# Enterprise Coherence Assessment

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**Abstract.** In this paper, the authors discuss an instrument for the assessment of enterprise coherence (Enterprise Coherence Assessment, ECA). The term 'coherence' is used rather than the more common term 'alignment', since the latter is generally associated with bringing two concepts in line (typically 'Business' and 'IT'). The word coherence, however, stresses the need to go beyond this. Coherence involves connections and synchronisation between *all* important aspects of an enterprise. 'IT' and 'Business' just being two of these aspects.
The ECA instrument was developed as part of the ongoing GEA (General Enterprise Architecting) research programme, and has so far been applied in seven large Dutch organizations. The paper discusses the context in which the ECA instrument was developed, the instrument itself, as well as the results of the assessment study in which the instrument was applied.

**Key words:** business-IT alignment, enterprise coherence assessment, enterprise architecture

## 1 Introduction

Developments such as globalisation, the fusion of business and IT, the introduction of new technologies, novel business models, etc., pose many challenges to modern day enterprises [14]. As a result, enterprises need to cope with a rapidly changing environment, which means they need the ability to transform themselves (at least) as quickly as their environment does. 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. They may be the result of a top-down (strategy driven) desire to change, but they can also consist of numerous bottom-up changes as a result of locally needed changes. Finally, the required/desired transformations will typically touch upon several additional aspects of the enterprise, such as human resourcing, finance, organizational structures, reporting structures, etc.

To make large enterprise transformations feasible and manageable, they are typically split into programmes and eventually into projects. Even more, larger enterprises typically do not just have one transformation programme but multiple, that all need to be coordinated 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 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 unspecific to indeed steer the programmes and projects within the transformation [14]. 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 [14, 30]. Traditionally, project management and programme management are put forward as being responsible for these coordination tasks [17, 16]. However, these approaches focus primarily on the management of typical project parameters such as budgets, resource use, deadlines, etc. When indeed only considering the typical project parameters, one runs the risk of conducting "local optimisations" at the level of specific projects. For example, when making design decisions that have an impact, which transcends a specific project, projects are likely to aim for solutions that provide the best cost/benefits trade-off within the scope of that specific project, while not looking at the overall picture. Regretfully, however, in practice such local optimisations do not just remain a potential risk. The risk actually materializes, and consequently damages the overall quality of the result of the transformation [14]. This type of risk generally occurs when stakes with regards to general infrastructural elements of an enterprise collide with local short-term interests. This especially endangers the needed coherence/alignment between different aspects within an enterprise (such as business and IT, but also human resources, physical infrastructures, etc.). As a result, more often than not, enterprises fail to actually realize the desired transformation even though it might be the case that all projects are finished on time and within budget.

Slot [22] has shown that a correlation exists between the performance of IT projects and the use of architecture to steer/coordinate these projects, i.e. projects being implemented *under architecture*. IT projects implemented under architecture result in 19% less budget over-runs. In principle, one might expect that such a positive effect would be discernable when working *under architecture* would be applied to enterprise transformations as a whole as well. Regretfully, however, in various assignments in practice[1], we have been confronted with the situation that transformation projects fail due to budget overruns, or a failure to meet objectives and expectations. Table 1, provides examples of issues and causes, which we have (informally) recorded during our own practical work in several organizations.

Our informal experiences and observations are also supported by the (Dutch) General Court of Auditors [3], who has produced a report on the cause of failures in ICT projects. The lack of enterprise coherence between several aspects is identified as a key cause in the failure of ICT projects (quotes translated from Dutch):

> "*ICT projects for the government seem to be much more expensive than anticipated initially, require more time than planned to complete, or do not deliver the desired results. This is a serious matter, since ICT projects of the government mostly involve the spending of public money. Furthermore the effects of projects that fail, to a larger or lesser extent, are often large-scale projects with profound social impact.*
> *The most important cause of the (partial) failure of ICT projects revealed by the first part of the research was that ICT projects for the government are of-*

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| Issues | Causes |
|---|---|
| "*In this case, the same wheel has been discovered in several places!*" | There is no common shared view or approach to the organisation's design and layout. Solutions are problem specific and implemented locally. Connections with other questions arising from the same (sort of) problems are not made. |
| "*Our programmes and projects do not fit well with our strategy*" | Irrespective of how clearly the strategy is formulated and how widely it is accepted throughout the organisation, issues are not solved from the organisations mission, vision, core values and objectives, which creates a gap between what we are doing and what we aspire to achieve. |
| "*Strategic decisions are not followed up!*" | Decisions are not presented as sufficiently convincing to lower management levels, which offers too much room for individual interpretation – and personal interest. |
| "*We do not have sufficient grip on the progress of our change process.*" | Interdependencies between correlated paths are not properly identified thereby causing unnecessary delays. |
| "*Our decision-making process is slow and inconsistent!*" | Management lacks the overall picture and can't properly gauge the consequences of their decisions, creating delays as a result of indecision. Furthermore, the absence of an overview increases the risk of decisions not being in line with each other. |
| "*We are not innovative enough in solving our problems.*" | Not enough attention is devoted to the idea-forming process, which means that the full potential of new possibilities is not being used. |
| "*Our solution doesn't cover the issue.*" | The issue is not properly analysed and is thus approached from too few perspectives, which don't include the bottlenecks. |
| "*Over and over again there are endless discussions about the value and necessity of the decisions that have been taken*" | Management does not unanimously support the decisions, because they have been taken unilaterally or are insufficiently substantiated. Opposition in the organisation uses these divisions and uses its influence to delay progress. |

**Table 1.** Informal observations

> *ten overly ambitious and too complex because of the combination of politics, organizational and technical factors. With these overly complex projects there is no balance between ambition, available people, resources and time.*"

In Op't Land et al. [14], the authors also provide a summary of possible causes for failures of strategic initiatives, as well as 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 organizations are reached [23]. When considering the possible failures in strategy execution . . . an instrument is needed to support this process*". In [8,

9] Hoogervorst also argues in favour of using enterprise architecture as a means to govern coherence in enterprises.

