the traditional IT-driven approach. This also resulted in the recognition that much more needed to be changed in the enterprise than previously assumed.

4. a shorter lead-time for obtaining the perspectives and core concepts as a result of the strategy used to derive guiding statements from policy documents.

5. the turnaround time of developing the outline of a solution direction, and the choice of the approach to be taken, was reduced to one day using the ECF. Note: preparing the ECF based on the policy documents, took a team of two people a total of four weeks.

6. only a limited number of SAE-employees, for a limited amount of time, a 3 hours validation session and a 6 hours workshop analyses, were needed to apply the GEA method.

7. the experience of having 22 representatives of the perspectives meet in a workshop requires timely planning and a convincing modus operandi from the project team, based on a clear problem solving vision and arguments based on added value.

8. the business issue at hand should be positioned at the right management and priority level. This may sound trivial, but especially in the case of business issues that initially are disguised as IT-only issues, this is of the utmost importance.

9. despite the successful results achieved using the GEA method the person responsible for the architecture function at SAE did not want to adopt the GEA method.

At the end of the synthesis process the members of the core team of the research programme for this thesis evaluated the GEA approach based on the criteria as set out in chapter 3.5.3 Design data collection protocol for level 1 and level 2. See Table 48.
The overall conclusion of this evaluation led to the following insight: the required documents at the level the purpose were easy to obtain and setting up the ECF was a short turnaround. After creating the ECF the representatives of the perspectives were perfectly capable of performing the analysis processes. The short amount of time taken to develop the ECF was mainly due to the fact that this is almost entirely done by two external consultants. The representatives of the SAE’s perspectives only had to validate and approve the ECF in a workshop session.

<table>
<thead>
<tr>
<th>Levels of questions</th>
<th>Nr.</th>
<th>Question</th>
<th>Score</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Evaluation of the GEA approach at SAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>1</td>
<td>Are the guiding statements valid and up to date?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Do the representatives of the perspectives agree with the identified perspectives, the identified core concepts within it and the related guiding statements?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Do the causes, triggers, sub problems, risks, implications, et cetera of the business issue lead to change initiatives?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Do the (existing) guiding statements result in additional change initiatives or restrictions, the solution space?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td>1</td>
<td>Are the documents at the level of purpose present and accessible?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Does the definition of the level or purpose result in a clear understanding of the sense of purpose and design of the enterprise? Do we get all the desired cohesive elements of GEA?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Is one capable of identifying, and engaging, the right representatives for each of the perspectives? This engagement should cover both the identification and validation of the cohesive GEA elements (ECF), and the GEA analysis processes to solve the business issue.</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Are the representatives of the perspectives able to validate the ECF?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Are the representatives of the perspectives, using the validated ECF, able to execute the analysis processes to solve major business issues?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Does the development of the ECF lead to increase coherence?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Does the use of GEA lead to an integral solution that contributes to the coherence of the enterprise?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Is the enterprise able to, independently, specify a business issue that can serve as input to a GEA based analysis?</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Did the owners of the business issue succeed in specifying the business issue in such a way that the representatives of the prospects could perform the complete GEA analysis</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
Table 48. Evaluation of the GEA approach SAE level 1 and level 2 questions

12.6 Experiences and insights for improving GEA

The case study also resulted in the following general insights into the application of GEA:

1. the initial investment, in making the enterprise coherence explicit in terms of the ECF, is repaid in terms of a better understanding of the environment. Furthermore it stimulated further innovation/improvements within, and even beyond, the enterprise. It also enabled an improvement in the collaboration of all parties involved in the different perspectives.

2. the underlying causality driven way of thinking on coherence, was easily and naturally adopted by all attendees giving rise to an enormous improvement in quality for both the image and opinion formation phases of the decision making process.

3. the active participation of the representatives of all perspectives resulted in an acceleration in the decision making process and the creation of management support.

4. the use of a full and current set of guiding statements imposed on all perspectives enlarged the resolving power of the enterprise, leading to achievable and high quality solutions.

5. the key players of the enterprise, the representatives of the perspectives in this case, gained a better insight into and understanding of each other’s domains.

6. the process of bringing and keeping the key players together in the workshop sessions makes a strong demand on the competencies of the facilitators, enterprise architects.

7. the quality with which the business issue, in all its facets in terms of causes, implications and risks is introduced, determines the quality of the change initiatives.

8. a major business issue, like introducing a new system to automate business critical processes, can perturb an enterprise’s coherence in all its facets. As a result, all the preserved, newly added, eliminated and modified cohesive elements must be established in a new actual state of the enterprise coherence at the moment the decision to adopt an integral solution is made. This way, the enterprise is ready to develop an integral solution for the next business issue.

9. there are several ways to create an ECF. In this case it was almost entirely done by two external consultants after which the representatives of the perspectives only needed to validate and approve the ECF in a workshop session. In another case the representatives of the perspectives mainly devel-
and develop an integral solution?

Table 48. Evaluation of the GEA approach SAE level 1 and level 2 questions

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9. There are several ways to create an ECF. In this case it was almost entirely done by two external consultants after which the representatives of the perspectives only needed to validate and approve the ECF in a workshop session. In another case the representatives of the perspectives mainly developed the ECF [120]. The latter method requires more processing time but has the advantage that the ECF becomes more ‘lived through’ by everyone. The first approach allows for a faster start to an impact analysis of a business issue and thus produces faster tangible results.

12.7 Conclusion

In this chapter, we discussed a real world case study in business/IT alignment at the strategic level. The specific business issues addressed in the case were: (1) What are the necessary change initiatives for the introduction of this new system? (2) What are the best choices in terms of solution direction and approach? The ECF as configured for the Ministry of SAE, illustrated that business/IT alignment is not only a matter of aligning ‘the business’ and ‘the IT’ aspects of an enterprise. The SAE case indicates that a more refined perspective is called for, in which multiple aspects need to be aligned with the goal of achieving more coherence. As discussed in the introduction, in the case of the Dutch Ministry of SAE, the GEA method was a given, however, as also indicated, the GEA method is being continuously developed further using a design science rhythm. The lessons learned as listed in the previous paragraph, have already lead to further improvements of the GEA method.
13 Cross-case Conclusions

In this chapter we will use the previously formulated questions from the data-collection protocol to formulate the cross-case conclusions, see section 3.5.3.

1. Questions to specific interviewees.
2. Questions at the level of an individual case, these are the questions in the case study protocol to be answered by the investigator during a single case, even when the single case is part of a larger, multiple-case study.
3. Questions focused on finding patterns across multiple cases.
4. Questions at the level of the entire research effort, for example, calling on information beyond the case study evidence and including literature or published data that may have been reviewed.
5. Normative questions about policy recommendations and conclusions, going beyond the narrow scope of the study.

We refer to the corresponding sections of the cases for the answers to questions numbers 1 and 2. Referring to question number 3 we will draw cross-case conclusions based on:

- the results achieved in the case studies
- evaluations of the cases
- experiences and insights for improving GEA

13.1 Cross-case conclusions based on the results achieved by the cases

Before we formulate our conclusions based on the results obtained using case studies we will outline the main results of the three cases.

The main results of the Dga case were:

- we provided an integral solution and approach to solve the business issue within time and budget.
- using a PgSA obtained by applying the GEA method we provided a set of recommendations to get Dga in control. The governance of the project within the borders of the PgSA led to the following results:
  a. the execution of the subsidy arrangements was within time and agreed budget.
  b. the return of application forms due to application errors was reduced from 62% to 35%, and consequently fell within the error tolerance.
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  a. the execution of the subsidy arrangements was within time and agreed budget.
  b. the return of application forms due to application errors was reduced from 62% to 35% and consequently fell within the error tolerance.
  c. the number of objections was reduced from 22,000 to 7,000 with a corresponding reduction in associated costs.
  d. the Internet participation of applicants rose from 0.5% to 6%.
  e. the European supervisory authority and the Dutch parliament were satisfied with the results and the answers given to their submitted questions.
  f. with regard to the new outsourcing parties:
     i. their performance was in line with the agreed quality, time and budget
     ii. no client dossier was lost
     iii. given the good performance all contracts were subsequently prolonged
  g. in this, real world case study, a totally derailed enterprise was brought back into control within a single year, while simultaneously making substantial savings.

The main results of the case DJI were:
- we provided an integral solution and approach to solve the business issue within time and budget.
- through the use of GEA a separate project with all contingent costs was avoided.
- we adjusted the objective of the implementation program of this new law. Thus we avoided the implementation program being saddled with a, by definition, unachievable goal.

The main results of the case SAE were:
- we provided an integral solution and approach to solve the business issue within time and budget.
- an acceleration of the decision-making process resulting in a decision to start the transition process within a few weeks.
- Support for the SAE project was created at the board level.

Based on the results of these cases we state that, when the GEA method is applied, significant results can be achieved in terms of the higher quality of the decision making process taking place and improvements in efficiency and effectiveness.

This insight triggered the researchers participating in this research program to conduct further research and in particular to prove the postulate given in chapter 5.5.

The overall performance of an enterprise is positively influenced by proper coherence among the key aspects of the enterprise, including business processes, organizational culture, product portfolio, human resources, information systems and IT support, et cetera.
## 13.2 Cross-case conclusions based on the evaluations of the cases

With reference to the questions of level number 3 based on the evaluations of the cases, the core team of the research programme formulated the questions and their answers as depicted in Table 49, see also section 3.5.3. Before formulating the cross case conclusions of these evaluations we will first make some remarks, see also the corresponding numbers in Table 49.

- Remark nr. 1: the average score for DJI to questions nr. 1, nr. 4 and nr. 7 was a consequence of the fact that some perspectives were not represented by their representatives, both during the development of the ECF and at the time of the GEA analyses, due to agenda issues.
- Remark nr. 2: the low score for DJI to question 8 was a consequence of the fact that the issue at hand fully took place in the field of on-going business, as a result of changes to existing legislation.

<table>
<thead>
<tr>
<th>Levels of questions</th>
<th>Nr.</th>
<th>Question</th>
<th>Score: 1 high, 2 aver, 3 low</th>
<th>Remarks Nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 3</td>
<td>1</td>
<td>Degree of acceptance by stakeholders?</td>
<td>1 2 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Extent of applicability?</td>
<td>1 1 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Extent of matching required dynamics?</td>
<td>1 1 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Extent of compliance with required integrality?</td>
<td>1 2 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Degree of accessibility?</td>
<td>1 1 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Degree of transferability?</td>
<td>3 3 3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Extent of balance of interests?</td>
<td>1 2 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Degree of innovativeness?</td>
<td>1 3 1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 49. Evaluation of the GEA approach SAE level 3 questions

The explanations of the DJI scores taken into consideration, we conclude that the application of GEA can achieve a high score for all aspects, except that of transferability.

Our experiences with these cases yielded the insight that the issue of transferability was not in play during the execution of these cases, but afterwards. After our departure all the enterprises fell back to their old behaviour. The enterprises did not implement GEA on a permanent basis. Some possible causes are:

- the teams of these enterprises could not join the external facilitators sufficiently because of time constraints. This occurred for example in the case SAE.
- the enterprises where these cases were performed already had existing architecture methods. Possibly there was resistance to the adoption of a new architecture method. The term enterprise architecture method, in practice, is strongly associated with IT.
These insights triggered the researchers working in the program discussed in this thesis to study further, and in particular to answer the questions:

- How can we achieve a situation in which enterprises implement GEA on a permanent basis?
- Should GEA be positioned as a decision-support method rather than an enterprise architecture method?

### 13.3 Cross-case conclusions based on the experiences and insights gained during the case studies

With reference to the questions of level number 3 based on our experiences and insights for improving GEA, the core team of the research programme formulated the following cross-case conclusions.

- The initial investment required to make the enterprise coherence explicit in terms of the ECF, is repaid well in terms of a better understanding of the environment of the enterprise. Furthermore making an ECF stimulated further innovation/improvements within, and even beyond, the enterprise. It also enabled improvements in the collaboration between all parties involved in the different perspectives.
- The use of a full and current set of guiding statements, which was imposed on all perspectives, enlarged the resolving power of the enterprise, leading to achievable and high quality solutions.
- Application of the GEA method implies involvement of the key social forces in an enterprise and redirects these into ‘a valuable business asset’. More specifically, the key players of the enterprise, the representatives of the perspectives in our case studies, came to know and trust each other more during the design of the GEA framework and gained a better insight into and understanding of each other's domains.
- The process of bringing and keeping the key players together in the workshop sessions demands a high level of the required competencies from the facilitators, enterprise architects.
- The level of quality at which the business issue, in all its facets in terms of causes, implications and risks, is introduced determines the quality of the change initiatives.
- After developing an ECF in all the three case studies we were able to conduct a GEA analysis to solve the business issue at hand in one day. In our opinion this means that the GEA method can be qualified as ‘agile’ and be used to provide the agile enterprises of the future an appropriate control instrument.
At the time of the execution of the case studies, we found that many of the enterprise officials did not have a common view on the object types at the level of purpose in their enterprise.

In some cases, data concerning object types at the level of purpose were partly unavailable, however when present the data was not always consistent.

The cohesive element ‘relationship’ was found only once in one case. This element should not be confused with the cohesive element ‘relevant relationship’. The element ‘relationship’ represents a connection between the guiding statements of one perspective. After researching and developing insights about recursively applying GEA, the cohesive element ‘relationship’ can be expressed on the second level of the ECF as a ‘relevant relationship’. Due to these insights we decided not to distinguish the cohesive element ‘relationship’.

After developing the GEA theory we produced the GEA meta-models [112]. Applying GEA in our three case studies resulted in insights that led us to modify the GEA object model to become part of the GEA meta-models. We missed the cohesive elements in this object model on the level of purpose and the cohesive elements ‘policy statement’ and ‘objective’ on the design level. See chapter 14 ‘modify theory’.

A major business issue can perturb enterprise coherence in all its facets at the moment an enterprise decides to react on it. This means that all the preserved, newly added, eliminated and modified cohesive elements must be established to determine the new state of enterprise coherence at the moment the decision to adopt an integral solution is made. The enterprise is then ready to develop an integral solution for a next business issue.

