

A Longitudinal View on the Perceived Contribution of Enterprise Architecture in the Netherlands

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Abstract. Since the rise of Enterprise Architecture (EA) in the first decade of this century, three surveys about the perceived contribution of EA have been conducted in the Netherlands. This paper compares these three surveys mutually and with the international literature about EA benefits. Developments in the perceived contribution of EA over time are analyzed using a set of 31 categories where benefits of EA can be expected, called the EA benefit areas. We found a set of 12 EA benefit areas (which we have called the core EA benefit areas) that are mentioned in most of the literature about EA benefits and score (relatively) high in all three surveys. We also found a notable increase in the perceived contribution of EA in the second and third surveys compared to the first, indicating that generally EA is assessed as a useful discipline nowadays. The analysis further shows that over time, the focus of EA has extended from an internal orientation to include the environment of the organization. From the observed evolution in EA benefit areas, we conclude that the areas where a contribution of EA to the organization is perceived are not static but have increased over time. Based on recent developments in and around EA, we have extrapolated where changes in the perception of the contribution of EA may be expected in the future. The results of this research may support architects in optimizing the value they contribute to their organization.

Keywords: Enterprise Architecture, Enterprise Architecture Value, Enterprise Architecture Value Survey, Longitudinal Research.

1 Introduction

In the literature, many benefits of Enterprise Architecture (EA) can be found, but most of these claims are not supported by empirical evidence [1-4]. To illustrate: Shanks et al. [2] found in 2018 only 12 publications with empirical evidence about EA benefits, among them 8 surveys, and in 2021 Ahleman et al. [4] counted 13 surveys about EA benefits, EA practices, and EA success factors. To obtain more empirical evidence about EA value, we conducted a survey in the spring of 2021 into the perceived contri-

bution of EA in the Netherlands. Including this survey, since 2010 three surveys tailored to the perceived contribution of EA in the Netherlands have been conducted: in 2010 by Foorthuis et al. [5], in 2014 by Plessius et al. [6, 7], and, as already mentioned above, in 2021 by Plessius et al. [8]. These three surveys divide the discussion about the contribution of EA in timeframes. In this paper, we look at changes visible across these timeframes, both in the international literature about EA value and in the outcomes of the three surveys. A challenge in comparing these three surveys is that no commonly accepted classification of EA benefits exists [1, 9-11] and as a result, the constructs used in the three surveys are different. To overcome this problem, we used the classification from [8] and defined a mapping procedure to represent the benefits of the other two surveys in this classification.

This research contributes by providing insight into the changes in the areas where a contribution of EA to organizations is perceived and in which direction these changes may continue in the future. The research question addressed is: *How has the perception of the contribution of EA in the Netherlands evolved over time?* In a practical sense, this research highlights the areas where the expectations about the contribution of EA are greatest and supports architects in choosing which areas to focus on to create maximum impact.

The paper is structured as follows. In the next section, we discuss the background of the classification used, followed in section 3 with the research approach chosen, including the mapping procedure. In section 4, the results of the comparison can be found, which are analyzed in more detail in section 5. In section 6 we look at the areas where in the future EA contributions may be expected. Section 7 closes the paper with a discussion of the results and the conclusions.

2 Background

2.1 The three surveys

In the first survey [5], 18 questions were asked about EA benefits, divided into questions about EA benefits for the organization as a whole and EA benefits for projects. The outcomes were mainly positive, but a distinct difference was found between EA creators (for example enterprise architects) and EA users (for example project members and line managers) where the first group scored higher than the second group. They also found that compliance of projects with EA is a crucial factor in organizational performance.

In the second survey [6, 7], a difference was made between creators, implementers (for example solution architects and project managers) and users of EA. The questions were tailored to each of the three groups, and the survey questions were categorized in the four perspectives of the balanced scorecard [12]: Financial, Customer, Internal processes and Learning and Growth. The outcomes showed a notable increase in the per-

ceived contribution of EA compared to the previous survey and were again mainly positive, except for questions in the Customer perspective where hardly any benefits of EA were perceived (in the first survey [5], no questions about this perspective were asked).

In the third survey [8], the same three respondent groups as in the second one [6, 7] were discerned. To categorize the survey questions a subdivision of the four perspectives of the balanced scorecard was used. The outcomes are comparable to those in the second survey [6, 7], but most questions from the Customer perspective scored higher, indicating, according to the authors, a shift towards a more ‘outside-looking-in’ attitude of the architects [8].