Our own experiences, and the above discussed general insights, seem to indicate that maintaining/achieving coherence (by means of architecture) between different aspects of an enterprise is a crucial factor with regards to change processes, and therefore at least warrants a closer study of causes and potential solutions. The general concept of coherence is described in the MacMillan English dictionary [13] as: "*in which all the different parts fit together in a sensible or pleasing way"*, while the Van Dale [26] dictionary describes coherence as: "*the extend in which several aspects are connected*". In line with these definitions, we define *enterprise coherence* as follows:

> *Enterprise coherence is the extend to which all relevants aspects of an enterprise are connected, to the extend necessary to let the enterprise meet its desired results.*

Since achieving, and/or maintaining enterprise coherence, seems to be an important issue (i.e. there is a potential positive correlation with the performance of an organization), there is also reason to explicitly govern *enterprise coherence*. This insight triggered the multi-client *General Enterprise Architecting* (GEA) research programme [29][2]. The aim of this programme was to answer on the following research questions: *What factors influence/define enterprise coherence? How to govern coherence and improve the performance of an organization?* The results of the first iterations of this research programme have been reported in [28][3]. Failure to adopt a holistic approach to key business issues, i.e. the frequent unilateral approach from a IT oriented angle, has been an important trigger for the research program GEA.

A fundamental first step in the GEA programme was the development of the *Enterprise Coherence Assessment* (ECA) to attain a clearer understanding of the challenges to *enterprise coherence* and its associated *governance of coherence* [28], as well as the impact of *enterprise coherence* on organizational performance.

The remainder of this paper is structured as follows. Section 2 positions how current approaches suggest how to govern enterprise coherence and contrasts this with the approach taken in the GEA programme. Section 3 then provides a discussion on the research context of this paper, in terms of the driving research question, and the research methodology used. In Section 4 we then continue with the presentation of the current version of the ECA instrument. Section 5 continues with a report on the application of the instrument in the context of seven large Dutch organizations.

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[2] 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.

[3] For strategic reason, the initial target of the results was the Dutch language community, as most participating organizations where also based in the Dutch language area, while also having a national/local focus. In the near future, these initial results will be made available in English as well.

## 2 Governing enterprise coherence

As argued in [14, 28], architecture offers a means for management to obtain insight, and to make decisions about the direction of enterprise transformations. As such, it should act as a means to steer enterprise transformations, while in particular enable senior management to govern coherence. We regard *enterprise architecture* as the appropriate means to make enterprise coherence explicit, as well as controllable or at least influenceable.

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

1. It is necessary to take the concerns, and associated strategic dialogues, of senior management as a starting point. 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 not doing so, it will be difficult to really involve senior management. Even more, the strategic dialogues provide the starting point for steering enterprise transformations and to guard coherence.
2. The power structures, 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 that way. Doing so, however, also requires a strong commitment from senior management to these design decisions transcending projects. “Local business stakeholders”, such as business unit managers, who have a direct interest in the outcome of a project, may want to take projects a different direction (more favourable to their own interest) than would be desirable from an enterprise-wide perspective. Such divergent forces are also likely to lead to erosion of the desired enterprise coherence.

We argue that existing approaches and frameworks, such as, Zachman [24], DYA [30], Abcouwer [4], Henderson & Venkatraman[7], TOGAF [25], IAF [27], ArchiMate [11, 10], 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 [5].

The above requirements, however, suggest the use of another style of 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 terms of De Caluwé [5], this is more the Yellow-print style of thinking about change. In the GEA programme, this line of thinking was taken as a starting point, by taking the perspective that the actual political power structures/domains, and associated strategic dialogues, within an enterprise should be taken as a starting point, rather than the aspect/perspective frameworks suggested by existing architecture approaches.

In future research, we intent to position governing coherence in relation to the *Green*, *Red* and *White* “colours” as well. This does not imply that the existing Blue-print

style frameworks and approaches are not useful. On the contrary, the engineering perspective is 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 uses/created 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 would have to be structured based on those domains that are meaningful within the strategic and political dialogue in an enterprise. For example, in terms of "human resourcing", "clients", "regulators", "culture", "intellectual property", "suppliers", etc. Needless to say that this is also highly organization specific.

This leads to the situation as suggested in Figure 1, 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 suggest to tune the models and views to the interests/concerns of the 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 power structures in an organization into account.

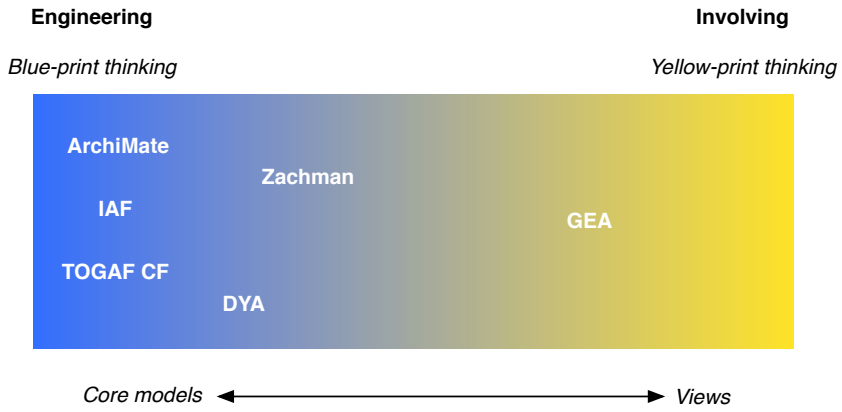



**Fig. 1.** Bridging Blue-print thinking to Yellow-print thinking

## 3 Research context

As mentioned before, the development of the ECA is part of the ongoing GEA research programme. In this section we provide more background to this research programme, as well as the research method used in developing the ECA.