The underlying causality driven way of thinking on coherence, was easily and naturally adopted by all attendees of the GEA analyses in our case studies, giving rise to an enormous quality improvement in both the image and opinion formation phases of the decision making process.

The active participation of the representatives of all the enterprise perspectives results in an acceleration in the decision making process and the creation of management support.

There are several ways to create an ECF. In one case it was almost entirely done by the representatives of the perspectives. In other cases the facilitators mainly developed the ECF after which the representatives of the perspectives the ECF validated in a validation session. The first method requires more processing time but has the advantage that the ECF becomes more ‘enterprise-own’. The latter approach allows for a faster start for an impact analysis of a business case and thus allows the enterprise to achieve faster tangible results.

In the future as we further develop the GEA method, we should pay more attention to the following lessons we learned:

- Application of GEA leads to a strong increase in transparency within an enterprise. Not all managers are equally happy about this as this transparency offers the possibility for criticizing others on their functioning.
- Success achieved as a result of an application of GEA is quickly used up, adoption of working methods that accord to the GEA method requires more effort and energy to maintain. The enterprises in our case studies relatively soon fell back to using old ineffective, and familiar, behaviours after our departure.

The case studies we performed offered enough practical insights, and there was sufficient diversity in the business issues studied. This led to the conclusion that the performing of additional cases would not make any further essential contributions to our evaluation of the GEA method.

A disadvantage of applying a case study research approach is that a case can never be performed twice and the results of such case studies with or without the use of the GEA method in case cannot be compared.
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A disadvantage of applying a case study research approach is that a case can never be performed twice and the results of such case studies with or without the use of the GEA method in case cannot be compared.
14 Modify theory

After developing the GEA theory and executing the case studies we were able to develop an extended ECA (eECA) based on the ECA as discussed in chapter 4.4. The eECA is discussed in chapter 15. Here we give substance to the part ‘modify theory’, as part of the multiple case study research approach of Yin [130], by explaining the differences between the meta models GEA immediately after we developed the GEA theory and the modified meta models of the GEA theory after we had executed the case studies. The differences between these meta models and the way we gave substance to modifying the GEA theory is discussed in chapter 16.
15 Extended Enterprise Coherence-governance Assessment (eECA)

15.1 Introduction

In chapter 4, on enterprise coherence-governance assessment (ECA) we stated we should develop a more comprehensive ECA at the end of the first development cycle of the GEA method. The development of this comprehensive assessment, called the extended enterprise coherence-governance assessment (eECA), was completed at the beginning of 2011 and in the same year it was tested at 54 enterprises with a total of 120 respondents [118]. In this chapter we discuss both, the content of eECA and the results of its application. These tests gave us a broader range of insights into the eECA method and confirmed the results of our ECA case studies carried out in 2007.

15.2 Explanation of the eECA

The 31 GEA requirements, the GEA cohesive elements and the GEA components formed the basis for the eECA. We also used as sources of inspiration characteristics of the Architecture Maturity Model embedded in the Dynamic Enterprise Architecture (DYA) method [103], the IT Architecture Capability Maturity Model [23], the Normalized Architecture Organisation Maturity Index (NAOMI) [99], the Enterprise Architecture Score Card [78], and the NASCIO Enterprise Architecture Maturity Model [62]. These architecture maturity models, like existing architecture approaches and architecture frameworks, focus mainly on information provision or business-IT alignment at the level of organisational structure. We argue that existing approaches and frameworks, such as Zachman [87], DYA [103], Abcouwer [1], Henderson & Venkatraman [36], TOGAF [92], IAF [101] and ArchiMate [48, 42], take an ‘engineering oriented’ style of communicating with senior management and stakeholders in general. The architecture frameworks underlying each of these approaches are very much driven by ‘engineering principles’, and as such correspond to a blue-print style of thinking about change [21]. The aforementioned requirements, however, suggest the use of another style of thinking. Thinking in terms of stakeholder interests, formal and informal power structures within enterprises, and the associated processes of creating win-win situations and forming coalitions. In the terms of De Caluwé [21], this is more the yellow-print style of thinking about change. Yellow-print thinking according De Caluwé [21] is based on socio-political views on organizations, where interests, conflicts and power play an important role. In our research programme, this line of thinking was taken as a starting point, by taking the perspective that the actual social forces and associated stra-
Strategic dialogues within an enterprise should be taken as a starting point, rather than the frameworks of existing architecture approaches suggesting the full make ability of an enterprise. For this reason we have adopted the maturity levels used in the aforementioned architecture maturity models, but as aspects on which the maturity level should be determined we use the GEA components, including the requirements and cohesive elements which these components are based on. The eECA developed by the members of the research programme for this thesis consists of 3 interrelated parts. See Figure 51.

**Figure 51. Application of the eECA (processes and products)**

These parts consist of a set of 50 rating questions, see Appendix C, a set of 23 open questions, see Appendix D, and an interview based on these questions. To conduct these 3 parts including the following reporting activities takes a turnaround time of approximately 5 weeks with about 25 respondents. Each of the rating questions must be answered using one of the following ratings: ‘not at all’, ‘minor’, ‘sufficient’, ‘largely’, ‘entirely’, ‘do not know’. Choosing the last possibility indicates that the appropriate question does not count and it should not be used in the calculations to determine the maturity level of an enterprise.

Three types of reporting are used for the rating questions: a ‘spider diagram’, a ‘quadrant diagram’ and a ‘maturity matrix’ both at individual level and at organizational level. The answers to the open questions provide the necessary context information, also included in the open questions are a number of cross-reference questions with respect to the rating questions. Interviews of the respondents of the aforementioned questions are planned after receiving the answers to the rating questions and the open questions. During the interviews the interviewer can ask more detailed questions about the interviewee’s ratings and open questions, but they may also ascertain things that the respondents did not initially want to write.
down. The interview completes the process of gathering of context information using open questions. We will now discuss the diagrams and maturity matrix.

15.3 Spider diagram

The answers to the 50 rating questions obtained from an enterprise are plotted in the spider diagram, on a 4-point scale on the 7 axes representing the 7 GEA components, see Figure 52. This allows one quickly to see how each of the maturity levels of the GEA components are measured and also the spider diagram gives an insight into the overall maturity level of the enterprise architecture (EA) function for the enterprise in question. If the shaded area in the spider diagram is relatively small one can say that in the opinion of the respondent(s) the enterprise has not done enough to improve/establish its EA. The spider diagram will be completely shaded in the case where all the questions are answered with an ‘entirely’.

![Spider diagram](image)

Figure 52. Maturity score on the 7 GEA components of employee 1 of organisation XYZ.
15.4 Quadrant diagram

The results of the answers to the 50 rating questions are presented in quadrant models, as depicted in Figure 53. This model is composed of two axes, the horizontal axis represents the level of development of the EA vision in an enterprise and the vertical axis represents the level of application of EA in an enterprise. These axes represent two dimensions of the governance of enterprise coherence, which correspond to the GEA components that need to be developed.

The axis ‘EA vision’ describes the extent to which an enterprise’s body of knowledge concerning the governance of enterprise coherence has been made explicit, in particular the EA vision and the EA methodology. Is there a vision about enterprise architecting? Has the vision been translated into a methodology and how the enterprise wants to use it: is there an implementation plan? Is there real ambition to apply EA in the enterprise? The axis ‘EA application’ describes the extent to which an enterprise actually operates the body of thought, in particular the EA processes, the EA products, the EA people, the EA means and the EA governance. The combination of the two axes results in four quadrants. Each quadrant has a label, characterising the hypothetical state of the enterprise as a function of the maturity of the EA function. In short, the scores are computed as follows:

\[
S_{\text{development}} = \sum_{i=1}^{7} W_{i}^{\text{development}} \cdot C_i
\]

\[
S_{\text{application}} = \sum_{i=1}^{7} W_{i}^{\text{application}} \cdot C_i
\]

\[
C_i = \sum_{j=1}^{50} w_{i,j} \cdot Q_j
\]

where:

- \( W_{\text{development}} \) is a vector expressing the relative weight of a GEA component towards the development of an EA vision.
- \( W_{\text{application}} \) is a vector expressing the relative weight of a GEA component towards the application of an EA vision.
- \( w \) is a matrix expressing the relative contribution of a question to the score of a given GEA component.
- \( Q \) is a vector expressing the score that was given to a specific question, ranging from 0 (‘not at all’) to 4 (‘entirely’).

A brief outline of the characteristics per quadrant is given in Figure 54. Below we will discuss the quadrants in more detail. We provide anonymised real world examples of 54 enterprises and their positioning in relation to the quadrants in section 15.5.
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The axis ‘EA application’ describes the extent to which an enterprise actually operates the body of thought, in particular the EA processes, the EA products, the EA people, the EA means and the EA governance. The combination of the two axes results in four quadrants. Each quadrant has a label, characterising the hypothetical state of the enterprise as a function of the maturity of the EA function. In short, the scores are computed as follows:

\[
\sum_{i=1}^{7} W_{development} \cdot C_i \cdot S_{development} = \sum_{i=1}^{7} W_{application} \cdot C_i \cdot S_{application} = \sum_{j=1}^{50} w_{i,j} \cdot Q_j.
\]

A brief outline of the characteristics per quadrant is given in Figure 54. Below we will discuss the quadrants in more detail. We provide anonymised real world examples of 54 enterprises and their positioning in relation to the quadrants in section 15.5.

Figure 53. Example of the perception of the maturity of the EA function of employee number 1 at organisation XYZ after executing the rating questions.

**Degenerating quadrant:**

If an enterprise has no vision about enterprise architecting and also does not know how to apply this form of management then the enterprise scores in the degeneration quadrant as shown in Figure 53 above. Coherence in the enterprise will continue to degenerate producing the hypothesized proportionate effects on the enterprise’s performance. The hypothesized characteristic aspects for the quadrant degeneration are:

- coherence is not considered an important aspect of governance
- there is little or no synchronisation between representatives of the important aspects of the enterprise
- not worth mentioning EA vision or activities
- strategy is not supported by EA
- there is no awareness of EA
- no people or resources are allocated to EA
- solutions are designed and implemented without architecture
- decrease in effectiveness and efficiency

15.4.1 Philosophical quadrant:

There is a vision of enterprise architecting, this is also translated into how it should be implemented, but it is not developed beyond terms of ‘paper’ and ‘goodwill’. It is not ‘exploited’, let alone implemented. There may be a hypothesized basic increase in effectiveness. A basic level/awareness of governance of enterprise coherence may be developed. Therefore, there is an increased likelihood that things will move in ‘the right direction’. The hypothesized characteristic aspects for this quadrant are:

- coherence is considered to be a strategic aspect throughout the enterprise
- there is regular synchronisation between representatives of the important aspects of the enterprise
- there is an integral EA vision, limited EA activities in the enterprise’s operations
- EA is integrated in the enterprise’s strategy
- EA is inspired especially by third parties
- a limited number of people and resources has been allocated to EA
- some solutions are implemented with architecture
- increase in effectiveness, not in efficiency

15.4.2 Suboptimal quadrant:

Enterprises positioned in this quadrant are inhabited with ‘do-ers’, individuals with their own perceptions, beliefs and ideas about enterprise architecting, who have taken their own local actions. Models have been designed that perhaps offer the most potential for reinforcing governance of coherence throughout the enterprise, however, these are not synchronized/aligned and are formulated in their own jargon. The biggest flaw is that the managers, who should use these products in their decision making processes, do not know that they exist or they do not know how to understand and interpret them. A number of things are done well, but these are not good things by definition. Throughout the enterprise there is a hypothesized increase in efficiency. The hypothesized characteristic aspects of this quadrant are:

- coherence is only experienced as an enterprise aspect locally and in different ways
• there is no synchronisation between representatives of the important enterprise aspects
• local EA perceptions and interpretations and activities are on the agenda
• EA is integrated in one or more department strategies
• EA is applied, particularly by third parties
• local and frequent temporary allocation of people and resources to EA
• local solutions are implemented with architecture
• not effective, increase in efficiency

15.4.3 Optimisation Quadrant:

In this quadrant, vision and action go hand in hand. The enterprise has a clear understanding of enterprise architecting and knows how to use it to its advantage. The managers take strategic decisions from their integral and actual knowledge about the meaning and design of the enterprise. The enterprise works on optimising management and implementation processes that are supported by EA processes and products. The good things are done well, in other words the hypothesized efficiency and effectiveness go hand in hand. The hypothesized characteristic aspects for this quadrant are:

• coherence is experienced as an important aspect and governance of coherence is applied throughout the enterprise
• there is frequent synchronisation between representatives of the important aspects of the enterprise
• EA is used as a directional framework to guide decision making processes resulting in integral solutions addressing all important aspects of the enterprise on strategic, tactical and operational levels and aligning the interdependencies between them
• EA is integrated in the enterprise’s strategy
• the notion of necessity of enterprise coherence is internalized in the thinking and action of its leaders and managers
• people and resources are structurally assigned to the EA function
• integral solutions for major issues are implemented with architecture
• structural improvements in coherence within the enterprise is on the agenda
• there is high effectiveness and efficiency
Once the questions from the questionnaire have been answered, the respondents’ scores will offer a good starting point for follow up actions to improve the governance of enterprise coherence within the enterprise. The following questions can be used as drivers.

- How can the (possible) differences in the positioning of the maturity of EA in the enterprise, according to the respondents, be explained?

- What are the steps that need to be made to improve the enterprise’s score in the direction of the optimisation quadrant, based on the positioning of the enterprise after aggregating the respondents scores, i.e. average of the respondents scores?