We expected that differences in questions and outcomes of the three surveys could (at least partly) be explained by changes in the perception of EA as expressed by Lapalme [13] in his three schools of thought: Enterprise IT architecting, Enterprise integrating, and Enterprise ecological adaptation:

1. *Enterprise IT architecting*: the scope is the IT/IS within the organization and the main goal of EA is aligning the IT/IS of an organization with the enterprise strategy. “*EA is the glue between enterprise and IT*”.
2. *Enterprise integrating*: takes a holistic view on the enterprise and is concerned with all aspects of the enterprise, including the IT/IS. “*EA is the link between strategy and execution*”.
3. *Enterprise ecological adaptation*: considers the organization in its environment and as a consequence, puts adaptation and organizational learning central. “*EA is the means for organizational innovation and sustainability*”.

2.2 The EA Benefit Areas

For a benefit to be credited as a contribution of EA, it is important that this benefit can (at least partly) be attributed to the activities of the EA function and is relevant, which in previous research [14] we have defined as contributing to the goals of the organization. These two properties are used in [14] to define a classification of EA benefits: by organizational goal and by activity of the EA function: “*an EA benefit is the positive contribution from (one or more) EA activities towards the desired state of affairs for an organization as stated by some goal of that organization (based on the definitions given by Renkema and Berghout [15])*”.

In a Delphi study [16], with the help of 13 Dutch EA experts, a set of 31 categories were discerned that together cover the organizational goals where a contribution of EA may be expected: the *EA benefit areas*. In Table 1 these areas are summarized by keyword and categorized in the four perspectives of the balanced scorecard [12], the starting point for this classification. The full description of the EA benefit areas can be found in the Appendix of this paper. For example, the keyword ‘Costs’ stands for the benefits of EA concerned with goals related to the reduction in expenses made by the organization.

This classification was used in the most recent survey of Plessius et al. [8]. In the questions of this survey the EA benefit areas ‘Costs’ and ‘Revenues’ were combined

and the areas ‘Procurement’ and ‘Technology (non-IT)’ were left out as no EA benefits were found in the papers consulted by the authors [8]. With these adaptations, the classification is used as a ‘common denominator’ to compare the three surveys mentioned in the Introduction.

Table 1. The EA benefit areas: goal areas where a contribution of EA may be expected [16]

----- Balanced scorecard perspectives -----			
Financial and accountability	Customer and partnerships	Internal processes	Learning and growth
Costs	(Customer)	Logistics	Competences
Revenues	experience	Procurement	Culture
Investments	(Customer)	Business (production) processes	Communication and knowledge mgt
Compliance	relationships	Marketing and sales	Alignment
Governance	Product position	Service delivery	Agility
Risk management	Market strategy	Data management	Technology research
Societal responsibility	Ecosystem	Information mgt	Evaluation and re-use
		Technology (non-IT)	
		General management	
		Quality management	
		HRM	
		Innovation	

3 Research Approach

The three surveys mentioned in the previous sections were conducted from October 2009 to May 2010 [5], December 2013 to January 2014 [6, 7], and April 2021 to May 2021 [8]. These surveys define three timeframes:

1. Up to 2010, including the survey of Foorthuis et al. [5].
2. From 2010 until 2014, including the survey of Plessius et al. [6, 7].
3. From 2014 until 2021, including the survey of Plessius et al. [8].

To be able to compare the three surveys, they must be (made) comparable. This encompasses the background characteristics of the respondents and the questions asked in the surveys. In all three surveys, a 5-point Likert scale was used but the questions about the contribution of EA turned out to be quite different in the three surveys. To make the questions and outcomes comparable we used the classification from Table 1. These EA benefit areas were already used in the third survey [8] but for the other two surveys [5] and [6, 7], a mapping was defined. As far as we know, no fixed method exists for such mappings and we had to devise our way of working. As such a mapping is many to many, meaning that a survey question may map on more EA benefit areas and several survey questions may map on the same EA benefit area, two decisions had to be made:

1. A 'cut-off' limit. If a survey question maps marginally on some EA benefit area, what is the limit beyond which this mapping can be neglected?
2. An arithmetic. How to weight the various mappings on the same EA benefit area?