The GEA programme [29] is driven by four key research questions:

1. What are the core factors that influence/define enterprise coherence?
2. What is (in practice!) its impact on the performance of an enterprise?

3. How can an enterprise's level of coherence be expressed explicitly?
4. How can 'enterprise coherence' be governed?

More specifically, the research objectives of the GEA programme are:

1. Define the core indicators and factors defining/influencing enterprise coherence.
2. Identify the impact of enterprise coherence on an enterprise's performance.
3. Develop an instrument to assess an enterprise's level of coherence.
4. Develop instruments to guard/improve the level of coherence in enterprises during transformations.

The Enterprise Coherence Assessment (ECA) was developed to gain initial insight into the first two questions. On the one hand the answer to these questions determine if it is appropriate to carry out further research into the governance of enterprise coherence, while on the other hand providing a first refined definition of enterprise coherence and its practical impact on organizational performance.

The GEA programme took the perspective that if more than 50% of the organizations involved in the first ECA studies lack effective governance coherence, it was safe to assume that "*the lack of coherence governance in enterprise*" is indeed a relevant issue that needs further study as well as the development of a set of instruments (and underlying theory) supporting enterprises in governing coherence. The initial application of ECA involved seven large Dutch organizations (members of the GEA programme).

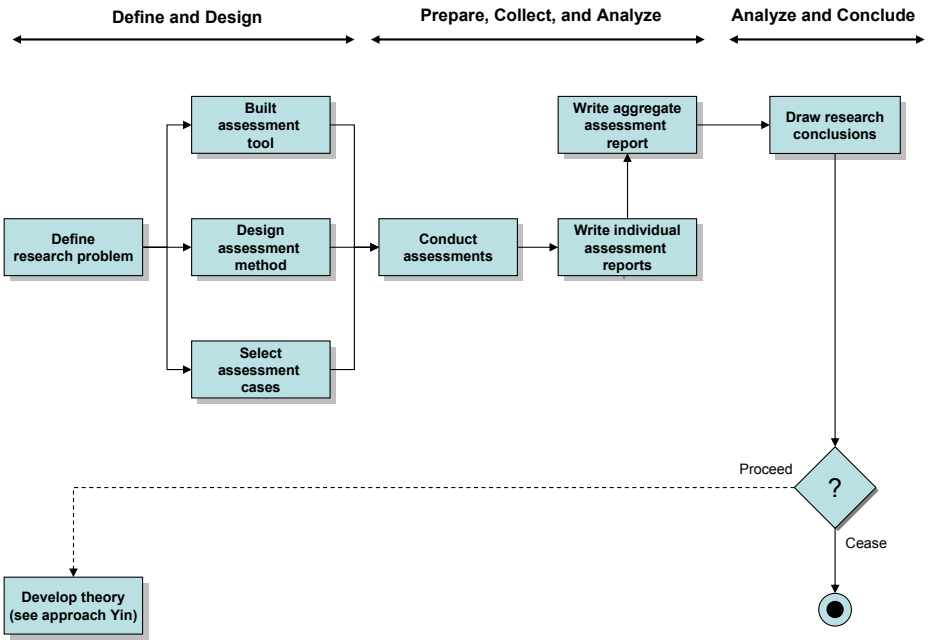



**Fig. 2.** Preliminary research approach for the development of the ECA, based on Yin [31]

At the start of the GEA programme, the plan was to execute ECA assessment (for each of the participating organizations) at three stages:

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

However, soon it became clear that doing these three assessments was not feasible. In the time needed for such longitudinal assessments, the composition of the involved organizations, as well as the people involved, would change so much that the results would no longer be comparable. We have therefore modified this idea to only implement the first assessment in the form of the ECA assessment instrument, while using a case-based research methodology [31] to further evolve the instrument. See Figure 2 and Figure 3.

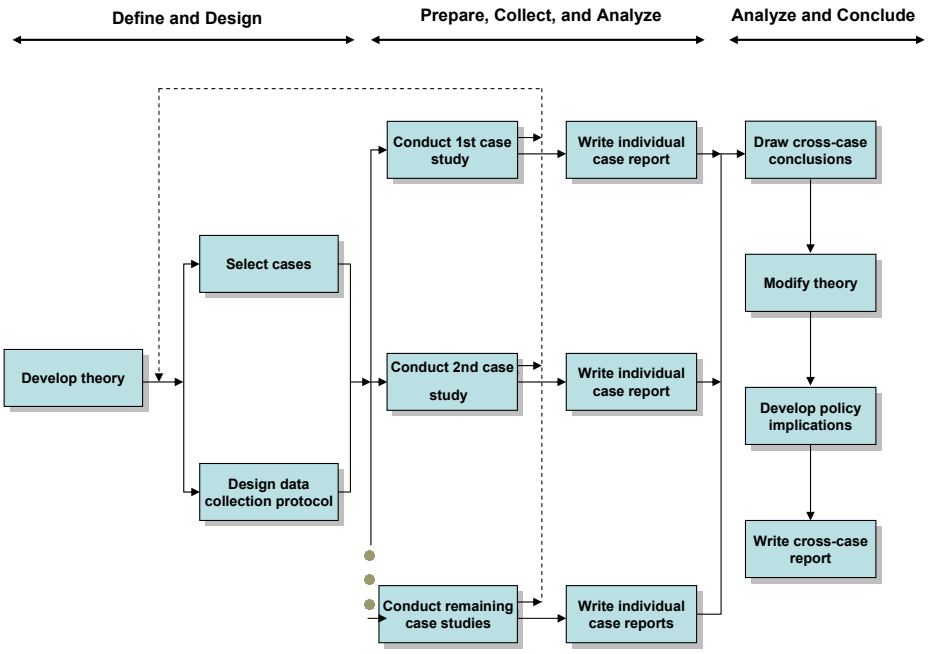



**Fig. 3.** Research approach adopted from Yin [31]

The ECA that has been carried at the start of the GEA programme convinced the participants that there was enough evidence warranting the development of effective