The discussions arising from the first question may urge employees to adjust their views, which would provide a very different score, especially from those employees who are supposed to make use of EA products, but do not have the courage to do so. This will give them a platform to express their dissatisfaction, or if not, it may lead to new concepts for the whole group. The enterprise’s score is an average of the given scores of the individual respondents, however, as we will see in the next section, the average is not just computed, but rather determined in joined sessions with all the involved respondents. During such a session, individual respon-
The respondents may change their scores in response to improved insights into their understanding of the actual situation in the enterprise and/or added insight into the question. If the results of the enterprise’s score are in the optimisation quadrant then people will reap the benefits of applying coherence governance. It is important to maintain this optimisation and to stay alert and not fall back into old habits. In other words, an enterprise’s position in a quadrant is not a fixed state, but subject to constant change. More specifically, an enterprise needs to put a constant effort into improving its enterprise coherence otherwise it will gradually decline into a state of degeneration. If the initial positioning of the enterprise falls in one of the three following quadrants: degeneration, philosophising or sub-optimisation, this offers greater possibilities for improvement. If the score falls in the degeneration quadrant this means that the enterprise must first take a step to the right or directly upwards, before the step can be made towards optimisation (see Figure 55). The choice between these approaches correspond to an enterprise’s management style. One enterprise may first want to consider it properly, as a supporter of the Design School and another enterprise may want to initiate experiments first, as a supporter of the Learning School [69].
15.5 Maturity matrix

The results of the answers of the 50 rating questions are reflected in a weighted, not normalised score and showed in a maturity matrix, as depicted in Figure 56. This model is composed of two axes, the horizontal axis represents the EA maturity levels and the vertical axis represents the set of GEA components. In the cells of appendix E ‘GEA Maturity Model’ one will find the status of a GEA component on a certain maturity level and descriptions of the maturity levels and GEA components. In practice, we plot the maturity scores of the GEA components as represented in Figure 56 using the figure given in appendix E making the state of maturity in terms of the GEA components quickly visible.
The results of the answers of the 50 rating questions are reflected in a weighted, not normalised score and showed in a maturity matrix, as depicted in Figure 56. This model is composed of two axes, the horizontal axis represents the EA maturity levels and the vertical axis represents the set of GEA components. In the cells of appendix E 'GEA Maturity Model' one will find the status of a GEA component on a certain maturity level and descriptions of the maturity levels and GEA components. In practice, we plot the maturity scores of the GEA components as represented in Figure 56 using the figure given in appendix E making the state of maturity in terms of the GEA components quickly visible.

15.6 Results of application of the eECA

In 2011 we applied the eECA with respect to the part ‘grading questions’ in 54 enterprises with a total of 120 respondents. We distinguished four market sectors in this research: public, finance, industry and rest, see Table 50 for the distribution of participating enterprises per market and numbers of respondents.

<table>
<thead>
<tr>
<th>Market sector</th>
<th>Number of enterprises</th>
<th>Number of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>Finance</td>
<td>17</td>
<td>29</td>
</tr>
<tr>
<td>Industry</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Rest</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>120</td>
</tr>
</tbody>
</table>

Table 50. Participants eECA in 2011

The results of the eECA 2011 per market sector in a spider diagram are shown in Figure 57. These diagrams provide the following insights: first all market sectors expended about the same effort in enterprise coherence governance, in which the finance sector scores a little higher. Compared to the other sectors the finance sector scores, except for the component Means, for all GEA components 1.5 points. Second, all market sectors had a low score for enterprise coherence governance. If all the rating questions had been answered with an ‘entirely’, the surfaces shown in Figure 57 would have been fully shaded.
Figure 57. Results of the eECA 2011 plotted on a Spider Diagram

The results of the eECA 2011 per market sector on the GEA quadrant diagrams are shown in Figure 58. The numbered spheres in the quadrants represent the participating enterprises.
From Figure 58 it can be seen that 11.1% (6 of 54) of the enterprises had a score in the quadrant optimisation, so 88.9% did not. In our similar but more limited study in 2007 [113] we claimed there was a general lack of governing enterprise coherence, if less than 50% of the assessed enterprises scored in the optimisation quadrant. In that study we found that 85.7% of the participants did not score in the optimisation quadrant and this clearly demonstrated the need for further research into the governance of enterprise coherence, in particular the need to develop a theory for the governance of enterprise coherence. The similar score of 88.9% obtained in our extended study in 2011, confirmed this conclusion.

The results of the eECA 2011 per market sector on the GEA maturity model are shown in Figure 59. These maturity models provided the following insights. First, in all market sectors the GEA component ‘Governance’ scores lowest. Second, all the market sectors were at the beginning of the maturity level ‘In development’ in which the market sector ‘Finance’ had achieved the most.
In this chapter we explored the extended enterprise coherence-governance assessment (eECA) instrument and the application of the eECA in 54 enterprises in the Netherlands with 120 respondents divided into the market sectors public, finance, industry and rest. This instrument can be used to provide individual managers of enterprises with an important measure for positioning their enterprises on a maturity scale, indicating the enterprise’s ability to govern enterprise coherence. The eECA also helps to provide managers with an understanding of their enterprise’s degree of maturity on the 7 components of enterprise coherence governance. The eECA, conducted in 2011, showed that 88.9% of the participating enterprises lacked enterprise coherence governance. We also confirmed the results obtained in a similar, but more limited study, carried out in 2007, which showed a corresponding percentage of 85.7 for enterprises lacking enterprise coherence governance.

Figure 59. Results of the eECA 2011 plotted on the GEA Maturity Model

15.7 Conclusions
16  Modification of the GEA theory through comparison of meta models

In this chapter we discuss how we gave substance to the part ‘modify theory’, of Yin’s multiple case study research approach [130], by explaining the differences between the meta models GEA made immediately after the development of the GEA theory and the adjusted meta models GEA produced after the case studies were executed.

16.1 GEA Meta models after development of the GEA-theory

Successively, we will discuss the meta models:
- GEA processes
- GEA products
- GEA cohesive elements

All the cohesive elements of GEA are represented with these meta-models, as are all the GEA activities and results in terms of processes and products.

Meta model GEA processes
The GEA processes at the meta level of the enterprise architecture processes are indicated in this meta model, as are their interrelationships and relationships with the control processes of the enterprise, see Figure 60. The GEA governance processes govern the GEA execution processes. In their turn the GEA execution processes develop the GEA specialized products and the GEA steering products, possibly based on specialized products. These GEA steering products are used in the governance processes of an enterprise and used to control the business. All these processes are detailed in section 7.2.2.
Figure 60: Meta model GEA processes

Meta model GEA products

In the meta model GEA products the meta level enterprise architecture products are indicated and their interrelationships and relationships with the control processes of the enterprise, see Figure 61. The GEA governance products govern both the development of the GEA specialized products and the GEA steering products. External reference products can influence the GEA specialized products and the GEA steering products. The GEA steering products govern the development of business products. All these products are detailed in section 7.2.3.
Figure 61. Meta model GEA products

Meta model GEA cohesive elements

The ‘meta model GEA cohesive elements’ describes the definitions of the cohesive elements GEA, including a specification of the definition relationships, depicted in the form of an object model. The meta model GEA cohesive elements include an important foundation to develop a tool for capturing and analysis of the ECF.

The GEA cohesive elements are defined in the object model, using object types. The identified and defined object types are then placed in a structure that is based on determining the mutual subsistence dependencies. This results in a model in which, in a structured manner, the GEA cohesive elements are related to each other. Note: an object model represents ‘definition relationships’, more specifically in an object model there is only a relation if in the definition of an object type another object type is mentioned. There may also be ‘information logical relationships’ between two object types, without reflection in the definition, and in the object model.

There are three types of definition of relationships: aggregation, classification and specialization [96], see Figure 62 for the meaning of the symbols used in the meta models of Figure 63 and Figure 64.
Figure 62. Definition of relationships

The ‘definition relationships’ applied to the GEA cohesive elements provides the following GEA object model with five aggregations and two specializations, see Figure 63.

Figure 63. GEA object model after development of the GEA-theory, before the case executions

For an explanation of the GEA object types and their interrelationships see Table 51 and Table 52. Note: a term in black capitals indicates the object type.
## Definitions GEA object types after development of the GEA-theory

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business issue</td>
<td>A <strong>BUSINESS ISSUE</strong> is an organizational issue that is considered and controlled from the coherence of several <strong>PERSPECTIVES</strong>.</td>
<td>An ‘event’ in the outside world of the enterprise becomes a business issue as it has been observed that enterprise coherence governance, i.e. several relevant perspectives are identified, is necessary.</td>
</tr>
<tr>
<td>Core concept</td>
<td>A <strong>CORE CONCEPT</strong> is a concept that plays a key role in governing the enterprise from a perspective.</td>
<td>A key concept is by definition context dependent i.e. uniquely linked to a perspective, and has no right to exist without a perspective.</td>
</tr>
<tr>
<td>Core model</td>
<td>A <strong>CORE MODEL</strong> is a high level view of a perspective, based on and in line with the guiding statements of the corresponding perspective.</td>
<td>In the graphical model a single arrow is drawn to indicate the minimum requirement: a core model represents one perspective and one principle.</td>
</tr>
<tr>
<td>Perspective</td>
<td>A <strong>PERSPECTIVE</strong> is an angle from which one wishes to govern/steer/influence enterprise transformations.</td>
<td></td>
</tr>
<tr>
<td>Principle</td>
<td><strong>PRINCIPLES</strong> are general rules and guidelines, intended to be enduring and seldom amended, that inform and support the way in which an enterprise sets about fulfilling its mission. In their turn, principles may be just one element in a structured set of ideas that collectively define and guide the enterprise, from values through to actions and results.</td>
<td>This is the definition of the Open Group.</td>
</tr>
<tr>
<td>Relationship</td>
<td>A <strong>RELATIONSHIP</strong> is a description of the relationship between two <strong>PRINCIPLES</strong>.</td>
<td></td>
</tr>
<tr>
<td>Relevant relation-ship</td>
<td>A <strong>RELEVANT RELATIONSHIP</strong> is a description of the connection between <strong>GUIDING STATEMENTS</strong> from different <strong>PERSPECTIVES</strong>.</td>
<td></td>
</tr>
<tr>
<td>Guiding statement</td>
<td>A <strong>GUIDING STATEMENT</strong> is an internally agreed and published statement which directs desirable behaviour.</td>
<td></td>
</tr>
</tbody>
</table>
Table 51. Definitions GEA object types after development of the GEA-theory

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business issue</td>
<td>A business issue is an aggregation of a perspective.</td>
</tr>
<tr>
<td>Core concept</td>
<td>A core concept is an aggregation of a perspective.</td>
</tr>
<tr>
<td>Core model</td>
<td>A core model is an aggregation of a perspective and a principle.</td>
</tr>
<tr>
<td>Perspective</td>
<td>-</td>
</tr>
<tr>
<td>Principle</td>
<td>A principle is a specialization of a guiding statement.</td>
</tr>
<tr>
<td>Relationship</td>
<td>A relationship is an aggregation of a principle.</td>
</tr>
<tr>
<td>Relevant relationship</td>
<td>A relevant relationship is a specialization of a relationship and an aggregation of a perspective and a principle.</td>
</tr>
<tr>
<td>Guiding statement</td>
<td>A guiding statement is a generalization of a principle.</td>
</tr>
</tbody>
</table>

Table 52. Definition relationships GEA object types after development of the GEA theory

16.2 GEA Meta models after execution of the cases

The definitions of the GEA object types and the definitions of the relationships between the GEA object types apply to all levels on which GEA is used. In particular when GEA is applied recursively, the same definitions apply at each level. It may happen that for example a business issue at one level does not meet the definition at that level, but rather at a lower level. The execution of the case studies resulted in the GEA object model as depicted in Figure 64.
Table 51. Definitions GEA object types after development of the GEA theory

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business issue</td>
<td>An aggregation of a perspective.</td>
</tr>
<tr>
<td>Core concept</td>
<td>An aggregation of a perspective.</td>
</tr>
<tr>
<td>Core model</td>
<td>An aggregation of a perspective and a principle.</td>
</tr>
<tr>
<td>Perspective</td>
<td></td>
</tr>
<tr>
<td>Mission</td>
<td></td>
</tr>
<tr>
<td>Principle</td>
<td>A specialization of a guiding statement.</td>
</tr>
<tr>
<td>Relationship</td>
<td>An aggregation of a principle.</td>
</tr>
<tr>
<td>Relevant relationship</td>
<td>A specialization of a relationship and an aggregation of a perspective and a principle.</td>
</tr>
<tr>
<td>Guiding statement</td>
<td>A generalization of a principle.</td>
</tr>
</tbody>
</table>

Table 52. Definition relationships GEA object types after development of the GEA theory

The definitions of the GEA object types and the definitions of the relationships between the GEA object types apply to all levels on which GEA is used. In particular when GEA is applied recursively, the same definitions apply at each level. It may happen that for example a business issue at one level does not meet the definition at that level, but rather at a lower level. The execution of the case studies resulted in the GEA object model as depicted in Figure 64.