To reduce the subjective nature of these decisions, we had the mappings done twice, once by one of the authors of this paper and once by one of the creators of the original survey. To decide whether the mapping of a survey question on an EA benefit area can be neglected, we used the following criteria:

1. Do the survey question and the definition of the EA benefit area (see Appendix) cover some *common ground*?
2. Is the mapping *necessary* or *desirable* in the context of the question?

If both experts answer the questions posed above with 'yes', the mapping is included, but if a question is answered with 'no' by both experts, it is not included. If the experts disagree or have reasonable doubt about an answer, a decision is made in mutual agreement.

An example from the survey by Foorthuis et al. [5] is the question: *EA turns out to be a good instrument to integrate, standardize, and/or deduplicate related processes and systems*. It is not a priori clear which processes are included in the survey question. After a discussion, it was decided that the question is related mainly to the definitions of the EA benefit areas 'information management', 'data management', and 'business processes', and it seems at least desirable to include these EA benefit areas. While there is some overlap with processes in EA benefit areas such as 'logistics' and 'marketing and sales', these mappings were found neither necessary nor desirable, to avoid giving this question too much weight in those areas.

Ideally, the weighting of various questions on the same EA benefit area should balance the contribution of these questions to that EA benefit area. However, we found no way to balance the various contributions, so we decided after consulting the authors of the original surveys, to weight all mappings on the same EA benefit area equally and average the scores given. Both the mapping procedure and the weighting method chosen are debatable so the numbers derived in this way are an indication and should not be interpreted as absolute. However, as the mapping and the weighting of all questions are done in the same way, the numbers derived can be used for ranking.

As the questions in the surveys are based on benefits found in the literature, we decided to compare the surveys with the literature referenced in the corresponding study. Second, to highlight possible changes over time, we decided to use only papers published in that timeframe. In the third place, to make the scoring uniform, we wanted to use the same number of papers in each timeframe. In the last study [8] there were only five papers that met these restrictions, so we selected, based on our earlier research into the literature about EA value [8, 14, 16], the same number of papers from the first two studies ([5] and [6, 7]). The benefits mentioned in the papers were mapped in the EA benefit areas in the same way as the mapping of the questions in the surveys. But while in the surveys a valuation is given to the benefits, in the papers they are only listed. While some contributions were mentioned in only one paper consulted, others were

mentioned in several, and sometimes all, papers. To qualitatively reflect the degree of agreement between the various papers, we used the following rating: if an EA benefit area is mentioned in one of the papers, it is scored with a '+'. If it is mentioned in two or three papers, we rate the area with a '++' and if it is found in four or five papers, we rate that area with a '+++'. By this rating a '+' corresponds with: 'has been mentioned', a '++' with: 'has been mentioned several times', and '+++ with 'is mentioned in (almost) all papers'.

4 Results

4.1 Background of the Respondents

In Table 2, we have listed the number of respondents in the three surveys, together with the calculated error margin for a confidence level of 95%. The error margins in the first two surveys are comparable, but the error margin in the last survey is greater, due to a (much) smaller sample size.

Table 2. Survey size and calculated margin of error

	2010 survey [5]	2014 survey [6, 7]	2021 survey [8]
Number of respondents	293	287	105
Margin of error (in percentage points) *	6 %opt	6 %opt	10 %opt

*) Confidence level 95%

In Table 3 the economic sectors of the respondents are listed.

Table 3. Distribution over economic sector

The organization I work for can be classified in the following economic sector:	2010 survey [5]	2014 survey [6, 7]	2021 survey [8]
No answer	0%	0%	0%
Agriculture, fishing, forestry and mining	1%	2%	0%
Industry and construction	6%	3%	13%
Energy, water and waste processing	5%	5%	4%
Education and research	2%	6%	7%
Health and community work	3%	5%	11%
Government (including Defense)	31%	24%	28%
Financial and insurance services	30%	35%	14%
Information, communication & recreation	12%	6%	7%
Trade, transport and other services	10%	13%	15%

In the first two surveys, we see comparable numbers while in the third survey, the percentage of respondents in the industry sector is higher and the percentage in the financial and insurance sector is much lower. In [8] this is explained by the fact that the

sector 'Financial and insurance services' has diminished considerably in the Netherlands in the last decade. However, considering the error margins (Table 2), the differences could also be explained by the uncertainty in the outcomes.