instruments to govern enterprise coherence. The resulting set of instruments, based on multiple additional case studies, is called GEA (General Enterprise Architecting) [28].

## 4 The Enterprise Coherence Assessment instrument

As a first step in the development of the ECA, a series of Metaplan [21] sessions was organized involving experts from eighteen organizations involved in the GEA platform [1]. The aim of these sessions was to gather an inventory of established characteristics for the success of coherence governance, from the perspective of experts from the field. The identified set of characteristics are shown in Table 2 and Table 3. As an additional source of input for the creation of the inventory, we also used characteristics of the Architecture Maturity Model embedded in the Dynamic Enterprise Architecture (DYA) [30] method.

The ECA instrument was not designed to carry out large-scale surveys in which all current rules in the field of statistics apply. ECA is specifically designed to make differences in the opinions of respondents of an organization explicit. This provides an explicit indication of the degree of governing coherence, while also providing a base to achieve a shared understanding of this level of coherence, and 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 organizations. To reduce the variance that may result from different interpretations by the respondents, all respondents will be taken (by the interviewer) through a *joint* discussion of the questions and their further explanations (see Appendix A).

In future iterations of the ECA instrument, we intend to also include characteristics from additional sources, including the IT Architecture Capability Maturity Model [6], the Normalized Architecture Organization Maturity Index (NAOMI) [18], the Enterprise Architecture Score Card [20] and the NASCIO Enterprise Architecture Maturity Model [2].

In the GEA 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 EAmeans. The core of the ECA comprises of twelve key questions and their connections to these GEA parts. The resulting twelve questions are divided into two blocks of six questions each. The first block of six questions addresses the level at which an enterprise has developed a vision on the governance of its coherence. The second block of six questions concerns the extent of the application of the vision to the enterprise architecture practices.

The resulting set of questions are listed in the example questionnaire shown in Figure 4. The extent to which an organization answers ‘yes’ to the questions determines its score. Before answering the questions, a process is carried out whereby the questions are weighted by the respondents. Some respondent can of course assign a higher importance to a specific question than another. Below we will return to the role of this weighting process.

To ensure that the assessment questions are answered as objectively as possible, the interviewer who is responsible for the collection of the answers is provided with a reference frame (see Appendix A). As mentioned before, before the respondents are

| *Characteristic* | *Description* |
|---|---|
| E.A. Vision | In order to be able to prove the value of EA one pre-requisite is that the top of the organisation holds a vision on EA. |
| Added value | 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. |
| Integral | 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. |
| Open | EA is an open model, managers control the number and the name of EA perspectives and the related components. |
| Customer orientation | The EA processes and products should support the control processes in a tailor made way, while supplying the results supporting these control processes. |
| Scope | There are never many principles. Its limitations 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. |
| Product distinction | 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. |

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

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

**Table 3.** Characteristics for success on the level of the application of the EA vision

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

**Fig. 4.** Example of a completed ECA questionnaire

asked to answer the questions, the interviewer will *jointly* take them through the list of questions and the associated reference frame. This frame ensures that the answers of all respondents are 'calibrated'. The relationship between the questions and the GEA parts are given in the table shown in Table 4. The numbers correspond to the twelve ECA questions in Figure 4.

| GEA parts | Question |
|---|---|
| EA-Vision<br>EA-Governance | 1 – 6 |
| EA-Processes<br>EA-Products<br>EA-People<br>EA-Means | 7 – 12 |

**Table 4.** Mapping GEA parts to the questions

The results of an ECA are reflected in a quadrant model, as depicted in Figure 5. This model is composed of two axes, the horizontal axis represents the level of development of the EA Vision and the vertical axis represents the level of the application of the EA Vision. These axes represent two dimensions of the governance of enterprise

coherence, which correspond to the aforementioned GEA parts that need to be developed.

The axis 'EA vision development' describes the extent to which an organization's body of knowledge concerning the governance of enterprise coherence has been made explicit. *Is there a vision about enterprise architecting? Has the vision been translated into a methodology and how an organization wants to use it (is there an implementation plan)? Is there a real ambition for the application of EA?* The axis 'EA vision application' describes the extent to which an organization actually operates the body of thought.

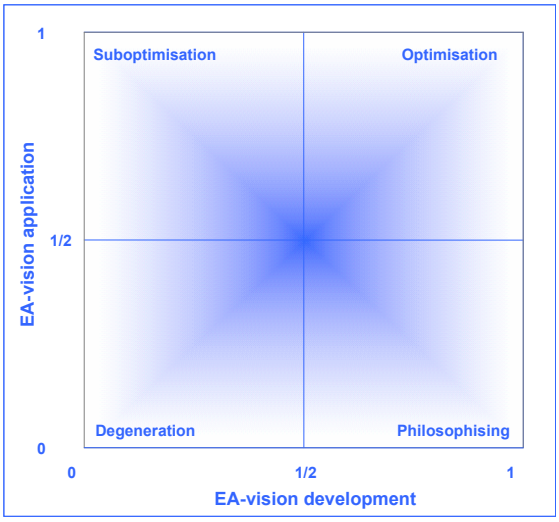



**Fig. 5.** Effects of ECA on the organization

The correlation between the two axes results in four quadrants. Figure 6 provides a brief outline of the characteristics per quadrant. Below we will discuss the quadrants in more detail, while Section 5 provides anonymized real world examples of organizations and their positioning in relation to the quadrants.

