

# PERCEIVED BENEFITS FROM ENTERPRISE ARCHITECTURE

*Complete Research*

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## **Abstract**

*Enterprise Architecture has been developed in order to optimize the alignment between business needs and the (rapidly changing) possibilities of information technology. But do organizations indeed benefit from the application of Enterprise Architecture according to those who are in any way involved in architecture?*

*To answer this question, a model has been developed (the Enterprise Architecture Value Framework) to organize the benefits of Enterprise Architecture. Based on this model, a survey has been conducted among the various types of stakeholders of Enterprise Architecture, such as architects, project managers, developers and business or IT managers. In the survey the respondents were asked to what extent they perceive various benefits of Enterprise Architecture in their organization. The results of this survey (with 287 fully completed responses) are analyzed and presented in this paper. In all categories of the framework benefits are perceived, though to different extent. Very few benefits are perceived in relation to the external orientation of the organization.*

*Few statistically significant correlations were found in relation to the background of the respondents: the overall view on benefits of Enterprise Architecture appeared independent of the role of the respondents, the economic sector and the number of years of experience with architecture.*

*Keywords: Enterprise Architecture, Benefits, Value Framework*

## **1 Introduction**

Many organizations employ Enterprise Architecture (EA) as an instrument to structure and manage their processes, information systems and technical infrastructure from an integral perspective. EA is seen as an important means for organizations to realize their business goals (Ross et al. 2006). EA provides an integrated view of the organization, taking all aspects of the organization into account. Usually, this view is presented in the form of direction-giving principles as well as models depicting the current and/or the target structure of the organization in all its facets (i.e. processes, information systems, technology). For EA to contribute to the realization of the business goals, it has to be developed, communicated and used in decision making and solution design.

Though many benefits are claimed for EA (see for instance Tamm et al. 2011 for an overview), proof of actual benefits is scarce (Boucharas et al. 2010). A clear model of the kind of benefits that one might expect of EA is lacking as well. This lack of insight in the benefits organizations may realistically expect from their EA practice makes it difficult to optimize the contribution of EA and to actually reap benefits from it. This makes the question of how much EA is needed in a given organization hard to answer and as a result, we see very different implementations of EA in organizations. If the EA discipline does not guide architects in this respect, how do architects know what is optimal for an organization in a given situation? A way to add to our knowledge on EA is empirical research: what are the benefits of applying EA as perceived by organizations? In this paper we want to answer the following research question:

*In what way do organizations benefit from the application of EA according to those who are involved in architecture?*

From the main question the following sub-questions are derived:

- How can benefits be classified?
- Are there differences in perceived benefits between the categories?
- Have different stakeholders different perceptions of the benefits?
- Which organizational aspects influence the perception of benefits?

To answer these questions, we developed a framework for classifying the benefits of applying EA. Based on this framework, a survey has been conducted in the Netherlands in the period from December 2013 until the end of January 2014. A total of 287 stakeholders, both developers and users of EA, from a wide range of enterprises, completed the survey. In this paper we present the result of our first statistical analysis showing that in the opinion of most stakeholders, independent of their role in the organization, EA benefits can be found in various areas.

In the next section, a short review of the literature on EA benefits is presented, together with a theoretical framework for classifying EA benefits. In section 3 the research approach is discussed, and the results are presented in section 4. In section 5 the results are discussed and in section 6 the conclusions from the research, as well as its limitations, are presented and further research is outlined.

## **2 Theoretical background**

The concept of Enterprise Architecture (EA) was introduced in 1987 by Zachman with the words: *“With increasing size and complexity of the implementations of information systems, it is necessary to use some logical construct (or architecture) for defining and controlling the interfaces and the integration of all of the components of the system.”* (Zachman, 1987, p. 276).

Since those days, a whole line of architectures have been introduced where architecture is defined as: “*Architecture is the fundamental organization of a system embodied in its components, their relationships to each other and the environment, and the principles guiding its design and evolution*” (ISO/IEC 42010:2007). It follows that architecture is concerned with the construction and the evolution of systems. Applying EA involves the enterprise as a whole: “*how does the enterprise operate and how can it most effectively achieve its current and future objectives*” ([www.searchCIO.com](http://www.searchCIO.com)). In this paper (not uncommon in the world of EA, see for example Jonkers et al, 2006), the term EA will be used in the latter sense, meaning the application of architectural constructs in order to contribute to the goals of the organization.