As a final reference point, we looked at the reported organizational size in the three surveys. As Table 4 shows, the percentage of organizations with less than 2000 employees has increased over time, which in [8] is explained by the fact that EA has become more generally implemented since 2010, even in smaller organizations (of which there are more than larger companies). Again, different explanations are possible here.

Table 4. Organizational size

Number of employees	2010 survey [5]	2014 survey [6, 7]	2021 survey [8]
< 2000	28 %	38 %	50 %
2000 – 5000	27 %	23 %	22 %
>= 5000	44 %	38 %	29 %

We conclude that because all three surveys are considered representative [5-8] and differences in the background of the respondents can be explained, they are mutually comparable. However, it should be taken into account that the third one, due to the lower number of respondents, has a greater error margin.

4.2 First Timeframe: Up to 2010

The results of all timeframes can be found in Table 5 where empty cells mean that no references to that EA benefit area were found in the literature consulted or that there are no survey questions that could be mapped into that EA benefit area.

For the first timeframe, we collected EA benefits from the papers by Morganwalp and Sage [17], Ross et al. [18], Niemi [9], Kappelman et al. [19] and Slot et al. [20] and mapped these on the EA benefit areas as discussed in section 3. From these papers, we learned that EA benefits in this timeframe are mainly found in the Financial and Accountability perspective, in the EA benefit areas concerning business processes, IT and management of the Internal processes' perspective, and in the EA benefit areas 'alignment', 'agility', and 'communication and knowledge management' from the Learning and Growth perspective. Areas related to the environment of the own organization are hardly mentioned as a source for EA benefits which is most obvious in the Customer and Partnerships perspective. This is in line with the objectives of EA practice in that timeframe: flexibility, adaptability, and reliability [21] or alignment, agility, interoperability, and standardization [22]. It is also consistent with the Enterprise IT architecting and Enterprise integrating schools of Lapalme [13] in which EA is focused on internal business and IT processes, not on the interaction with the outside world. In the survey that ends this timeframe [5], for each EA benefit area we added the percentages of respondents who scored high in that area (scores 4 and 5 on the 5-point Likert scale).

Table 5. Importance of the EA benefit areas in the literature consulted and in the surveys

<i>BSC perspective</i> Goal area	Timeframe 1			Timeframe 2			Timeframe 3		
	Lit	% h	% m	Lit	% h	% m	Lit	% h	% m
<i>Financial and accountability</i>									
Costs and revenues	+++	13.4	49.4	+++	37.6	36.5	+++	51.5	24.6
Investments	++			+++			++	59.6	24.2
Compliance	+++	55.6	31.0	+++	51.9	38.7	++	83.0	11.4
Governance	+++	52.7	31.3	+++	72.3	23.6	+++	57.5	24.0
Risk management	+++	51.1	43.1	++	46.8	22.4	++	63.9	27.8
Societal responsibility				+				40.0	30.0
<i>Customer and partnerships</i>									
(Customer) experience				++	32.1	59.3	++	61.6	19.3
(Customer) relationships	+			++	53.6	34.6	++	56.9	23.6
Product position	++			++	42.9	53.7	++	23.8	23.0
Market strategy	+			++				50.1	13.7
Ecosystem	+	28.2	55.9	++	69.2	27.3	+++	59.2	17.5
<i>Internal processes</i>									
Logistics	+			+			+	49.7	23.9
Business processes	+++	55.6	31.0	+++	50.3	45.9	++	65.7	21.9
Marketing and sales				++			+	32.3	33.7
Service delivery							++	48.8	27.0
Data management	+++	55.6	31.0	++	68.0	29.9	++	68.4	17.1
Information management	+++	55.6	31.0	+++	61.5	35.6	+++	64.3	21.6
General management	+++	56.2	24.4	+++	52.8	40.7	+++	52.0	28.3
Quality management	+++	38.7	44.4	+++	51.4	39.9	+++	57.4	22.7
HRM	++			++	42.9	43.9	+++	55.3	33.2
Innovation	++			++	55.5	36.9	+++	50.9	28.7
<i>Learning and growth</i>									
Competences	++			+++	67.6	31.9	+++	60.9	19.3
Culture	+	28.5	46.4	+++	62.2	34.5	++	64.5	15.3
Alignment	+++	57.4	30.8	+++	75.4	22.0	+++	65.1	23.8
Agility	+++	25.3	50.2	+++	57.1	33.1	+++	60.1	24.3
Technology research							+	35.1	40.1
Communication and KM	+++	46.2	40.1	+++	42.9	33.1	+++	53.6	28.9
Evaluation and re-use	++			+++	38.2	60.0	++	33.6	29.9
<i>Lit:</i>	the relative importance of the EA benefit area in the papers selected for that timeframe								
<i>% h:</i>	the percentage of respondents who considered the contribution of EA as (very) important (4 or 5)								
<i>% m:</i>	the percentage of respondents who considered the contribution of EA as average (3)								
<i>Empty cells:</i>	no references found in the literature selected/ no question asked in the survey								