**Degenerating quadrant** – If an organization has no vision about enterprise architecting and also does not know how to apply this form of management then the organization scores in this quadrant. Coherence in the organization will continue to deteriorate with proportionate effects on the organization's performance.
Characteristic aspects for this quadrant are:
- Coherence is not considered an important aspect.
- There is no synchronisation between representatives of the important aspects of the enterprise.
- No 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 implemented without architecture.
- Decrease in effectiveness and efficiency.

**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. There may be some basic increase in effectiveness. A basic level/awareness of governance of enterprise coherence may be developed. Therefore, there is an increased likelihood that things move in 'the right direction'.

Characteristic aspects for this quadrant are:

- Coherence is considered to be a strategic aspect throughout the organization.
- 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 organization'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.

**Suboptimal quadrant** – Organizations positioned in this quadrant will be organizations with do-ers, with individuals with their own vision 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 organization. However, these are not synchronized/aligned and are formulated in their own 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 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 organization there is some increase in efficiency.

Characteristic aspects of this quadrant are:

- Coherence is only experienced as a 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.

**Optimisation Quadrant** – In this quadrant, vision and action go hand in hand. The organization 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 organization. The organization works on optimising management and implementation 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.
Characteristic aspects for this quadrant are:

- Coherence is experienced as an important aspect and governance of coherence is applied throughout the organization.
- 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 organization'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 organization is on the agenda.
- There is high effectiveness and efficiency.

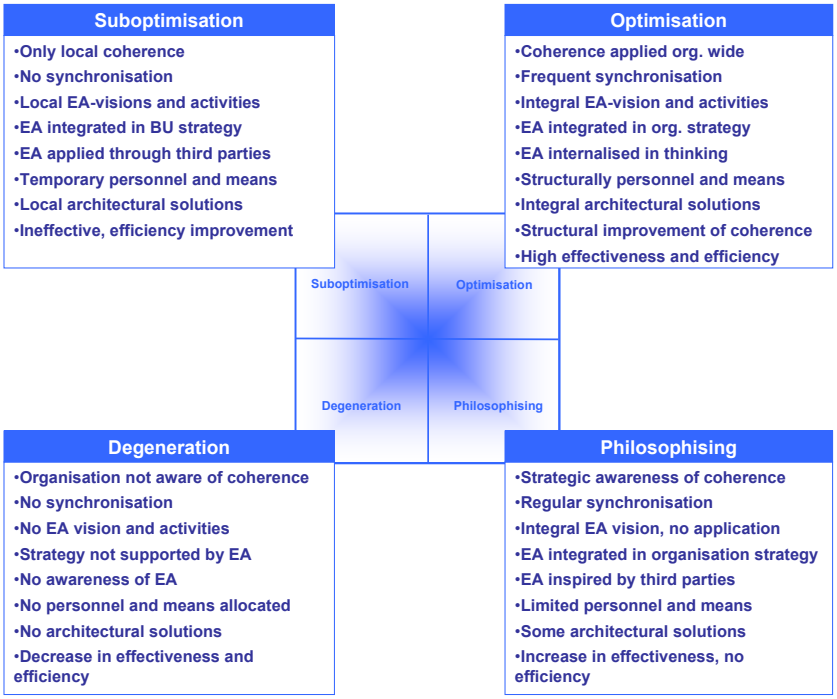



**Fig. 6.** Characteristics per quadrant

When the questions from the questionnaire have been answered, then the respondents' scores offer a good starting point for follow up actions to improve the governance of enterprise coherence. In particular, by using the following questions as drivers:

– How can the (possible) differences in the positioning of the respondents be explained?
– Which steps for improvement can be made in connection with the positioning at an organizational level (average of the respondents' scores)?

The discussion arising from the first question may lead to the employee adjusting their views, which would have provided a very different score. Or if not, it may lead to new concepts for the whole group. The organization'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 their understanding of the actual situation in the organization and/or insight into the question itself.

If the results of the organization's score are in the optimisation quadrant then people will be reap the rewards of applying coherence governance. It is important to maintain this optimisation and to stay alert so as not to fall back into old habits. If the positioning falls in one of the three following quadrants: degenerative, philosophical or suboptimisation, then this offers greater possibilities for improvement. If the score falls in the degenerative quadrant this means that one must first take a step to the right as well as directly upwards, before the step can be made towards optimisation (see Figure 7). These approaches correspond to organization's management styles. One organization first wants to consider it properly, as a supporter of the Design School and the other organization wants to first initiate experiments, as a supporter of the Learning School [15].