Figure 64. GEA object model after execution of the case studies

For an explanation of the GEA object types and their interrelationships after execution of the case studies see Table 53, Table 54, Table 55 and Table 56. Note: a term in black capitals indicates the object type.
### Definitions GEA object types at the level of purpose after execution case studies

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>A <strong>STRATEGY</strong> of an enterprise forms a comprehensive master plan stating how the enterprise will achieve its <strong>GOALS</strong>.</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>A <strong>GOAL</strong> is a formulation of a desired stage of development of the enterprise towards achieving the <strong>VISION</strong>.</td>
<td></td>
</tr>
<tr>
<td>Vision</td>
<td>A <strong>VISION</strong> is a concise statement that operationalizes the <strong>MISSION</strong> in terms of the mid to long-term <strong>GOALS</strong> of the enterprise. The vision should be external and market oriented and should express, preferably in aspirational terms, how the enterprise wants to be perceived by the world [44].</td>
<td>The mission is an emergent property arising from the interaction between all vision statements. The mission naturally rises to the surface if one internalizes all vision statements.</td>
</tr>
<tr>
<td>Mission</td>
<td>A <strong>MISSION</strong> is a brief, typically one sentence, statement that defines the fundamental purpose of the enterprise [44] that is ‘enduringly pursued but never fulfilled’ [18]. It should include what the enterprise provides to its clients and inform executives and employees about the overall goal they have come together to pursue [44].</td>
<td>In the first place core values determine the behaviour of individuals and become somehow tangible in the culture.</td>
</tr>
<tr>
<td>Core value</td>
<td>A <strong>CORE VALUE</strong> of an enterprise prescribes its desired behaviour, character and culture [44] and is conditional to be or become successful within the formulated <strong>VISION</strong>.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 53. Definitions GEA object types at level of purpose after execution case studies**

### Definitions GEA object types at the level of design after execution case studies

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business issue</td>
<td>A <strong>BUSINESS ISSUE</strong> is a problem, bottleneck, challenge or alleged solution, that is considered and controlled from the coherence of several <strong>PERSPECTIVES</strong>.</td>
<td>An ‘event’ in the outside world of the enterprise becomes a business issue as it has been observed that enterprise coherence governance, i.e. several relevant perspectives are identi-</td>
</tr>
<tr>
<td>Object type</td>
<td>Definition relationship</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Policy statement</td>
<td>A POLICY STATEMENT is a GUIDING STATEMENT that expresses an intention of the enterprise.</td>
<td></td>
</tr>
<tr>
<td>Objective</td>
<td>An OBJECTIVE is a GUIDING STATEMENT that expresses a desired state of the enterprise in concrete results to be achieved.</td>
<td></td>
</tr>
<tr>
<td>Core concept</td>
<td>A CORE CONCEPT is an angle from which one wishes to contemplate and to govern a PERSPECTIVE.</td>
<td></td>
</tr>
<tr>
<td>Core model</td>
<td>A CORE MODEL is a level view of a perspective, based on and in line with the guiding statements of the corresponding perspective.</td>
<td></td>
</tr>
<tr>
<td>Perspective</td>
<td>A PERSPECTIVE is an angle from which one wishes to contemplate and to govern the enterprise.</td>
<td></td>
</tr>
<tr>
<td>Principle</td>
<td>A PRINCIPLE is a GUIDING STATEMENT with an enduring effect in giving shape to the VISION so that it can be realized.</td>
<td></td>
</tr>
<tr>
<td>Relevant relationship</td>
<td>A RELEVANT RELATIONSHIP is a description of the connection between GUIDING STATEMENTS from different PERSPECTIVES.</td>
<td></td>
</tr>
<tr>
<td>Guiding statement</td>
<td>A GUIDING STATEMENT is an internally agreed and published statement which directs desirable behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 54. Definitions GEA object types at level of design after execution case studies**

**Definition relationships GEA object types at the level of purpose after execution the case studies**

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>A goal is an aggregation of a vision.</td>
</tr>
<tr>
<td>Core value</td>
<td>A core value is an aggregation of a vision</td>
</tr>
<tr>
<td>Mission</td>
<td>-</td>
</tr>
<tr>
<td>Strategy</td>
<td>A strategy is an aggregation of a goal</td>
</tr>
<tr>
<td>Vision</td>
<td>A vision is an aggregation of a mission</td>
</tr>
</tbody>
</table>
Table 55. Definition relationships GEA object types at the level of purpose after execution case studies

<table>
<thead>
<tr>
<th>Object type</th>
<th>Definition relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business issue</td>
<td>A business issue is an aggregation of a perspective.</td>
</tr>
<tr>
<td>Policy statement</td>
<td>A policy statement is a specialization of a guiding statement.</td>
</tr>
<tr>
<td>Objective</td>
<td>An objective is a specialization of a guiding statement.</td>
</tr>
<tr>
<td>Core concept</td>
<td>A core concept is an aggregation of a perspective.</td>
</tr>
<tr>
<td>Core model</td>
<td>A core model is an aggregation of a perspective and a principle.</td>
</tr>
<tr>
<td>Perspective</td>
<td>-</td>
</tr>
<tr>
<td>Principle</td>
<td>A principle is a specialization of a guiding statement and an aggregation of a vision.</td>
</tr>
<tr>
<td>Relevant relationship</td>
<td>A relevant relationship is an aggregation of a perspective and a guiding statement.</td>
</tr>
<tr>
<td>Guiding statement</td>
<td>A guiding statement is a generalization of a principle, an objective and a policy statement.</td>
</tr>
</tbody>
</table>

Table 56. Definition relationships GEA object types after execution case studies at the level of design

16.3 Explanation of the differences in the meta models

The cases discussed above did not result in a need to make adjustments to the previously discussed meta models GEA Processes and GEA Products. The differences in the GEA cohesive elements were found, especially, in the object models of the ECF. This concerned:

- the cohesive elements on the level of purpose, including their relationships
- the cohesive elements ‘policy statement’ and ‘objective’ on the design level, including their relationships
- the cohesive elements ‘relationship’ and ‘principle’ on the design level, including their relationships

The reasons for including the cohesive elements at the level of purpose in the ‘GEA object model after execution of the cases’ were:

- the differentiated shaping value of these elements at the design level. We found patterns in the way:
  - core values did function as principles to shape behaviour at design level perspectives like culture, people, employees, etc.
  - principles at the design level originate from the vision statements.
  - objectives at the design level originate from the goals.
the need to establish coherence between the cohesive elements on the level of purpose as a prerequisite for alignment on all subsequent lower levels of governance. We found that cohesive elements on the design level, ultimately, find their primitive in the cohesive elements at the level of purpose. This means that flaws in the coherence between elements at the level of purpose, will translate into a lack of coherence on the design level. In reverse, capturing the purpose of an enterprise by a solid, coherent set of strategic directives, provide the foundation for a solid and coherent organisational design.

the need to define a uniform, agreed strategic reference point from which the cohesive elements at the design level can be derived and aligned. At the time of the execution of the case studies, we found that many officials did not have a common view of the object types at the level of purpose, and that, by making these elements explicit, the strategic dialog improved in quality.

The need to justify and qualify the strategic direction of the enterprise on completeness. In some cases, the data concerning the object types at the level of purpose were partly available. These strategic statements were scattered over relatively many documents and were not always consistent, to diagnose the quality of the available strategic material, you need a uniform and agreed strategic reference point.

These insights triggered the need to define the object types at the level of purpose and to include these in the GEA object model.

In all cases the guiding statements consisted of objectives and policy statements in addition to principles. The SMART formulated guiding statements were classified as ‘objectives’. All other guiding statements, not concerning principles, were classified as policy statements. These insights triggered the researcher to identify and define the object types ‘objective’ and ‘policy statement’ and record these in the GEA object model. Due to this the definition relationship of the object type ‘guiding statement’ was changed to: a guiding statement is a generalization of principle, objective and policy statement.

The cohesive element ‘relationship’ was needed just one time in one case, this should not to be confused with the cohesive element ‘relevant relationship’. The cohesive element ‘relationship’ represents a connection between guiding statements of just one perspective. After the research and development of the insights about recursively applying GEA, the cohesive element ‘relationship’ could be expressed on the second level of the ECF as a ‘relevant relationship’. Due to these insights we dropped the cohesive element ‘relationship’ from the set of cohesive elements at the level of design.

Initially, concerning the object type ‘principle’ we adopted the TOGAF definition [92]. As a result of the application of ‘principles of object modelling’ in the defini-
tions of the object types we adjusted the definition of the object type ‘principle’. This definition is shorter and the relationships with the other object types is made explicit.
17 Evaluation of the artefact and design process of GEA

17.1 Evaluation of GEA as an artefact

As stated in chapter 3 section 2 we used Gregor et al’s anatomy of a design theory [35] to evaluate GEA as an artefact. Gregor et al. state that any design theory should include, as a minimum, the following components: (1) the purpose and scope, (2) the constructs, (3) the principles of form and function, (4) the artefact mutability, (5) testable propositions, (6) justificatory knowledge, (7) principles of implementation, and (8) expository instantiation.

On the right sight of Table 57 we show how we met these components for the artefacts of the GEA method presented in this thesis.

<table>
<thead>
<tr>
<th>Component</th>
<th>The way in which GEA artefacts meet components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose and scope</td>
<td>The purpose and scope of GEA is the development of an approach for understanding, governing and improving enterprise coherence.</td>
</tr>
<tr>
<td>Constructs</td>
<td>The constructs GEA are an ECF to make the enterprise coherence explicit, an ECG to govern and to improve the enterprise coherence, and an ECA to measure the maturity level of enterprise coherence governance.</td>
</tr>
<tr>
<td>Principle of form and function</td>
<td>GEA is an methodology to aid in the identification of the level of enterprise coherence and issues a set of processes and heuristics to measure and improve the enterprise coherence.</td>
</tr>
<tr>
<td>Artefact mutability</td>
<td>Suggestions for improving GEA are given for further work and research: one example is further research in applying GEA in cases of contractual alliances.</td>
</tr>
<tr>
<td>Testable propositions</td>
<td>It is claimed that GEA is adaptable to situational settings, despite of its positioning as a general approach.</td>
</tr>
<tr>
<td>Justificatory knowledge</td>
<td>GEA is derived from other governance theories and enterprise architecture approaches and based on several design theories.</td>
</tr>
<tr>
<td>Principles of implementation</td>
<td>Implementation of GEA requires facilitation by a facilitator experienced in enterprise architecture, governance approaches, assessment approaches and running collaborative workshops.</td>
</tr>
<tr>
<td>Expository instantiation</td>
<td>Three examples of the application of GEA are given</td>
</tr>
</tbody>
</table>
Table 57. Evaluation of GEA as an artefact based on Gregor et al.

17.2 Evaluation of the design process of GEA

As stated in chapter 3 section 2 we used the design science research methodology for information system research of Peffers et al. [68] to evaluate the design process of GEA. Peffers et al [68] offers a design science research methodology (DSRM) process as pictured in Figure 65.

Figure 65. Evaluation of the design process of GEA based on Peffers et al.

The design process of GEA is in line with the design science research methodology from Peffers et al [68]. We followed the nominal process sequence as pictured in Figure 65. In chapter 2 we discussed the research problem area, the problem definition and research motivation and in chapter 4 we showed and proved the importance of the identified research problem. In section 3.3 we defined the objectives of a solution in terms of the research questions and research objectives, and in chapter 5 we discussed the question ‘what would a better artefact accomplish’ in terms of the requirements the artefact GEA has to meet. The third step ‘design and development of the artefact’ is discussed in chapters 6-8 and 14-15.

The step ‘demonstration’ was discussed using the case studies reported in chapters 10-12 and the step evaluation, including the iteration back to design, was discussed in chapters 13-16. The last step ‘communication’ was completed with the publica-
tion of 8 white papers and a book, 9 scientific papers, 5 industrial papers, attendance and presenting at 8 scientific congresses, 26 work conferences with the members of the research programme, and about 150 meetings with the members of the core team of the research programme, through the website [www.groeiplatformgea.nl](http://www.groeiplatformgea.nl) and a lot of presentations at industrial congresses and industrial enterprises.

The possible research entries are shown at the bottom of Figure 65, for this thesis the ‘problem centered initiation’ is applicable. As Peffers et al. [68] state: *A problem centered approach is the basis of the nominal sequence, starting with step 1. Researchers might proceed in this sequence if the idea for research resulted from observation of the problem ...*. As discussed in chapters 1 and 2 the research discussed in this thesis was based on such an observation.
18 Conclusions and recommendations for further research

18.1 Conclusions regarding the research questions and research objectives

In drawing these conclusions we refer the reader to the research questions and research objectives outlined in section 2.4. Our research programme [30] was based on the aforementioned triggers, requirements and postulate outlined in section 5.5, and driven by five key research questions:

1. What are the core factors that define enterprise coherence?
2. What are the core factors that influence enterprise coherence?
3. What impacts does the governance of enterprise coherence have on the performance of enterprises in practice?
4. How can enterprise coherence be expressed explicitly?
5. How can enterprise coherence be governed?

More specifically, the research objectives of the research programme for this thesis were:

1. to define the core indicators and factors that define enterprise coherence
2. to define the core indicators and factors that influence enterprise coherence
3. to identify the potential impact factors of enterprise coherence governance on organisational performance
4. to be able to measure an enterprise’s maturity level of coherence governance
5. to develop a design theory of how to guard/improve the level of coherence in enterprises during transformations

Our development of the ECF, allowed us to answer research questions number 1 and 4 and we achieved research objective number 1. The formulation of the basic philosophy given in section 5.5, including the statement that internal and external driven business issues will improve or decrease the enterprise’s coherence, answers research question 2 and achieves research objective number 2.

Our development of the ECA and the eECA, answers research question 3 and we achieved research objectives 3 and 4.

Our development of the ECG, provided an answer to research question 5 and we achieved research objective number 5.
Having developed the ECA, the eECA, the ECF and the ECG we have met all the EA requirements outlined in sections 5.1–5.4, see also appendix B: Relationship EA requirements/Cohesive elements/GEA components.

We applied the GEA theory in several cases and evaluated and improved it, in line with the multiple case study research approach of Yin [130].

18.2 Conclusions regarding the definition of the core indicators and factors that define enterprise coherence

We use the following definition of enterprise coherence for these conclusions: 

**enterprise coherence is the extent to which all relevant aspects of an enterprise are connected, in such a way that these connections facilitate an enterprise obtaining/meeting its desired results** [119].

The core indicators and factors that define enterprise coherence are the cohesive elements at the level of purpose and the level of design of an enterprise as discussed in chapter 6, the enterprise coherence framework.

In our case studies, which we used to evaluate the GEA theory, we did not discover any elements that were not included in the defined enterprise coherence framework. Based on this evaluation we conclude that we met the first part of the definition of enterprise coherence: *enterprise coherence is the extent to which all relevant aspects...'*

The requirement of the definition ‘of an enterprise are connected in such a way that these connections facilitate an enterprise obtaining/meeting its desired results’ is met by extracting the guiding statements from the level of purpose and connecting these at the cohesive element ‘perspective’ of the level of design, followed by indication of the relevant relationships between the perspectives.