Table 5 lists these high scores, together with the middle scores (a 3 on the 5-point Likert scale). The high and middle scores together indicate the percentage of respondents who find there is at least some contribution of EA visible in that EA benefit area. The survey follows the papers selected for this period and no questions were asked concerning the customer or the market. It follows that no conclusions can be drawn about the perceived importance of these areas.

In the high-scores column, the relatively low scores in the EA benefit areas ‘costs and revenues’, ‘ecosystem’, ‘culture’, and ‘agility’ stand out. The low importance given to ‘costs and revenues’ may be explained by the fact that in this timeframe, EA is a relatively new discipline and has in most organizations not yet produced tangible results. The low evaluations of ‘ecosystem’, ‘culture’, and ‘agility’ are in line with the focus of EA in this timeframe [13]: internally oriented and mainly concerned with aligning business and IT. The other EA benefit areas are evaluated as average (mid scores) to important or very important (high scores), supporting the attention of EA to ‘internal affairs’ in this timeframe, but no scores stand out particularly.

4.3 Second Timeframe: From 2010 until 2014

For the second timeframe, we collected EA benefits from the papers of Boucharas et al. [10], Tamm et al. [23], van der Raadt [24], Lange et al. [25], and Wan et al. [26]. In these papers we discern, compared to the first timeframe, an increasing agreement that EA benefits can be found in areas related to the outside world. The increasing interest to include the outside world in the EA is evident in the Customer and Partnerships perspective (see Table 5). It seems that EA has started to look ‘outside in’, possibly influenced by the interest in customer journeys [27] which connect the outside world with internal business processes and IT, areas that were already recognized as EA benefit areas. Also, in the Learning and Growth perspective, EA benefits are mentioned more often than in the preceding timeframe, marking a beginning transition towards the Enterprise ecological adaptation school of Lapalme [13].

The increased attention to the outside world is reflected in the survey of Plessius et al. [6, 7] that ends this timeframe and in which most EA benefit areas in the Customer and partnerships perspective are present (albeit with a relatively low percentage of respondents who score the contribution of EA to the customer experience as high).

Noteworthy is the still low importance given to the EA benefit area ‘costs and revenues’. While the area is deemed more important than in the previous survey, it is only in the third timeframe that EA seems to pay out. On the other hand, very high evaluations are given to the EA benefit areas ‘governance’ and ‘alignment’. The scores in the high-scores column of most areas in the Learning and Growth perspective are among the highest given in this timeframe, which is in line with the increased interest in this perspective in the selected papers. This perspective scores better than in the first timeframe – an increase that persists into the third timeframe. The exception is the EA benefit area ‘evaluation and reuse’ which is evaluated quite low. An explanation may be that in practice there often is no time for evaluations because the next challenge is already presenting itself.

4.4 Third Timeframe: From 2014 until 2021

For the third timeframe, we used the EA benefits that can be found in the publications by Jusuf and Kurnia [28], Niemi and Pekkola [29], Gong and Janssen [3], Kurnia et al. [30] and Saleem and Fakieh [11]. In Table 5 we see that in these papers the agreement about the importance of some areas in the perspective of Financial and Accountability has decreased. The EA benefit areas ‘service delivery’ and ‘technology research’ are mentioned for the first time in the literature consulted and the increase in the EA benefit area ‘innovation’ stands out, which may indicate the contribution EA can make to digital transformation.

The increased interest in digital transformation in these papers is not reflected in the outcomes of the survey that ends this timeframe. Looking at both the high and middle scores the EA benefit area ‘innovation’ evaluates lower than in the survey of the second timeframe and the evaluation of ‘technology research’ is also not very high. It seems that the contribution of EA to digital transformation is not yet recognized by the respondents.