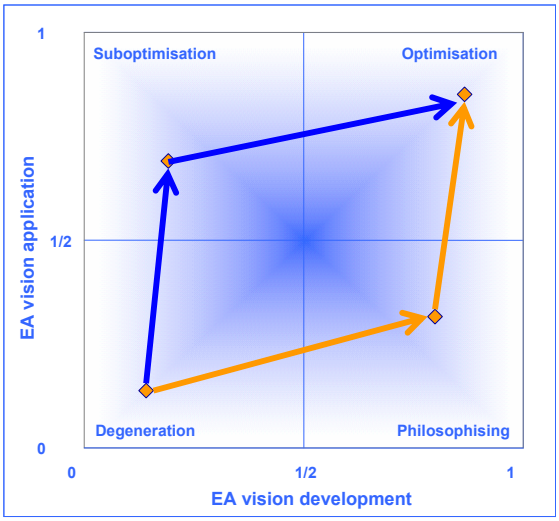



**Fig. 7.** Development scenarios

## 5 Using the ECA instrument

In this Section we are concerned with the use of the ECA instrument in practice. We start with a discussion of the steps involved in applying the instrument, followed by the discussion of the application of the ECA instrument in seven large organizations in the Netherlands.

The ECA instrument uses the following steps 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 organization?*"
3. Process the answers and feedback of the positioning per respondent.
4. Analyze the differences between the individual positions.
5. Aggregate the individual positions to determine the organization's positioning.

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

As a first step, for each question the respondent indicates its relative importance to the organization. See Figure 8. A question's importance is determined according to the situation, no two organizations are the same. Where, for example in a more hierarchal organization it is an absolute must for the management to have agreed a vision on enterprise architecting, in a different organization 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 [19]. Pair Wise Comparison ranks the twelve questions by pairing them by comparison. By bundling the results of this weighting it is subsequently possible to divide the research population into segments, who have the same standpoints regarding the questions.

The actual comparison was computed using Analytic Hierarchy Process (AHP) [19]. In the ECA case, two dimensions and twelve questions are used. These are respectively (D)evelopment and o(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 organization. The weighted averages for D and P are calculated from the weighted average of weight $\times$ 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 more important than 2 respectively $1/2$ and if equally important each 1 point. The total number of points per statement determines the weight.

**Step 2:** *Answer situational questions*

After determining the weight of the twelve questions, the form with the situational questions is completed with yes/no. See Figure 4.

**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. See the diagram in Figure 9 for the person in question.

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

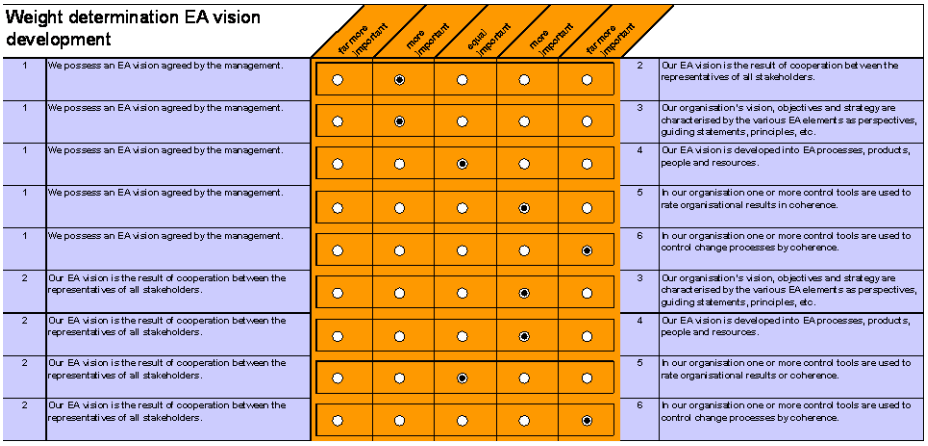



**Fig. 8.** Part of the process to determine the weight of the questions [19]

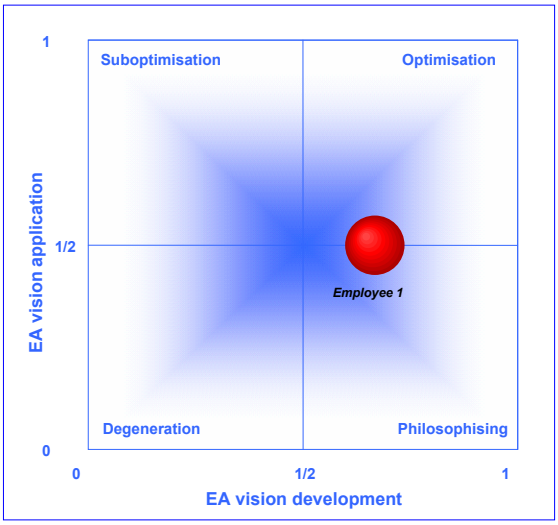
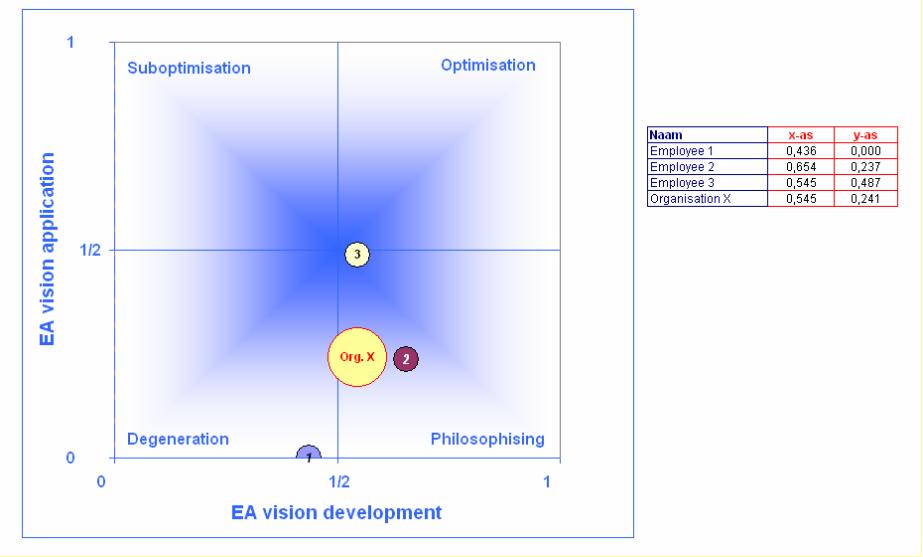



**Fig. 9.** Diagram of individual positioning

Analysis of the differences between the individual positions can be carried out in one of two ways: on the aspect of the weight determination that is known for the questions and on the aspect of the situation. Making these differences explicit can result in interesting discussions and may already lead to adjustments in opinions of individuals or groups of people at this stage of the process. See Figure 10, which illustrates the positioning of individual employees as well as the position of the organization.