It was found that the enterprise coherence framework (ECF) in practice was generally straightforward to obtain, see the case studies and the cross case conclusions given in chapters 10–13. Generally, two ways to make an ECF could be distinguished. One, in which the ECF primarily is established by external supervisors, followed by a validation by representatives of the different perspectives and elements at the level of purpose. The other, in which the ECF is primarily a co-creation designed by the representatives of the perspectives. The first method has the advantage that the processing time for the creation of the ECF is relatively short and one can proceed quickly to develop integrated solutions for the business issues to hand. A disadvantage of the first method is that the ECF becomes less a proprietary product of the representatives, making the discovery and understanding of, for example, relevant relationships more difficult. In the second method these things reversed, the processing time for the creation of the ECF lasts longer than in the first method, the ECF is better owned and internalized by the relevant representatives, but time to developing integrated solutions for the business issues to hand will be longer, however, one is better able to discover and understand e.g. the rele-
vant relationships within an enterprise. An additional advantage of the second method is that 'unwritten laws' in enterprises can be easily made explicit. It depends on the situation as to which approach an enterprise will prefer. In both methods we recommend carrying out desk research on the enterprise’s documentation at the level of purpose and the level of design for designing the ECF as this will provide more complete guidelines than will be obtained by only holding a workshop with the representatives of the perspectives.

A pitfall in the development of the ECF regards the cohesive element ‘relevant relationship’. The relevant relationships are defined between the guiding statements from two perspectives. Since in practice the number of perspectives are generally between 9 and 11, an average of 15 to 25 guiding statements are linked to a perspective, and two guiding statements can provide multiple relationships, the number of relevant relationships can amount to thousands. There is a risk here that the facilitator, managing the creation of the ECF in an instrumental way, may find perspective holders lose themselves in the desire to establish too many relevant relationships. This is certainly not the intention. The intention behind discovering and determining the relevant relationships is that the representatives of the perspectives will discover and understand the most important relevant relationships for their enterprise and thus gain a much better insight into the way the level of design has taken shape and thereby understand that an intervention on a perspective, due as a result of the development of an integral solution to a business issue, will have an impact on other perspectives. We therefore recommend that one or two workshops are organised with the representatives of the enterprise perspectives to help them discover and understand the main relevant relationships for their enterprise.

In many cases the level of purpose can be rather quickly visualized because in many enterprises the required work for this purpose will have been conducted at a good level, see for example the elements on the level of purpose of the ALIBABA Group, outlined in section 6.1., however, this is not always the case as has been shown in a number of situations. Making an ECF in these cases has a signal function and triggers the enterprise to perform the required work to produce a good ECF.

In all the cases conducted to develop integral solutions for business issues the representatives of the perspectives were, after some guidance, well able to apply an ECF, however, the process of synthesis, especially in which the proposed change initiatives further causality were analysed, leading to an integral solution and choice of approach, required a more thorough knowledge and experience level, and this was provided by the enterprise architects.
After conducting a large number of case studies in practice, it was possible to recognize patterns in the relationships between the numbers of occurrences of the cohesive elements at the level of design. For all of the enterprises concerned the number of occurrences of perspectives was about 9 to 11, the number of occurrences of core issues was approximately 6 to 10, the occurrences of the guiding statements was about 150 to 250. The guiding statements were not always equally distributed over the perspectives, with the number of guiding statements about 20 to 30% principles, 30 to 50% policy statements, and 20 to 30% objectives. In an extreme case, there were 190 policy statements, one principle and one objective. Given our present level of experience, it was immediately clear that the enterprise was strong in thinking and talking, but had little or no result orientation. We recommend further research into these patterns.

The co-creation used to develop the ECF lead to greater understanding and knowledge of each other's perspectives among the perspective holders and a strengthening of the interrelationships between them so that the effects of business issues in each area become more transparent and were perceived as a shared problem. This became very clear in practice, in a case where the perspective 'finance' was discussed in more detail, the method of financing of the enterprise was raised, and it was then that the representative of the perspective 'production' understood that the summaries of the production progress he had to provide, on a monthly basis to the department finance, were the basis for the financing of his enterprise.

Regarding the increase in mutual understanding there is also some things to criticise. In a case where there are heavily disturbed relationships between the representatives of the different perspectives in an enterprise, application of the GEA method will not solve this problem. In such a case other interventions are needed. We recommend that facilitators of the ECF identify these situations in advance if possible, and take appropriate actions to solve this.

Practice has shown that in the first instance it can be enough to use what we call an ECF light version. The ECF light version contains the elements at the level of purpose and at the level of design only the elements 'perspective', 'core issue' and 'guiding statement'. The type 'principle' of the cohesive element 'guiding statement' is included in the ECF light version, but not fully developed in accordance with the principle template. Once a facilitator has carried out an ECF light design they should be better able to develop integral solutions for business issues, albeit less deeply elaborated and with an increased risk of missing certain effects on perspectives due to the lack of relevant relationships, core models and deeper elaborated principles. Secondly the missing cohesive elements can be elaborated, as well as the principles in accordance with the principle template to get an ECF full version of the ECF. The advantage of the ECF light version is that one is be able to realize faster the expectations of GEA, such as making better decisions and
strengthen the coherence and performance in the enterprise, and by developing the ECF-full version in the second instance, the GEA processes can be carried out more professionally resulting in better quality results. For example, the cohesive element ‘core model’ offers, in combination with the recursive capability of the ECF, the possibility quickly to fit all kinds of pre-existing models in the ECF. An important prerequisite of the ECF in these situations is that the existing core models are in line, respectively should be brought in line, with the guiding statements from the perspectives the core models relates. Given the presence of the relevant relationships, the elaborate principles and core models that are in line with their perspective’s guiding statements, the GEA analyses for developing integral solutions for business issues can be carried out faster and more thoroughly.

18.3 Conclusions regarding the definition of the core indicators and the factors that influence enterprise coherence

The factors that influence the coherence of an enterprise are summarized under the term 'business issues'. These can be internal and external driven issues or both, and can be problems an answer must be found for using selected solutions that must be implemented. In practice it was found that any need to change was expressed under the term ‘business issue’. This included the whole range of using strengths and opportunities, reducing weaknesses and prevention of threats, usually expressed in terms of strategic interventions, efficiency and effectiveness issues. In this thesis three such case studies are discussed in which the cases met the definition of business issue: a business issue is a problem, bottleneck, challenge or alleged solution, that is considered and controlled from the coherence of several perspectives. The Dga case study provided an example of an internal driven business issue, this is discussed in chapter 10. Dga was an enterprise completely out of control at the design level which was facing loss of its accreditation and a fine of € 20 million from the European Commission. The DJI case study provided an example of an external driven business issue, this is discussed in chapter 11. This enterprise had to anticipate the implementation of a new law. Another example of an external driven business issue was provided by the SAE case study, which is discussed in chapter 12. This ministry had to anticipate a decision of the Dutch parliament. In another workshop with the customer reference group we listed, within 20 minutes, more than fifty business issues that were considered and controlled from the coherence of several perspectives. Examples of these listed business issues were: implementation of new or modified laws and regulations, crises issues in the agriculture field such as bird flu and bovine spongiform encephalopathy (BSE), also called mad cow disease; extensive necessary cuts resulting from the financial crises, other social business issues such as aging of the staff population and the need to provide time-and location-independent work; technology-driven business issues such as implementing bring your own device (BYOD), and information security issues;
internal strategic issues such as changing growth strategies to meet certain growth ambitions, increasing in time to market, increasing in customer orientation; internal tactical and operational business issues such as increasing the efficiency of businesses processes and reducing salary costs.

Both from the theory [86] but also in practice, it became clear that it is essential when seeking to solve a business issue to perform a pre-analysis of the business issue in terms of urgency, extent, causes / reasons, the content of the business issue devoid of jargon, to determine in advance known implications and risks, and the perspectives to which the issue primarily relates. The quality of such a pre-analysis is very important for the quality of the process of the development of the solution, and the integral result. The better the representatives of an enterprises’ perspectives are able to represent and internalize their business issues, the better they will be able to indicate the impacts and necessary change initiatives and impossibilities for change.

18.4 Conclusions regarding the identification of the potential impact factors of enterprise coherence governance on the organisational performance

The potential impact factors of enterprise coherence governance on the performance of an enterprise is expressed in a quadrant diagram as explained in section 14.4. The impacts degeneration, sub optimisation, philosophising and optimisation are identified in a workshop with the customer reference group using a two-axis system and the 4 quadrants inside these axis. This means that the appointed impacts represent the opinion of this group of enterprises and not a scientific proof. Although all cases in which the GEA method hitherto has been used have led to successfull results, the number of cases in which GEA has been conducted within one enterprise is currently too limited to prove these impacts. We recommend further research to this end.

18.5 Conclusions regarding the ability to measure an enterprise’s maturity level of coherence governance

The instrument developed to measure the maturity level of enterprise coherence governance, the eECA, is discussed and explained in chapter 14. Measurements made with this instrument in the year 2011 at 54 enterprises showed that in more than 85% of these enterprises there was a lack of enterprise coherence governance [118]. Using these assessments, the status quo of the enterprise architecture functions of these enterprises were pictured, and shown to be consistent with our in practice gained finding that the discipline of enterprise architecture in terms of the holistic approach GEA predicts, is still in the early stages. In practice many enterprises associate the enterprise architecture discipline one on one with
information technology (IT) and treat business issues far too unilaterally with the result that all too often business issues are resolved from an IT perspective without having a picture of the effects of such treatment on other perspectives. This results in a unilateral IT solution that has no cohesion with other perspectives. We recommend further research into how to get more acceptance in practice for the holistic approach to applying enterprise coherence governance that GEA provides.

18.6 Conclusions regarding the development of a design theory of how to guard/improve the level of coherence in enterprises during transformations

The design theory of how to guard/improve the level of coherence in enterprises during transformations is described in chapter 7. The full implementation of an enterprise coherence governance approach (ECG) is a challenging task and has not, as yet, been done fully successfully. Up to now, cases have been carried out in which an enterprise is willing to develop an ECF, followed by a part of the ECG, i.e. the process of developing an integral solution for a business issue. In practice, many enterprises have already purchased an enterprise architecture method and show resistance with respect to the acceptance of a new method and its associated vision. Additionally the entire field of enterprise architecture is seen in the context of IT and enterprises have difficulties with accepting the holistic approach from a governance perspective with GEA pursued in contrast to the engineering approach used by existing enterprise architects. Current enterprise architects, read IT staff, will not, or to a lesser extent, have the top ten competencies required to apply the GEA method successfully and facilitate the successful performance of the enterprise architecture function. This means we believe that conscious adoption of the GEA method by board members and at senior management levels, and attracting enterprise architects with the necessary skills is a prerequisite for GEA to be used successfully. In our opinion, due to the engineering style applied towards EA in many enterprises, the enterprise architecture function has not earned its necessary position because many of the expectations of board members and managers have not been fulfilled within the context of an engineering style. Increasingly we speak in practice at the level of board members in terms of enterprise coherence governance instead in terms of enterprise architecture, since the latter term is commonly directly associated with IT. We recommend further research into implementation of the ECG.

18.7 Overall conclusions

With the development of the GEA method a governance instrument has been created that board members and managers can use to enable them to make well founded decisions about how to resolve important business issues and find integral solutions, see for example the case studies and cross case conclusions in chapters
10-13. Under the condition the postulate of GEA as mentioned in section 5.5 is true, and by consistently applying GEA and implementation of the integral solutions, the coherence of an enterprise will be permanently strengthened and its performance will be improved. The time required for decision making will be strongly reduced. We explain this to be a result of the holistic and governance character of the GEA approach. Once a board member sees his/her key executives and opinion leaders have participated in the creation of the solution, and as a result they have adopted the solution, the final decision to adopt the proposed solution can be taken more easily, and also less time will be needed to create support for the solution.

Proving the postulate of GEA outlined in section 5.5 has been stated to be beyond the scope of this thesis, however, as a result of the fact that all the case studies, including those not discussed in this thesis, were successfully performed, and led to successful realizations of the solutions, we are strengthened in the conviction that this postulate is true. We assume that a much better start of a realisation programme, due to a PgSA as a result of the GEA analysis, makes an important contribution to a successful realization of a solution, and that, due to the holistic character of the PgSA, repair and failure costs, often seen in change programs and change projects, are avoided or reduced and so this contributes to a better performance of the enterprise. In addition we argue that a better decision making process, resulting from the use of the GEA method, leads to better quality decisions; especially at the strategic level. This reduces the risks of disinvestments and similar problems. In our opinion the latter especially can have a large impact on the financial results of an enterprise. We recommend further research into the evidence of the postulate outlined in section 5.5.

18.8 Recommendations further research

We recommend further research on the following issues:

- research into the patterns of the relationships between the numbers of occurrences of the cohesive elements at the level of design, see for more details section 17.2.
- research into the identification of the impact of enterprise coherence on the performance of an enterprise, see for more details section 17.4.
- research into getting more acceptance, in practice, for the holistic approach of the GEA method, see for more details section 17.5.
- research into the implementation of the ECG, see for more details section 17.6.
- research into the evidence of the postulate of GEA as outlined in section 5.5, see for more details section 17.7. Based on the results of the case studies we state that, when the GEA method is applied, significant results can
be achieved in terms of higher quality of the decision making process and improvement of efficiency and effectiveness.

- research into the provisional conclusion that it might be more difficult to implement enterprise architecture in enterprises with divisions that operate with a relatively high degree of autonomy than in more centrally managed enterprises, see for more details in section 3.3.
- research into the positioning of enterprise coherence governance in relation to the green, red and white ‘colours’ of De Caluwé [21].
- research into and to pay more attention to the following lessons learned:
  - application of GEA leads to a strong increase in transparency, not all managers are equally happy about this as it offers the possibility for criticizing others on their functioning.
  - success as a result of application of GEA is quickly used up, the adoption of working methods according to GEA requires more effort. The enterprises studied for the cases felt back relatively soon into old ineffective behaviours after our departure.
- research into the application of the GEA method as part of due diligence investigation, we believe that application of GEA as part of the due diligence investigation in the case of mergers and acquisitions could offer good added value, as due diligence investigation significantly occur from a financial perspective instead of a holistic approach.
- research into examining the similarities to and differences of GEA with other enterprise architecture methodologies. A first step has been made by us in an industrial paper in which the added value of the combined application of GEA and TOGAF is examined [122].
- research into examining the similarities to and differences of GEA with other governance instruments. A first step has been made by us in an industrial paper in which GEA is compared to Balanced Score Card (BSC) [123] and to some other governance instruments [112].
- research into examining the way GEA can be used to implement specific reference architectures into the enterprise architecture of an enterprise. A first step has been made by us in an industrial paper in which GEA is applied to implement the NORA (Dutch Government Reference Architecture) into the enterprise architecture of enterprises [124].
- research should be done into how GEA can be used for major themes that currently are important for many enterprises. A first step has been made by us in a scientific chapter for a book in which the GEA method is applied to the issue of information security [119]. At the time of finishing this thesis we had started to examine how to use the GEA method in relation to the theme ‘cloud’.
research into our experiences with 9 to 12 perspectives and trying to bring down large amounts of data to between 5 and 9 categories as done by most people. See for more details in section 6.3.2.