In the survey that ends this timeframe [8], almost all EA benefit areas are present, and in many areas we see outcomes that are a bit higher than in the previous timeframe. Striking exceptions with a decrease of 10 %pt or more (considering the error margins of Table 2) are found in the EA benefit areas ‘governance’, ‘product position’, ‘ecosystem’, and ‘alignment’.

The increased perceived contribution of EA in the EA benefit areas ‘costs and revenues’ and ‘customer experience’ is interesting. In both EA benefit areas, the trend from previous timeframes is continued. A very high evaluation is given to ‘compliance’, but it is not clear why; maybe regulations have become stricter. Furthermore, in the survey, a new area, not mentioned in the papers selected for this timeframe, is included: ‘societal responsibility’ – in line with the increased interest in sustainability in society.

5 Analysis of the Results

In the previous section, we have shown that in the selected papers about EA benefits some EA benefit areas are almost always mentioned which is reflected in a ‘+++’ or ‘++’ in Table 5. We will call these the *core EA benefit areas* (Table 6).

Table 6. Core EA benefit areas

Financial and accountability	Internal processes	Learning and growth
Costs and revenues	Business processes	Alignment
Compliance	Data management	Agility
Governance	Information management	Communication and
Risk management	General management	knowledge management
	Quality management	

Except for the areas ‘costs and revenues’ and ‘agility’, as discussed in the previous section, the core EA benefits score high in all three surveys. They also reflect the internal orientation of EA in the early days as discussed above and are comparable to the EA goals identified by Lange and Mendling [31]. The absence of questions about customers and markets in [5] is in line with this internal orientation.

Starting in the second timeframe, we see an extension of the areas where benefits are found, both in the selected papers and in the outcomes of the surveys. On the other hand, there are no areas that disappear; it seems that more is expected from EA. Over time, enterprise architects are becoming more focused on the Customer and partnerships perspective as the starting point for their modeling [32] which is reflected in the perceived importance of the areas where EA benefits are found. As a result, we also see an increase in the scores for ‘agility’.

In the third timeframe, we see a further extension of both internal (‘competences’, ‘culture’) and external (‘technology research’, ‘innovation’, ‘service delivery’, ‘societal responsibility’) oriented EA benefit areas. A driving factor behind the extension in the internal areas mentioned may well be the rise of agile implementation methods in organizations [33]. The extension into more externally oriented areas may be driven by digital transformation which asks for a much more flexible and externally oriented approach to EA [34].

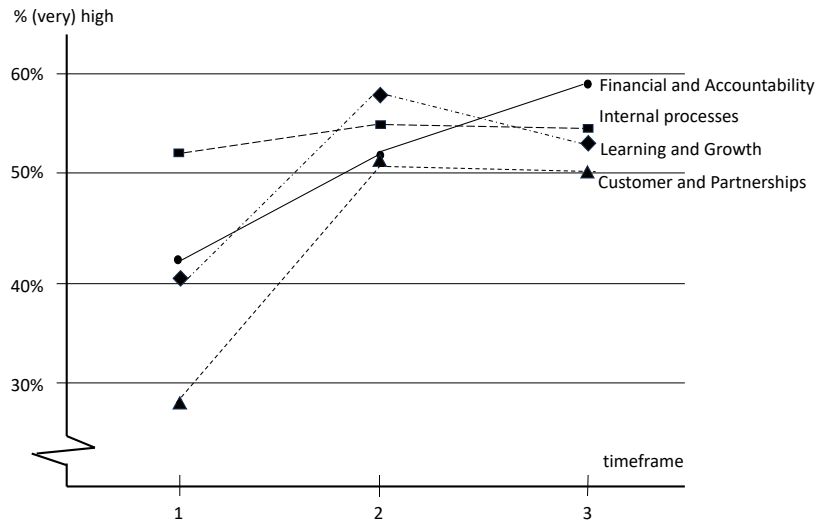


Fig. 1. Evolution of the contribution of EA over time in the Netherlands

In Figure 1 we have averaged the high scores of the surveys in the four perspectives of the balanced scorecard and plotted these against the timeframes. Overall, we see a clear increase from timeframe 1 to timeframe 2 indicating that the contribution of EA is much more appreciated. From timeframe 2 to timeframe 3 the image is more diffuse, in some perspectives there is a clear increase (Financial and Accountability), but other perspectives stay more or less equal (Customer and Partnerships, Internal processes) or show a small decrease (Learning and Growth). However, these small variations may be due to

the error margins (Table 2) in the original surveys. An interesting outcome of the last two surveys is the high score in the Customer and Partnerships perspective – areas from this perspective are not found in the core EA benefit areas (Table 6). This outcome clearly shows the importance of an external orientation of EA.