Since the turn of the century, a lot of research has been done in establishing the benefits of Enterprise Architecture. Though most authors classify benefits in some way, these classifications are in most cases not derived from a theoretical framework. As yet, no standard categorization of EA benefits has emerged. A number of authors build their classification bottom up from benefits reported in the literature, see for example Buchanan (2001), Brown (2004), Foorthuis et al. (2010), Tamm et al. (2011) and Lange et al. (2012). As a result, we see different classifications, which makes it difficult to compare results from different studies. Other authors use a more theoretical approach in classifying the benefits. Examples are the Agility and Alignment model of van der Raadt (2011) and the Balanced Scorecard, used by authors as Schelp and Stutz (2007) and Boucharas et al. (2010).

Van der Raadt distinguishes benefits for the organization aimed at external factors (like external monitoring, flexibility, speed, quality & customization and initiation of change) and internal factors (like internal monitoring, communication & understanding, governance, partnership, readiness for change and conformance & integration). The external factors are summarized in the agility of the organization while benefits aimed at the internal organization are called alignment benefits by van der Raadt. While not independent of each other, “*due to the abstract and multi-level characteristics of these concepts*” (van der Raadt, 2011, p. 98), all benefits may be classified in one of these categories (and sometimes in both).

A more comprehensive approach is the use of the Balanced Scorecard in its original form (Kaplan & Norton, 1992) or in the more extended form of the Strategy map (Kaplan & Norton, 2004). In the original Balanced Scorecard, four different perspectives are introduced: the Financial, the Customer, the Internal and the Learning & Growth perspective, whereas in the Strategy map the last two perspectives are subdivided, resulting in 8 (sub)classes. Based on a structured literature review, Boucharas et al. (2010) use the Strategy map to classify benefits reported in previous research.

Schelp and Stutz (2007) combine the four perspectives of the original Balanced Scorecard with the organisational scope of the benefits: the architectural, the IT-, the enterprise and the cross-company scope. However, organisational scope and the (organisational) perspectives of the Balanced Scorecard are not necessarily mutually independent.

Like Boucharas et al. and Schelp and Stutz, we use the four perspectives of the Balanced Scorecard as a dimension in classifying EA benefits. This is in line with the idea that the purpose of EA is to enable organisations to realize their business goals (Steenbergen and Brinkkemper, 2008) where the Balanced Scorecard is commonly used for structuring business goals. We add a second dimension based on the perception that EA benefits may evolve in time, following the lifecycle of EA in which three main phases may be discerned in the process from idea to delivered result: the development of the architectural artefacts (principles and models), the application of the architecture in projects and the resulting changes in business processes and systems. In these three phases different stakeholders are involved who may benefit in different ways. During the development of the EA artefacts, benefits may occur because conversations take place between architects and decision-makers and experts about several aspects of the organization, from a holistic perspective. This may create awareness and insights. When the EA prescriptions are applied in business projects, benefits may occur because the EA insights enable better management of projects: risks for instance can be assessed more precisely or

timelines can be predicted better. Finally, when parts of the target architecture have been implemented, the organization should be able to reap benefits such as increased agility, lower costs or greater operational efficiency.

Combining the two dimensions leads to the Enterprise Architecture Value Framework (EAVF) as depicted in figure 1.

<u>Phase</u>	<u>BSC-perspective</u>	Financial	Customer	<u>Internal</u>	Learning & Growth
Development					
<u>Realization</u>					
<u>Use</u>					

Figure 1. The Enterprise Architecture Value Framework (EAVF)

On the horizontal axis of the framework the four perspectives of the Balance Scorecard as originally published by Kaplan & Norton (1992) are plotted, while on the vertical axis of the framework the three phases of EA from its development to its implementation and use of the results are shown. These perspectives and phases are discussed in more detail in an earlier paper (Plessius et al., 2012) in which the phases are coupled to TOGAF (2011) as well<sup>1</sup>.

With the mutually independent dimensions of time and goal perspective we have created a framework in which it should be possible to position every EA benefit reported.