- in general, evaluation of the quality of methods, as a design artefact, needs more study. Design science provides good starting points to assess the quality of a method as an artefact, however, more research into the question of how actually to assess methods in terms of their performance/added-value in real world situations is called for. An important aspect of this type of assessment of the actual use of methods involves in-depth capturing of what happened during a specific situation in which the method was applied. This typically involves an interpretivist research style [125, 126, 61]. Early results of such work has e.g. been reported in [57, 25]. In the near future, we would like to see such evaluations conducted in situations where GEA was/is used.

- the creation of a coherent enterprise architecture, in particular when linked to the enterprise's strategy, involves a multitude of design decisions. To be able to understand the past, present and future of an enterprise, and its coherency, it is necessary to capture these design decisions. Even more, given the complexities involved in the decision making processes, it is important to have effective decision making strategies. We would like to see work done in this area (see e.g. [70, 71]) extended to the decision making in GEA processes.

- a crucial aspect of the yellow-print thinking [De Caluwe] approach is the role of culture. As acknowledged in e.g. the surveys conducted by Lange [47] and reported in his PhD, culture plays an important role in the context of enterprise architecture, while at the same time acknowledging the need to further elaborate on the role of culture in EA and enterprise transformations in general. The thesis of Van Steenbergen [100] also identified the need to study more closely the role of culture in EA. More elaborate work on this topic is being done [63, 64, 65], and applying this work in the context of GEA projects is desirable.

- capturing the core models, and more detailed models, in the context of enterprise architectures involves a plethora of languages. This is even exacerbated by the variety of concerns across the different perspectives. At the same time, being able to relate the different models formally, is important to be able to identify potential misalignments between different aspects and perspectives. Therefore, research is needed to allow us to use flexible constellations of modelling languages while still being able to maintain the coherence between these aspects. Some work is currently being conducted, that we hope will also be applied in the GEA context [10, 11, 12].

- the research programme on the GEA method should not be stopped. The program should be continued to assist making recommendations for further
research. The growth platform GEA was extended in February 2013 into a formal foundation with the following objectives:

a. further development, sharing, maintaining and promoting of the application of the general enterprise architecting philosophy (GEA philosophy)

b. the performance of all further actions, linked to the above in the broadest sense or that may be conducive thereto, see www.groeiplatformgea.nl.

In our further research we will, in line with the research methodology used, continue to conduct case studies and, based on the findings, elaborate and perfect the GEA theory.

Appendix A: Elaboration of the ECA Questionnaire

1. We possess an EA vision agreed by the management. If one participates in enterprise architecture (EA) then we assume that a vision of EA is articulated in a document and subsequently agreed to by management. With regards to the content aspect, which are reflected in the vision, we consider the following questions.

   – Is EA is defined in terms of what it is?
   – Why are we doing it?
   – Who does it, how and with what do we do it?
   – What does it solves, what are the desired effects, et cetera?
   – Are several management theories included in the vision’s principles?
   – Are EA’s success factors established?
   – Is there a clear degree of urgency?

2. Our EA vision is the result of cooperation between the representatives of all stakeholders. One of the EA factors for success involves the situation of whether all, representatives of, important organisational components cooperate in the design. In your view is this the case?

3. Our enterprise’s vision, objectives and strategy are characterised by the various EA elements as perspectives, key concepts, guiding statements, principles, et cetera. To identify the correct correlation and concepts for solving important problems with the help of EA, the organisational vision, objectives and strategy, EA elements such as perspectives, principles, key models and relevant relationships are extracted. These perspectives are the ways in which an enterprise is viewed and can be controlled, such as products, processes and culture. Is there such a characterisation of perspectives, key concepts, principles, et cetera, in your enterprise or corresponding concepts?

4. Our EA vision is developed into EA processes, products, people and resources. To translate this vision into effective actions it must be elaborated into processes, products, people and resources. This includes:

   – the application of executive EA processes that deliver EA control process related products and EA specialist products such as programme start architecture and key models respectively.
   – managing EA, including maintaining EA, resulting in EA governance products such as EA development plans or evaluation reports.
   – profile and competencies of the enterprise architects.
   – tools such as an EA framework, e.g. Zachman, DYA, Architect or Aris.

   Is this kind of vision present in your enterprise?
Appendix A: Elaboration of the ECA Questionnaire

1. *We possess an EA vision agreed by the management.*
   If one participates in enterprise architecture (EA) then we assume that a vision of EA is articulated in a document and subsequently agreed to by management. With regards to the content aspect, which are reflected in the vision, we consider the following questions.
   – Is EA defined in terms of what it is?
   – Why are we doing it?
   – Who does it, how and with what do we do it?
   – What does it solves, what are the desired effects, et cetera?
   – Are several management theories included in the vision’s principles?
   – Are EA’s success factors established?
   – Is there a clear degree of urgency?

2. *Our EA vision is the result of cooperation between the representatives of all stakeholders.*
   One of the EA factors for success involves the situation of whether all, representatives of, important organisational components cooperate in the design. In your view is this the case?

3. *Our enterprise’s vision, objectives and strategy are characterised by the various EA elements as perspectives, key concepts, guiding statements, principles, et cetera.*
   To identify the correct correlation and concepts for solving important problems with the help of EA, the organisational vision, objectives and strategy, EA elements such as perspectives, principles, key models and relevant relationships are extracted. These perspectives are the ways in which an enterprise is viewed and can be controlled, such as products, processes and culture. Is there such a characterisation of perspectives, key concepts, principles, et cetera, in your enterprise or corresponding concepts?

4. *Our EA vision is developed into EA processes, products, people and resources.*
   To translate this vision into effective actions it must be elaborated into processes, products, people and resources. This includes:
   – the application of executive EA processes that deliver EA control process related products and EA specialist products such as programme start architecture and key models respectively.
   – managing EA, including maintaining EA, resulting in EA governance products such as EA development plans or evaluation reports.
   – profile and competencies of the enterprise architects.
   – tools such as an EA framework, e.g. Zachman, DYA, Architect or Aris.
   Is this kind of vision present in your enterprise?
5. In our enterprise one or more control tools are used to rate organisational results in coherence.

Does your enterprise use control tools that measure integral coherence and on what basis are adjustments made as a result of the ratings? Examples would include the Balanced Score Card, INK, EFQM, et cetera.

6. In our enterprise one or more control tools are used to control change processes in coherence.

Does your enterprise possess control tools, which control integral coherence during preparation phases of important change processes, such as Prince II, business cases, programme start architectures?

7. Our EA architects are involved in setting up control processes at a strategic and tactical level.

Questions that arise are:
– Are concrete company problems the reason for involving enterprise architects in control processes?
– Are all the relevant company perspectives represented?
– Are all named EA success factors met in the vision?
– Is EA used as an integral control tool?
– Are EA control products such as principle analyses, scenario analyses and integral business solutions used as a guide for decision-making?
– Is the involvement of enterprise architects, with the EA control products, structurally embedded in organisational control processes?
– Are the EA control products concrete in terms of usability, readability, clarity, composed of the correct level of detail, et cetera?

8. Is it known whether all our change programmes were developed with or without ‘EA’.

Are the change programmes actually tested by means of EA control mechanisms, to ascertain whether they comply with architecture principles laid down in a Programme Start Architecture (PgSA)? Are established procedures followed for necessary deviations from the PgSA?

9. In our managers’ competence profile ‘EA’ is included as a competence.

If one wants to apply EA as ‘coherence governance’ one condition is that managers are familiar with it and can apply it. Is equipment for managers structurally organised with regards to knowledge and skills in the area of EA?

10. Our managers understand and use EA products in their control processes.

Is EA embedded in the control of the enterprise and not just something belonging to the ‘ivory tower architects’?

11. At least once a year there is an updated version of the content of our EA framework.

This statement raises the following questions:
– Is the EA maintenance process well organised?
– Do the specialist EA products, also called the EA building block products,
meet quality criteria such as being up to date and consistent?
– Is input from the EA application processes consistently regulated?
– Does the EA controller possess the necessary competencies and are the tools used of a professional level? For example, tools to capture and leverage enterprise architectures.

12. Those with end-responsibility for our change processes are accountable for time, money and quality, and meeting EA principles and guidelines.
This statement is based on the idea that if this situation applies then:
– solutions and choices of approach are developed from an integral view of the enterprise.
– all responsible parties, direct and indirect problem owners, are actively involved in developing company solutions.

Appendix B: Relationship EA requirements/Cohesive elements/GEA components

As mentioned in chapter 2 ‘Research context’, the EA requirements form the basis to make enterprise coherence explicit and to govern the enterprise coherence. In this thesis we have shown that we make the enterprise coherence explicit using cohesive elements and we realize the enterprise coherence governance by applying the GEA components using the cohesive elements. In this appendix we show the relationships between the cohesive elements and the EA requirements and the relationships between the GEA components and the EA requirements.

The confrontation of the cohesive elements and the GEA-components with the EA requirements, shows that all the requirements have been contributed. Conversely, the coherence between the cohesive elements and the GEA components is made explicit by the requirements that shape both categories.
Goals have to be an element of enterprise coherence at the level of purpose of an organization and objectives an element of enterprise coherence.

A complete and coherent set of organisational angles must be brought together by the decision makers.

The actual state of enterprise coherence must be represented on a permanent basis including current state as well as future directions.

An appropriate approach needs appropriate enterprise coherence products.

The "direction of solution and choice of approach" should be just one element of decision.

The organizational aspects that are dominant in the solution for a business problem, determine the choice of approach.

EA function

The model of enterprise coherence must represent the dynamics of the design level of an organization.

Regarding the decision making process, enterprise coherence governance should contribute both the solution direction and choice of approach of a business issue.

The added value of EA as a governance tool should be recognized and promoted by all parties concerned. Also the added value of EA compared with other control tools that are in use.

The purpose of a change process should be in line with the goals on the level of purpose and objectives on the design level.

To establish the EA function an integral approach to EA vision development, EA processes, EA products, EA people and EA resources needed for EA governance must have sufficient levers to influence enterprise coherence on the design level and support the enterprise coherence governance, distinguished by processes, products, people, means, governance, methodology and all based on an interdependancy with the level of purpose as well, including: forward and backward governance, event driven and cyclic governance, single and multi level governance (recursivity and projection).

Components

Enterprise architects must participate in the organisation's governance processes and must have direct access to managers on a peer to peer basis.

The EA governance products must provide direction to change programmes and the existing organisation.

A complete and coherent set of organisational angles must be brought together by the decision makers.

EA must be arranged as a continuous process whereby coherence is permanently adjusted to the dynamics of the internal and external environment.

EA must be applied as a governance instrument at the moment major business issues arise in order to establish integral solutions and approaches on time.

### Table: Relationship EA requirements/Cohesive elements/GEA components

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Cohesive elements</th>
<th>EA function Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
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<td>1.2</td>
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<td>1.14</td>
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<tr>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements</td>
<td>Cohesive elements</td>
<td>EA function</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
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<td>-------------</td>
</tr>
<tr>
<td>2.1 Goals have to be an element of enterprise coherence at the level of purpose of an organization and objectives an element of enterprise coherence at the design level of an organization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 The level of purpose of the organization must be within the scope of EA. This requirement is associated with the previous mentioned requirement “scope”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 Boundaries must be made explicit since boundaries define relations between angles of an organization, and as such form a basic asset of enterprise coherence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 The effect of intended strategic interventions on the enterprise coherence should be made clear interactively and beforehand between the representatives of the several perspectives.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Objectives have to be an element of enterprise coherence at the design level of an organization. (This requirement is also formulated from the theory of management control in table 2 requirement no. 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 The model of enterprise coherence must represent the dynamics of the design level of an organization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 The actual state of enterprise coherence must be represented on a permanent basis including current state as well as future directions.</td>
<td></td>
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</tr>
<tr>
<td>3.4 Enterprise coherence governance must have sufficient means to influence enterprise coherence on the design level and support the interdependency with the level of purpose as well, including: forward and backward governance, event driven and cyclic governance, single and multi level governance (recursivity and projection).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 Restrict the complexity and information overload by differentiating enterprise coherence in several interdependent levels. Allocate sufficient resources to enterprise coherence governance, distinguished by processes, products, people, means, governance, methodology and all based on an vision.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 The scope of enterprise coherence governance should include both internal and external angles of the organizational transaction environment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2 The purpose of a change process should be inline with the goals on the level of purpose and objectives on the design level.</td>
<td></td>
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</tr>
<tr>
<td>4.3 The organizational aspects that are dominant in the solution for a business issue, determine the choice of approach.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4 Every change process should be argued by the application of the enterprise coherence governance before execution.</td>
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<tr>
<td>4.5 The “direction of solution and choice of approach” should be just one element of decision.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.6 Regarding the decision making process, enterprise coherence governance should contribute both the solution direction and choice of approach of a business issue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.7 Enterprise coherence governance should guide the realisation of the “solution direction and choice of approach” of a business issue.</td>
<td></td>
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</tr>
<tr>
<td>4.8 An appropriate approach needs appropriate enterprise coherence products.</td>
<td></td>
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</tr>
</tbody>
</table>
# Appendix C: Rating questions eECA