In the last two timeframes, the high scores averaged by perspective are given by 50% or more respondents and we conclude that starting in timeframe 2, a distinct contribution of EA to organizations is perceived by the respondents.

6 Outlook

From the above outlined evolution of EA benefits, we conclude that the areas where a contribution of EA to the organization is perceived are not static, but are influenced by the role expected of EA. Undoubtedly, this will continue in the future and based on current trends in and around EA [35, 36], we expect the following changes in the benefits expected of EA:

1. In many organizations, software development takes place in agile teams. The proliferation of agile practices in organizations has revived the discussion about the usefulness and value of Enterprise Architecture [37, 38]. The outcome of this discussion may well be that EA has to reinvent itself: from a prescriptive role to a supporting role [33, 39]. This may imply that the core EA benefit areas become less important, while the areas in the Learning and Growth perspective and the Customer and partnerships perspective become more important.
2. Under the influence of the worldwide attention to sustainability, the contribution of EA to ‘societal responsibility’ will become more important. This area has already been indirectly mentioned by Jusuf and Kurnia [28] and is explicitly incorporated as a trend in Gampfer et al. [40].
3. In the discussion about the consequences of the developments in artificial intelligence, an important topic is its ethical impact [41], which is included in the area ‘societal responsibility’ (see definition in the Appendix). In our opinion, this should influence the role of EA to explicitly include ethical aspects when new technologies are introduced.
4. In IT, new technologies emerge at an increasing pace and enterprise architects are expected to advise on the usability of new technologies [3] such as cloud, big data, internet of things, and blockchain in the recent past and currently artificial intelligence [42, 43]. We expect that this will make the EA benefit areas ‘technology research’ and ‘innovation’ more important as forecasted by Gampfer et al. [40].
5. The trend towards using real-time data to support decision-making [44, 45] may lead to reporting benefits in the EA benefit area ‘technology (non-IT)’ as these data often originate in the (technical) production process.
6. A major concern for many organizations is their IT security. Cybersecurity is not only an operational challenge but should start on a strategic level [46]. This has led to a sub-domain of EA: Enterprise Information Security Architecture. IT security is in the current set of EA benefit areas included within the area of ‘Information management’ but with increasing interest, it may become an area in its own right.

7. A final but important development we want to mention is the increased role of EA in digital transformation. This transformation will quite often disrupt the business processes in an organization including their supporting IT/IS. EA can take a leading role in the process [29, 34, 47]. In the current set of EA benefit areas, aspects of digital transformation are spread over various areas, for example, ‘business processes’, ‘information management’, ‘innovation’, and ‘agility’ and it may be worthwhile to introduce an EA benefit area ‘digital transformation’ in which these aspects are gathered.

7 Discussion and Conclusion

The comparison presented in this paper has its limitations. First of all, there is the restriction to the Netherlands as the surveys are conducted there. On the other hand, the literature used is international and both the literature and the surveys support each other. Moreover, in international surveys [48, 49] we see the same EA benefit areas, so we tentatively conclude that our conclusions are valid outside the Netherlands as well.

A much more fundamental limitation is how we have constructed Table 5. In the first place, we have interpreted the questions in the various surveys when mapping these into the EA benefit areas. For example: in the first two timeframes no questions are mapped into the area ‘logistics’, but this topic may be implicitly included in survey questions that are mapped into the area ‘business processes’. The same goes for the area ‘investments’ which may have been implicitly included in survey questions about ‘costs and revenues’. Second, in averaging the results of the various questions mapped into one area, we have given them equal weight, which may not have been the intention of the survey constructors. However, by involving some of the original creators of the surveys, we have tried to minimize mapping errors.