In Figure 10 we illustrate the scores of three employees from one organization, resulting from the assessment carried out by the participants of the growth platform, as well as the organization's total score. Significant differences are apparent in the ratings




| Naam | x-as | y-as |
|---|---|---|
| Employee 1 | 0,436 | 0,000 |
| Employee 2 | 0,654 | 0,237 |
| Employee 3 | 0,545 | 0,487 |
| Organisation X | 0,545 | 0,241 |

**Fig. 10.** Individual and organizational positioning

completed by the employees. We can also deduce that the related organization scores 0.545 on the EA development axis.

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

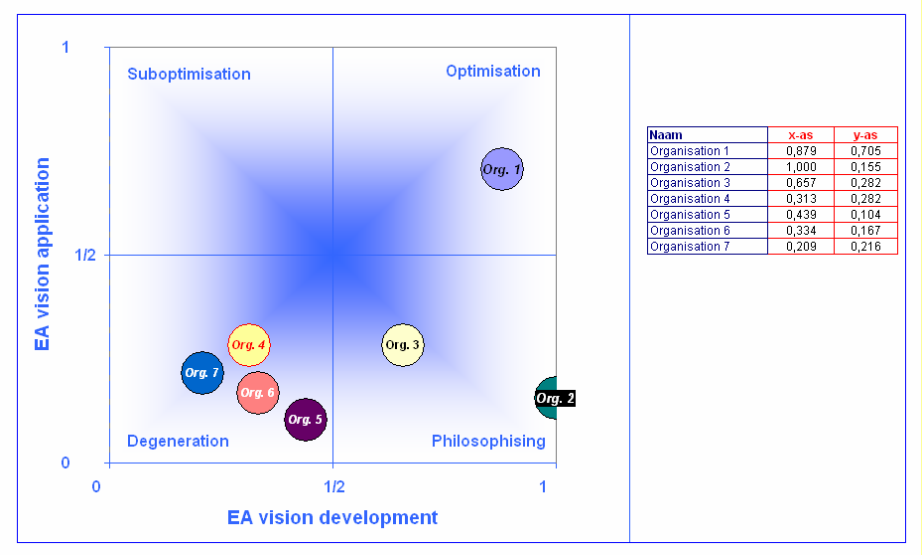
**Step 5:** *Aggregate the individual positioning at an organizational level*

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 organization in the matrix (see Figure 10). This yields an initial average of the individual scores of the respondents.

These results are then discussed in a joined session with the involved respondents. These discussions may lead to insights about the actual situation in the organization and/or better interpretation of the questions. This may, on its turn, lead respondents to want to change their individual scores, and eventually the aggregate scores for the organization. Using this joint discussion, undesired variance due to misinterpretations and/or incomplete knowledge about the organization, is reduced.

With the help of this positioning the starting points can be identified for a development and implementation strategy for enterprise architecting in the organization. Figure 6 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 etc.? In this case it is perhaps necessary to first establish a communication offensive.




| Naam | x-as | y-as |
|---|---|---|
| Organisation 1 | 0,879 | 0,705 |
| Organisation 2 | 1,000 | 0,155 |
| Organisation 3 | 0,657 | 0,282 |
| Organisation 4 | 0,313 | 0,282 |
| Organisation 5 | 0,439 | 0,104 |
| Organisation 6 | 0,334 | 0,167 |
| Organisation 7 | 0,209 | 0,216 |

**Fig. 11.** ECA positioning of several organizations

In the context of the research question "*how does governance of enterprise coherence work in organizations?*", we applied ECA to seven large organizations in the Netherlands, involving twenty-five participants.

Before the assessment we set the condition that if there was a lack of governance of enterprise coherence in more than 50% of the researched organizations, that the problem 'lack of coherence governance in organizations' is present. If this is proved then the conditions are met for further research and the development of a theory. We claim there to be a general lack of governing of enterprise coherence, if less than 50% of the assessed organizations scores in the optimization quadrant.

The results of the assessment are summarized in Figure 11. This provides an initial overview of the situation of participating parties and differences. More specifically, the assessment resulted in the following comments/feedback from the respondents:

– Organization 1 is characterized by the fact that its vision on enterprise architecture and its management are developed by themselves, while being based on methods used in the market, such as DYA, GEA and TOGAF. 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 organization is also well defined in the enterprise architecture.

Those who 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 (PSAs [30]) 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 organization at which meaning is assigned are also incorporated in the PSAs bridges the gap between the strategic and tactical levels.
In short, the coherence of the organization 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 organization are continuously improved.