## Extended Enterprise Coherence Governance Assessment

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Rating questions</th>
<th>Concerns GEA-component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To what extent is the EA vision supported by the board members?</td>
<td>EA vision</td>
</tr>
<tr>
<td>2</td>
<td>To what extent is the relationship between the level of purpose, vision / mission / core values / goals / strategy, and the level of design, frameworks for organizing processes, services, etc., made explicit in the EA vision?</td>
<td>EA vision</td>
</tr>
<tr>
<td>3</td>
<td>To what extent is the awareness of the added value of architecture included in the EA vision?</td>
<td>EA vision</td>
</tr>
<tr>
<td>4</td>
<td>To what extent is the governance of enterprise coherence the common thread in your EA vision?</td>
<td>EA processes</td>
</tr>
<tr>
<td>5</td>
<td>To what extent is ‘working under architecture’ used in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>To what extent are the EA processes uniformed and standardized to produce the EA products?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>To what extent are the collaboration processes of the existing enterprise, the change organization and the EA function formalized?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>To what extent are programme start architectures (PgSA’s) produced for the execution of a major change processes?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>To what extent does your enterprise develop the EA profession?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>To what extent do your enterprise architects participate in the preparation of strategic decision-making processes?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>To what extent is the resolution power of your EA used</td>
<td></td>
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<tr>
<td>Nr.</td>
<td>Rating questions</td>
<td></td>
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<tr>
<td>-----</td>
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</tr>
<tr>
<td>12</td>
<td>To what extent do the representatives from all perspectives participate in the development and application of your EA?</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>To what extent is your EA kept up to date?</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>To what extent is your EA regularly used in the preparation of decision-making processes?</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>To what extent is the added value of EA products in your enterprise actually achieved?</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>To what extent does the EA products play a real role in the decision making processes?</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>To what extent is the content of the EA products tailored to the choices of approach to solve issues in your enterprise? Consider for example choice of approaches as tailor made in house, outsourcing, acquisition, etc.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>To what extent are the core models tailored to the guiding framework of the business aspects they are about?</td>
<td></td>
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<tr>
<td>19</td>
<td>To what extent does your enterprise differentiate into EA products for communication within and outside the EA function?</td>
<td></td>
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<tr>
<td>20</td>
<td>To what extent are relationships made explicit between important business elements in your enterprise?</td>
<td></td>
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<tr>
<td>21</td>
<td>To what extent are external reference architectures embedded in your EA?</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>To what extent the EA is used for the preparation of PgSA's?</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>To what extent is the EA used for the preparation of program initiation documents (PgID's)?</td>
<td></td>
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<tr>
<td>24</td>
<td>To what extent do enterprise architects participate in decision-making processes that formulate answers to important issues?</td>
<td></td>
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<tr>
<td>25</td>
<td>To what extent are employees of the existing enterprise, the change organization and the EA function working together?</td>
<td></td>
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<tr>
<td>26</td>
<td>To what extent are the skills required for the various EA rolls made explicit in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Open questions</td>
<td>Concerns</td>
</tr>
<tr>
<td>-----</td>
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</tr>
<tr>
<td>27</td>
<td>To what extent are the task areas within the EA function identified in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>To what extent are the competencies of the EA function related to the task areas of EA in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>To what extent are EA competencies used as a control mechanism in the recruitment and operation of enterprise architects?</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>To what extent have your enterprise architects access to your board members?</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>To what extent do your enterprise architects work together in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>To what extent does the EA function operate as a ‘learning organization’?</td>
<td></td>
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<tr>
<td>33</td>
<td>To what extent are means allocated to EA? Think of money, resources, organizational unit, etc.</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>To what extent do your enterprise architects use specific architecture tools?</td>
<td></td>
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<tr>
<td>35</td>
<td>To what extent are the foundations or principles of your EA vision an integrated and coherent whole?</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>To what extent is the choice of approach to solve an important issue tailored to the possible solution?</td>
<td></td>
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<tr>
<td>37</td>
<td>To what extent are the relationships between the architectural layers applied?</td>
<td></td>
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<tr>
<td>38</td>
<td>To what extent are norms and standards explicitly incorporated in your EA framework?</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>To what extent has your EA an ‘open’ character in the sense that relatively simple other, or entirely new, perspectives in the EA can be included?</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>To what extent is your architecture on enterprise-level directive for the architecture levels of child domains?</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>To what extent does the control framework of your EA consist of business principles?</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>To what extent is EA used to manage the strategic level?</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>To what extent is EA used as a management instrument in combination with other conventional control tools such as Balanced Scorecard and EFQM?</td>
<td></td>
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<tr>
<td>44</td>
<td>To what extent is EA an integral part of the control cycles in your enterprise?</td>
<td></td>
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<tr>
<td>45</td>
<td>To what extent have objectives for your EA function been formulated?</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>To what extent does EA in your enterprise contribute to the business goals?</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>To what extent does your enterprise impose requirements on EA?</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>To what extent does the EA function assess of the change programs on whether or not the EA frameworks are met?</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>To what extent is the PgSA used for substantive direction of the change processes?</td>
<td></td>
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<tr>
<td>50</td>
<td>To what extent is your EA capable of event-driven improvement of the coherence in your enterprise?</td>
<td></td>
</tr>
</tbody>
</table>

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Appendix D: Open questions eECA

Extended Enterprise Coherence Governance Assessment

Organisation:
Name:
Function:
Date:
Email address:
<table>
<thead>
<tr>
<th>Nr.</th>
<th>Open questions</th>
<th>Concerns GEA-component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On what foundations or principles is the EA vision of your enterprise built?</td>
<td>EA vision</td>
</tr>
<tr>
<td>2</td>
<td>If the added value awareness of architecture is incorporated in the EA vision, how is this defined?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>What are the most important challenges for EA in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>What is the scope of your EA?</td>
<td></td>
</tr>
</tbody>
</table>

Appendix D: Open questions eECA
<table>
<thead>
<tr>
<th></th>
<th>Does your enterprise use EA to promote an integrated approach to solving major issues? If so, what actions does it take?</th>
<th>EA processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Which EA processes are executed in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>If in your enterprise ‘working under architecture’ is used, what does this mean in practice?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>How does your enterprise make explicit coherence on the EA level?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Do you have layering in the EA? If so, what?</td>
<td>EA products</td>
</tr>
<tr>
<td>10</td>
<td>Which EA products are produced in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Does you have designated staff in your enterprise permanently allocated to manage the EA? If so, how many full time equivalent (FTE)?</td>
<td>EA people</td>
</tr>
<tr>
<td>12</td>
<td>How do the architects work together within your enterprise?</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>How do your enterprise architects collaborate with architects from other organizational units?</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>If function performance objectives are defined for your EA, what are they?</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>If your enterprise imposes requirements on EA, what are they?</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Is there a control cycle for the control of the EA function? If so, please describe.</td>
<td>EA governance</td>
</tr>
<tr>
<td>17</td>
<td>Which function is ultimately responsible for EA in your enterprise?</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>What synergies exist between the existing organization, the change organization and the EA function?</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>What happens in your enterprise if the managers of a change program differ from those managing the EA frameworks?</td>
<td></td>
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<tr>
<td>20</td>
<td>To what extent does EA contribute to the governance of information provision?</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>How well is your enterprise be able to make connections top down and bottom up between EA, domain architectures and program start architectures?</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>How do you qualify the EA tools used by your enterprise?</td>
<td>EA means</td>
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</table>

Indicate per instrument.
## Appendix E: GEA Maturity Model

### GEA Maturity Model

<table>
<thead>
<tr>
<th>GEA components</th>
<th>Maturity Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Level 0: Absent</td>
<td>EA is totally unknown in the organization. This is reflected in: no vision, no support and no allocation of people and resources to EA. There are initiatives here and there, but that is not seen and experienced as EA. First tentative steps in EA are done. This is reflected in: local initiatives without consistency.</td>
</tr>
<tr>
<td>Processes</td>
<td></td>
<td>EA processes are not present or are redundantly repeated under different names and variations in the existing organization and change organization. EA processes are summarily and not uniformly, and locally and / or partially conducted.</td>
</tr>
<tr>
<td>Products</td>
<td></td>
<td>EA products are not present or are redundant present under different names and variants within the existing organization and change organization. EA products are summarily present, have different qualities in form and content and vary little or no cohesion.</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td>The organization has no employees with a position of architect. Roles of the EA function, or parts thereof are conducted under other names and variations. Some employees call themselves architect without this has been formalized.</td>
</tr>
<tr>
<td>Means</td>
<td></td>
<td>The organization do not allocate resources to EA or the resources are redundantly and under different names and variations applied within the existing organization and the change organisation. Local budgets are used to own initiatives in the field of EA development.</td>
</tr>
<tr>
<td>Governance</td>
<td></td>
<td>There is no question of an EA function and therefore no governance of it. Local governance, no overall governance activities.</td>
</tr>
<tr>
<td>Methodology</td>
<td></td>
<td>There is no question of an EA function and therefore no methodology. Some local descriptions of several EA components without consistency</td>
</tr>
</tbody>
</table>

### GEA components

- **GEA components**
  - The EA provides a clear vision and crystallized view on the added value and application of EA in the organization. The vision is based on by the organization accepted foundations of organizational theory and governance theory. The EA-vision is promoted by the top of the company and all employees.
  - The EA processes are all associated activities which carry out the EA vision. We distinguish: initialization processes, executive processes, evaluation processes, maintenance processes and the processes that govern the EA function.
  - The EA processes are all associated activities which carry out the EA vision. We distinguish: EA-specialist products and EA-governance products. Specialist products are the building blocks for compiling products that actively support the organizational management processes. The specialist products will not be communicated outside the EA function.
  - People are the individuals who practice the EA function. We distinguish: task areas and related competencies leading to EA roles.
  - Means are all to the EA function allocated resources. We distinguish: money, capacity, resources, housing, organizational unit, etc.
  - Governance concerns the management of the EA function itself. We distinguish planning processes, evaluation processes and adjustment processes of the EA function. The operational processes within the EA function have already been specified by the components ‘Processes’ and ‘Products’.
### Appendix E: GEA Maturity Model

We distinguish: money, capacity, resources, housing, 'Processes' and 'Products'.

Processes and adjustment processes of the added value and application of EA in the organization. The vision is based on by the organisation function itself. We distinguish planning processes, executive processes, evaluation processes, support the organizational management processes. The maintenance processes and the processes that govern the EA function.

Methodology concerns the formal description of the EA-organizational unit, etc. Means are all to the EA function allocated resources. People are the individuals who practice the EA function. EA products are all the results arising from the EA function.

The EA processes are all associated activities which support the EA vision. EA-governance products. Specialist products are the redundant present under different names and variations applied within the existing organization. The organization do not allocate redundant EA. There are initiatives which the EA processes are derived from the EA products. The architect profiles are identified and described. On enterprise and domain-level relationships are established and described. Profiles are included in the functional classification.

<table>
<thead>
<tr>
<th>Maturity level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0: Absent</td>
<td>EA-vision is lacking and need is not felt.</td>
</tr>
<tr>
<td>Level 1: Initial</td>
<td>Vision EA vision is lacking and need is not felt.</td>
</tr>
<tr>
<td>Level 2: In development</td>
<td>EA-vision functions in daily practice as a guide and is periodically updated.</td>
</tr>
<tr>
<td>Level 3: Defined</td>
<td>The EA-vision is an integral part of the corporate vision.</td>
</tr>
<tr>
<td>Level 4: Controlled</td>
<td>EA-executive processes are structurally embedded in the organisation control cycles.</td>
</tr>
<tr>
<td>Level 5: Optimized</td>
<td>EA-products govern anticipatory and retroactively, directly related to the governance of change processes. The coherence of the organization is structurally improved and both issue-and permanently adjusted.</td>
</tr>
</tbody>
</table>

#### Level 2: In development

EA-vision will be developed in line with the purposes of the organization. The EA-vision took shape within the boundaries of the organization and is included in the development plan of the EA function. The EA-vision is included in the daily practice as a guide and is periodically updated.

#### Level 3: Defined

EA-processes be coherently designed, described and validated. EA-processes are coherently developed, described and ensured. The EA processes are planned and carried out in coordination. EA-processes are planned and carried out in coordination.

#### Level 4: Controlled

EA-products are coherently developed in which the EA-processes are derived from the EA products. EA-products are coherently developed, described and ensured. Distinction between governance products and specialty products is made. EA-products govern enterprise coherence and result in integral solutions and choices of approach for major business issues.

#### Level 5: Optimized

Consistent with the EA processes to carry out, the necessary architects profiles are developed. The architect profiles are identified and described. On enterprise and domain-level relationships are established and described. Profiles are included in the functional classification.

Architects operate in accordance with profiles. Profiles are used as development and assessment instrument. Architects permanently realize the added value of the EA function. The EA function works according to the principles of the learning organization.

<table>
<thead>
<tr>
<th>Level 2: In development</th>
<th>Level 3: Defined</th>
<th>Level 4: Controlled</th>
<th>Level 5: Optimized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization sees the added value of EA, and the decision to develop the EA function has been taken. EA takes shape. This is reflected in temporary allocation of people and resources for the duration of the development of the EA function.</td>
<td>The essences (vision, processes, products, people and resources) of the EA function are documented and the EA plan has been approved. The essences and plan serve as a model for the design of the EA function, including the permanent allocation of people and resources.</td>
<td>There is a working EA function. This is reflected in the application of coherence between local initiatives, enterprise and domain architectures. Change processes are controlled using PgSAs and PSAs, the EA function is governed.</td>
<td>Current organization, the change organization and the EA function cooperate structurally and effectively at all levels (strategic, tactical and operational). This is reflected in the quantification and actual realization of the added value of ‘working under architecture’.</td>
</tr>
</tbody>
</table>

Budgets are coordinated and allocated to the EA function. Methods and tools will be standardized. EA capacity is being organized. Budget for the EA function is approved. Choices for methods and tools were made as well as the choice of the organizational form of the EA-capacity. The budget of the EA function has been incorporated in the budgeting cycle of the organization. Resources are appropriately implemented and assessed. Return On Investment objective of the EA function is fulfilled. Resources are effectively deployed to their added value.