Finally, the number of papers selected for the various timeframes is limited, but based on our previous research into the literature about EA value [8, 14, 16], we were able to select a representative range of papers from the literature cited in the papers about three surveys. However, to obtain a more in-depth validation of the results, we plan to discuss the outcomes of this study with a group of experts. The research summarized in this paper shows that the perception of the contribution of EA in the Netherlands has notably increased since 2010. EA nowadays is generally appreciated for its contribution. We also found that there exists a set of 12 core EA benefit areas which are mainly internally oriented. Over time, the focus of EA has become more externally oriented which is most clearly reflected in the Customer and partnerships perspective. We expect that under the influence of agile implementation methods, to maintain the current high appreciation, EA may move from a directive and prescriptive attitude towards a more supportive role.

Appendix. The EA benefit areas

In Plessius and van Steenbergen [16] a set of 31 areas is discerned, that together cover all organizational goals where a contribution of EA may be expected. These *EA benefit*

areas are validated in a Delphi study by 13 Dutch experts. In Table 7, brief descriptions of these EA benefit areas are given.

Table 7. Brief descriptions of the EA benefit areas

Main goal perspective	EA benefit area	Brief description (Goals related to ...)
Financial and Accountability	Costs ¹	... the reduction in expenses made by the organization
	Revenues ¹	... the increase in income that an organization generates from its activities
	Investments	... the commitment of capital to a resource with the expectation of obtaining additional revenues in the future
	Compliance	... how the organization operates in accordance with laws and regulations as well as internal standards
	Governance	... how rules, norms and actions are structured, sustained, regulated and held accountable in the organization
	Risk management	... how risks are identified, minimized, prevented and controlled by the organization
	Societal responsibility	... the moral justifiability to society of the processes, products and services of the organization (includes sustainability)
Customer and Partnerships	(Customer) Experience	... how customers experience their interactions with the organization (at all stages of the customer journey)
	(Customer) Relationships	... how (current and future) interactions with customers are structured by the organization
	Product position	... how the products and services of the organization fit in the marketplace and how these are distinguished from the products and services of competitors
	Market strategy	... the long-term plan(s) chosen by the organization to approach markets and customers
	(Business) Ecosystem	... the network of partner organizations that are involved in the delivery of products and services of the organization to customers
Internal processes	Logistics	... managing the storage and flow of products and services into, within and out of the organization (extends from supplier to customer)
	Procurement ²	... finding and acquiring materials and services from external sources
	Business (Production) processes ³	... the tasks and activities with which the organization creates its products and services
	Marketing and sales	... the processes responsible for promoting, pricing, selling and delivering the products and services of the organization to customers
	Service delivery	... the supporting activities around the products and services to internal and external stakeholders (customers)

Main goal perspective	EA benefit area	Brief description (Goals related to ...)
	Data management	... the processes and resources used that store, maintain, retrieve and safeguard data important to the organization
	Information management	... the processes and resources used to define, collect, organize, manipulate, store and distribute information by the organization
	Quality management ⁴	... ensuring that outputs and the processes by which they are delivered, meet the stated requirements and are fit for purpose
	General management	... deciding on the strategy of the organization and coordinating the efforts of the employees to accomplish the goals of the organization
	Human Resource Management (HRM)	... the recruitment, management, deployment and development of employees in the organization
	Innovation	... the implementation of ideas that result in the introduction of new or improved products, services and processes in the organization
	Technology (non-IT)	... the (non-IT) techniques, skills, methods, resources and processes used in the production of the goods and services of the organization
Learning and Growth	Competences	... developing and utilizing the potential of individuals to perform tasks within the organization
	Culture	... the system of shared assumptions, values, and beliefs, governing how people behave in the organization
	Communication and knowledge management (KM)	... how information and knowledge are gathered and shared between individuals and groups
	Alignment	... arranging components of a business to best support the fulfilment of its long-term goals
	Agility	... the ability of the organization to respond to changes in its environment or initiate changes for competitive advantage
	Technology research	... evaluating the possibilities of (new) technology for the organization
	Evaluation and re-use	... the systematic determination of the value of processes and results, using criteria governed by a set of standards and indicating for re-use artifacts that comply with these standards

Notes:

- 1) Because costs and revenues are – from an EA viewpoint - mirror images of each other, they are combined in one EA benefit area: Costs and Revenues
- 2) Often combined with Logistics in one EA benefit area: Logistics and Procurement
- 3) Called Production in the original paper [16]
- 4) Includes project management

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