– Organization 2 is a large Dutch government organization, which consists of several divisions that operate with a high degree of autonomy.
Within this organization, the high quality architecture products have been designed at concern level in the form of an extensive enterprise architecture vision, business process models, use cases, etc. 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.
– Organization 3 is a large executive agency from the Dutch government, which was created out of a merger of several similar organizations. This background made that the development of an enterprise architecture was not an easy job. There was a strong emphasis on producing an enterprise architecture as a product. One did not succeed in developing architecture processes and embedding these in the merged organization.
Therefore, the first large project that was supposed to be implemented 'under architecture' failed miserably. Even tough there were other contributing factors as well, the architecture was held as the primary cause of this failure. The enterprise architecture was written off as unreceptive and the architecture function was largely dismantled.
Although those involved were actually on the right track with the enterprise architecture vision, etc., they were a long away from implementing and applying it in the organization.
– Organization 4 is a large construction organization 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 organization describe themselves as 'architects', while applying architecture in their own personal way.
– Organization 5 is a large Dutch government agency with many offices located throughout the country. At a corporate level, the organization 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 also not been identified, described and implemented.

– Organization 6 is a large Dutch transport organization. The architecture function is this organization involves a relatively small architecture group. The situation is characterized by the fact that the organization does not employ separately managed change processes. 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.
– Organization 7 is a large association with several million members. The association organises activities in five different domains. The organization 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 organization entered a troublesome time in its existence. Its survival was indeed threatened. Major cost cuts that have been made as a result of this situation, have resulted in the architecture function not being developed further, while architectural initiatives have been reduced considerably.
  Regretfully, the board did not realize that during such cost cutting periods, an enterprise architecture can provide adequate support for effective cost cutting.

One party is clearly on the right track with coherence governance. This involves one of the largest Dutch pension funds that by 'working with architecture on an enterprise level' has already managed to halve its ICT costs within five years [12].

Two organizations score in the philosophical quadrant and four organizations in the degenerative quadrant. This overview of the relative positions have been discussed and validated in a meeting with the involved parties, with the aim to identify actions that will lead to the improvement of their respective governance of enterprise coherence. The situational questions that were indicated as irrelevant, combined with a relatively high importance, form the first indication for measures to reinforce governance of coherence.

Since 85.7% of the organizations do not score in the optimisation quadrant, an important conclusion that can be drawn from this assessment is that it clearly demonstrates the need for further research into the governance of enterprise coherence, in particular the development of a theory for the governance of enterprise coherence.

It is also interesting to note that organization 5 suffers from similar problems as Organization 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 organizations with divisions that operate with a relatively high degree of autonomy than in more centrally managed organizations. We recommend further research on this point.

## 6 Conclusion

In this article we explored the ECA instrument and a coherence assessment that was carried out in seven large organizations in the Netherlands. This tool provides individual organizations with a simple measure for positioning itself on an EA vision development level as well as its level of application. Situational differences can be taken into account. In particular, respondents can define the relative importance of the questions. Principles, design, procedure and backgrounds to the tool were also discussed. Our research revealed that in a substantial number of the assessed organizations there was a lack of governance of enterprise coherence. The results of the assessment offer organizations the tools to begin discussions, about the use of enterprise architecture as an instrument to achieve better governance of enterprise coherence.

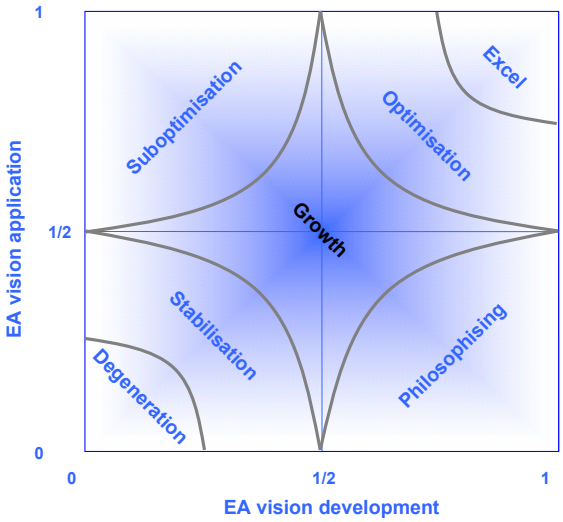



**Fig. 12.** Main stages of organizational development in GEA positioning

In our subsequent research we will refine the ECA instrument by developing more questions for the enterprise architecting dimensions EA vision, processes, products, people, resources, method and management. We also intend to also include characteristics from additional sources, including IT Architecture Capability Maturity Model [6], the Normalized Architecture Organization Maturity Index (NAOMI) [18], the Enterprise Architecture Score Card [20] and the NASCIO Enterprise Architecture Maturity Model [2]. In this refined positioning process we will also include the relationship with the organization's maturity. Figure 12 gives an impression of the desired result. The main diagonal in Figure 12 shows the known main stages of organizational development.

## 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:
   – Whether 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 solves it, what are the desired effects, etc.?
   – 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 organizational components cooperate in the design.
   In your view is this the case?
3. *Our organization's vision, objectives and strategy are characterised by the various EA elements as perspectives, key concepts, guiding statements, principles, etc.*
   To identify the correct correlation and concepts for solving important problems with the help of EA, the organizational 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 organization is viewed and can be controlled, such as Products, Processes and Culture.
   Is there such a characterisation of perspectives, key concepts, principles, etc., in your organization 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 translation present in your organization?
5. *In our organization one or more control tools are used to rate organizational results in coherence.*
   Does your organization 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, etc.

6. *In our organization one or more control tools are used to control change processes in coherence.*
   Does your organization 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 relevant company components 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 organizational control processes?
   - Are the EA control products concrete in terms of usability, readability, clarity, composed of the correct level of detail, etc.?
8. *It is 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 actually 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 actually embedded in the control of the organization 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, consistent, etc.?
    - 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 examples, tools to capture and leverage enterprise architectures.
12. *Those with end-responsibility for our change processes are accountable for time, money and quality as well as 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 organization.
– All responsible parties (direct and indirect problem owners) are actively involved in developing company solutions.

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