The governance of the EA function is being developed and the level of the governance position is being determined. Planning, evaluation and adjustment processes of the EA function are described and approved. The choice of level of governance position is made. The EA-function is adequately governed and in control. The control cycle of the EA function is performed optimally and continuously adapted to the control cycles of the organization.

The formal description of the EA function is being defined. The formal description of the EA function is defined. The formal description of the EA function is maintained on a regularly basis. The formal description of the EA function is an integral part of the corporate governance guidelines.
Acknowledgements

I would like to thank all the people who have made, from 2006 to present, contributions to my research program. Without your contributions this result could never have been achieved: Nico Baken, Teun Hardjono, Ronald Kasteel, Ard-Pieter de Man, Erik Proper, Frans van der Reep, Marcel Thaens and Han Wagter thank you for your time and good advice and for being members of the GEA programme’s steering committee.

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Finally, all thanks to my wife Gerda: Gerda thankyou for all the understanding and cooperation, and for the many times you invited my colleagues to dinner: And do you like the new dress?

November 2013,
Roel Wagter
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Table of terms

Business issue: a business issue is a problem, bottleneck, challenge or alleged solution to a problem, that is considered and controlled from the coherence of several perspectives. An ‘event’ in the outside world of the enterprise becomes a business issue as it has been observed that enterprise coherence governance, i.e. several relevant perspectives are identified, is necessary.

Coherence dashboard: a coherence dashboard is a synonym for enterprise coherence framework (ECF) and is an instrument that allows enterprises to make the enterprise coherence explicit.

Core concept: a core concept is an angle from which one wishes to contemplate and to govern a perspective. A core concept is by definition context dependent, uniquely linked to a perspective, and has no right to exist without a perspective.

Core model: a core model is a level view of a perspective, based on and in line with the guiding statements of the corresponding perspective.

The capability of recursive application of GEA is in particular possible due to the definition of perspective and core concept.

Core value: a core value of an enterprise prescribes its desired behaviour, character and culture and is conditional to be or become successful within the formulated vision.

Enterprise: enterprise is primarily a social system with a purpose and involves one or more organisations. In this thesis we focus on enterprises in the public or industrial area with more than 200 employees and many forms of labour division.

Enterprise architecture: the consistent set of rules and models that guide the design and implementation of processes, organizational structures, information flows, and the technical infrastructure within an enterprise. This definition is based on the one provided in [103].

Enterprise coherence: enterprise coherence is the extent to which all relevant aspects of an enterprise are connected, in such a way that these connections facilitate an enterprise obtaining/meeting its desired results.

Enterprise coherence-governance assessment (ECA): ECA is an instrument that allows enterprises to measure the maturity level of enterprise coherence governance within their enterprise.
Extended enterprise coherence-governance assessment (eECA): eECA is an instrument that allows enterprises to measure the maturity level of their enterprise coherence governance in a comprehensive way.

Enterprise coherence framework (ECF): ECF is an instrument that allows enterprises to make the enterprise coherence within an enterprise explicit.

Enterprise coherence governance-approach (ECG): ECG is an instrument that allows us to govern an enterprise’s coherence.

General enterprise architecting (GEA): GEA is a method for enterprise coherence governance and the result of this thesis. Depending of the stakeholders one can also speak of an enterprise architecture method or a governance method. A GEA’s essence can be determined in terms of three key questions and answers:

What is it?
GEA is a method for enterprise coherence governance consisting of a vision, processes, products, competences, means, governance and methodology that guides the development of an enterprise with a focus on coherence.

What is the intended effect?
The implementation of GEA permanently increases the governance capacity of an enterprise.

How does GEA meet what it desires?
This guiding is achieved by an enterprise applying GEA and participating in the control processes actively, and affords insight into the coherence of organizational components and aspects as the relevant environment on a permanent basis.

Goal: a goal is a formulation of a desired stage of development of the enterprise towards achieving the vision.

Guiding statement: a guiding statement is an internally agreed and published statement which directs desirable behaviour. Statements that are not involved in decision-making processes are not guiding statements.

Level of purpose: the level of purpose consists of the set of cohesive elements: mission, vision, core values, goals and strategy of an enterprise.

Level of design: the level of design consists of the cohesive elements: perspectives, angles from which one wishes to contemplate and to govern the enterprise, core concepts, angles from which one wishes to contemplate and to govern a perspective, guiding statements, internally agreed and published statements, which direct desirable behaviour, core models, views of a perspective, based on, and in line
with, the guiding statements of the corresponding perspective, and relevant relationships, description of the connections between guiding statements from different perspectives.

Mission: a mission is a brief, typically one sentence, statement that defines the fundamental purpose of an enterprise that is ‘enduringly pursued but never fulfilled’. It should include a statement of what the enterprise provides to its clients and inform executives and employees about the overall goal they have come together to pursue.

Objective: an objective is a guiding statement that expresses a desired state of the enterprise in concrete results to be achieved, objectives are ‘smart’ defined, specific, measurable, acceptable, realistic, and time bound.

Organisation: organisation is the realisation/implementation of an enterprise in terms of legal entity(ies), human beings and different kinds of supporting means, technology, financing, housing, et cetera.

Perspective: a perspective is an angle from which one wishes to contemplate and to govern an enterprise.

Policy statement: a policy statement is a guiding statement that expresses an intention of the enterprise, for example: ‘we pursue greater customer orientation’.

Principle: a principle is a guiding statement with an enduring effect in giving shape to the vision so that it can be realized.

Relevant relationship: a relevant relationship is a description of the connection between guiding statements from different perspectives.

Strategy: a strategy of an enterprise forms a comprehensive master plan stating how that enterprise will achieve its goals.

Vision: a vision is a concise statement that operationalizes the mission in terms of the mid to long-term goals of the enterprise. The vision should be external and market oriented and should express, preferably in aspirational terms, how the enterprise wants to be perceived by the world.
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Table of abbreviations and acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>DYA:</td>
<td>dynamic enterprise architecture</td>
</tr>
<tr>
<td>EA:</td>
<td>enterprise architecture</td>
</tr>
<tr>
<td>EC:</td>
<td>enterprise coherence</td>
</tr>
<tr>
<td>ECA:</td>
<td>enterprise coherence-governance assessment</td>
</tr>
<tr>
<td>eECA:</td>
<td>extended enterprise coherence-governance assessment</td>
</tr>
<tr>
<td>ECF:</td>
<td>enterprise coherence framework</td>
</tr>
<tr>
<td>ECG:</td>
<td>enterprise coherence governance-approach</td>
</tr>
<tr>
<td>GEA:</td>
<td>general enterprise architecting</td>
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<td>EAC:</td>
<td>enterprise architecture competence-profile</td>
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<tr>
<td>PgID:</td>
<td>program initiation document</td>
</tr>
<tr>
<td>PgSA:</td>
<td>program start architecture</td>
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<tr>
<td>TOGAF:</td>
<td>the open group enterprise architecture framework</td>
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</table>
Summary

Many enterprises lack enterprise coherence governance. This is the problem definition of this thesis. An assessment carried out in 2007 showed that this problem exists and provided the impetus to develop a theory for its solution. An important starting point in the theory presented in this thesis is the postulate:

*The overall performance of an enterprise is positively influenced by proper coherence among the key aspects of the enterprise, including business processes, organizational culture, product portfolio, human resources, information systems and IT support, et cetera.* From this postulate, we allow the conclusion that the aspect of coherence is an important notion, an aspect that one wants to influence, which one wishes to govern. To govern an enterprise’s coherence one needs the levers to adjust that coherence and to do this one has to make the coherence of the enterprise explicit. The fact that enterprise coherence is a dynamic concept leads to the insight that ‘enterprise coherence governance’ requires a permanent form of governance.

The developed theory for making ‘enterprise coherence governance’ possible in practice, consist of a theoretical framework and the following artefacts: an enterprise coherence framework (ECF) to make the enterprise coherence explicit, an enterprise coherence governance-approach (ECG) to govern the enterprise coherence and an enterprise coherence-governance assessment (ECA) to measure the enterprise coherence governance within an enterprise. The theory is called ‘general enterprise architecting (GEA)’ and was developed using the design science research method. A multiple case study research approach was used to evaluate and refine the theory within the framework of design science. Three major case studies in Dutch organizations were performed for this evaluation leading to remarkable performance improvements for these organizations, and also to the necessary feedback to refine and improve the GEA theory. Refinements of the GEA theory are detected by making comparisons between meta models of GEA. To this end, a meta model of the GEA theory was made before starting the case studies and after their implementation. One of the improvements of the GEA theory concerned the ECA and led to a more comprehensive form of this artefact: the extended enterprise coherence-governance assessment (eECA). This extension consists among others of a much larger set of rating questions, a set of open questions, interviews and maturity matrices. An eECA, conducted in 2011, showed that in more than 80% of the participating enterprises lacked enterprise coherence governance. This confirmed the previous findings of the limited assessment of 2007. The major message of the GEA theory concerns a paradigm shift in the enterprise architecture community: *using the GEA theory transcends enterprise architecture the IT domain.* Many parties from the Dutch government, industry and scientific community participated in the development of the GEA theory.
Nederlandse samenvatting

In veel ondernemingen schort het aan sturen op samenhang. Dit is de probleemdefinitie van dit proefschrift. Door middel van een uitgevoerd assessment in 2007 is aangetoond dat dit probleem bestaat en daarmee de zin om voor de oplossing hiervan een theorie te ontwikkelen. Een belangrijk vertrekpunt in de in dit proefschrift beschreven theorie is het postulaat: *de totale prestatie van een onderneming wordt positief beïnvloed door een juiste samenhang tussen de belangrijkste aspecten van de onderneming, met inbegrip van bedrijfssprocessen, organisatiecultuur, product portfolio, human resources, informatiesystemen en IT-ondersteuning, et cetera.*

Uit dit postulaat leiden wij af dat het aspect *samenhang* een belangrijk begrip is, een aspect dat men wil kunnen beïnvloeden, waarop men wenst te kunnen sturen. Om dit ‘sturen op samenhang’ mogelijk te maken is het zaak de samenhang in een onderneming expliciet te kunnen maken, daar anders de aangrijpingspunten voor deze sturing ontbreken. Ook het feit dat *samenhang* een dynamisch begrip is leidt tot het inzicht dat ‘sturen op samenhang’ een permanente vorm van sturing vergt.

De ontwikkelde theorie om ‘sturen op samenhang’ mogelijk te maken bestaat uit een theoretisch kader en de volgende artefacten: een enterprise coherence framework (ECF) om de samenhang in een onderneming te expliciteren, een enterprise coherence governance-approach (ECG) om op samenhang te sturen en een enterprise coherence-governance assessment (ECA) om ‘sturen op samenhang’ in ondernemingen te meten. De theorie heet ‘general enterprise architecting (GEA)’ en is ontwikkeld door middel van de onderzoeksmethode ‘design science’. Om de theorie binnen de kaders van design science te evalueren en te verfijnen is gebruik gemaakt van een ‘multiple case study research approach’. Voor deze evaluatie zijn drie omvangrijke casussen uitgevoerd in Nederlandse organisaties die enerzijds hebben geleid tot opmerkelijke prestatieverbeteringen in deze organisaties, en anderzijds de nodige feedback hebben opgeleverd ter verfijning en verbetering van de GEA theorie. Verfijningen van de GEA theorie zijn gedetecteerd door vergelijkingen tussen metamodellen van GEA te maken. Hiertoe is een metamodel van de GEA theorie gemaakt voor aanvang van de casussen en na de uitvoering daarvan. Een van de verbeteringen betrof het artefact ECA en heeft geleid tot een meer uitgebreide vorm hiervan het ‘extended enterprise coherence-governance assessment (eECA)’. Deze uitbreiding bestond onder andere uit een veel grotere set van gradatievragen, een set van open vragen, interviews en maturity matrices. Het eECA is in 2011 uitgevoerd bij 54 organisaties en heeft aangetoond dat in meer dan 80% van deze organisaties het schort aan ‘sturen op samenhang’. Hiermee zijn de eerderre bevindingen van het beperkter assessment van 2007 bevestigd. De grote boodschap van de GEA theorie betreft een paradigmaverschuiving in de enterprise architecture community: **door toepassing van de GEA theorie ontstijgt enterprise architecture het IT-domein.** Aan de ontwikkeling van de GEA theorie hebben vele partijen uit de Nederlandse overheid, het bedrijfsleven en wetenschappelijke wereld meegewerkt.

249
Curriculum vitae

Roel Wagter, who got his degree in Business Administration from the University of Applied Science in 1983 in Utrecht, the Netherlands, is a management consultant and partner at the Dutch enterprise PMtD in the field of enterprise architecture. Roel is also the chairman of the foundation ‘Groeiplatform GEA’. He has held numerous managerial positions since he graduated and he has more than thirty years of experience in the field of business/IT alignment. This experience is the foundation for his ideas on enterprise architecture. He is the founder of the internationally recognised and used method dynamic enterprise architecture, Dya®. In early 2006 he initiated and became responsible for the innovation programme ‘general enterprise architecting’ (GEA). Within the scope of this innovation programme he founded an open innovation alliance consisting of twenty large organisations in the field of government institutions, private enterprises and the science community. In the period 2001 to present Roel has published three books, eight white papers, seven industrial papers and nine scientific papers on the subject of GEA (www.groeiplatformgea.nl).
In this thesis it is shown that in over 80% of enterprises there is a lack of explicit governance of their coherence, with the consequent failures of change, the emergence of sub-optimisations, the divergence of enterprises and so on. Assuming that the overall performance of an enterprise is positively influenced by proper coherence among the key aspects of the enterprise, including business processes, organizational culture, product portfolio, human resources, information systems and IT support, et cetera, the lack of explicit coherence governance is deplorable. In this thesis, control instruments are proposed to make an enterprise's coherence explicit, to govern the coherence, as well as to measure enterprise coherence governance. The developed control instruments provide an integrated approach to solve actual business issues. Too often, solutions of important business issues are approached from a single perspective. In mergers, for example, whose success rates are deplorably low, the due diligence research approximates the merging parties often only from the financial perspective. Also in these type of studies, the control instruments provided in this thesis may be of significant value.