### 3 Research approach

To answer the research question, a survey has been developed by the authors of the paper. In this survey, for every cell of the EAVF, a statement was formulated, combining a phase of EA with a business goal perspective. For instance, the statement for the top-left cell of the EAVF is formulated as: *By developing Enterprise Architecture the organization has more insight into the costs, benefits and risks involved in changes.* For each statement the respondents were asked to indicate on a 5-point Likert scale to what extent the statement holds for the organization they work for. The choices for the example above, for instance, were *much less*, *less*, *as much*, *more* and *much more*. In this way the respondents could indicate that they perceived a negative impact of EA (by answering *much less* or *less*), no impact one way or the other (by answering *as much*), or a positive impact (by answering *more* or *much more*). To prevent respondents from scoring statements outside their scope, the option was provided to select *unknown* as an answer as well.

As Enterprise Architecture is a broad concept that can be understood differently by various individuals, we provided a description at the very start of the survey of what in the context of the survey was meant by Enterprise Architecture. In the same way we briefly introduced every row of the framework in the survey.

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<sup>1</sup> In this paper, a fourth phase Re-Use was included as a seamless continuation of the Use phase. We dropped Re-Use as a distinct phase as re-use can be part of any of the other three phases.

The survey was tested with two test-respondents who completed the survey in the company of one of the authors, explaining how they interpreted the statement and why they chose a particular answer. Based on their feedback a few adjustments were made in the statements. The survey was put on-line as a web-survey.

As we wanted the perceptions, not only of architects, but also of other stakeholders such as developers and managers, we targeted the survey broadly at people in the Netherlands who are professionally involved with Enterprise Architecture, either as an architect, as a developer or as a user experiencing the results of the architecture. To make it possible to analyse for differences in the opinions of the three different groups, a question was added about the role of the respondent in the organization.

As there are no registers available of our target group, we could not make a random selection, but had to broadly advertise our survey and try to reach as varied a population as possible. Thus we distributed the survey among the circa 700 attendees of the main Dutch annual architecture conference (LAC 2013, see [www.laccongres.nl](http://www.laccongres.nl)). In addition we sent out a mailing to more than 3000 relations and employees of several IT service providing companies.

At the end of January 2014 there had been no new responses for over a week. So we decided to close the survey with 287 fully completed responses (out of a total of 520 persons accessing the initial page of the survey). The persons not completing the survey largely did not proceed beyond the introductory page. For the statistical results as reported in the next section, we used the well-known statistical tool SPSS, version 22.

## **4 Research results**

### **4.1 Characterization of the respondents and their organization**

The respondents came from all economic sectors, with a strong emphasis on the financial and insurance sector and the government (see table 1). This distribution over economic sectors is similar to that found in other surveys related to EA, such as Foorthuis et al. (2010) and Obitz and Babu K (2009). It is reasonable to assume that the respondents present a good representation of organizations employing EA.

<i>Sector</i>	<i>Percentage</i>
Trade, transport and other services	12.9
Information, communication, entertainment and recreation	6.3
Financial and insurance services	35.2
Government (including defence)	24.4
Health and community work	4.9
Education and research	6.3
Energy, water and waste production/processing	4.5
Industry (nutrition and manufacturing) and construction	3.1
Agriculture, fishing, forestry and mining	2.4

*Table 1. Distribution over economic sectors*

Looking at the roles of the respondents (table 2), we can conclude that the three target groups (architects, developers and users) are all sufficiently represented.

<i>Role</i>	<i>Percentage</i>
I develop the Enterprise Architecture (e.g. as an enterprise or domain architect)	38.3
I apply the Enterprise Architecture in projects (e.g. as a project manager, solution architect, designer, developer, manager, purchaser, test manager)	23.7
I am a stakeholder in the Enterprise Architecture (e.g. as a business line manager, IT manager, staff executive)	38

*Table 2. Distribution over target groups*

In line with our expectation, larger organizations were better represented than smaller: only 7.3% of the respondents worked for an organization with less than 200 employees, while 61.6% was employed by a company with 2000 or more employees (see table 3).

<i>Number of employees</i>	<i>Percentage</i>
less than 100	3.5
100 to 200	3.8
200 to 500	7
500 to 2000	24
2000 to 5000	23.3
5000 or more	38.3

*Table 3. Distribution over organizational size*

From table 4 we learn that around 30% of the respondents work in organizations that employ more than 10 enterprise or domain architects. Almost 40% work in organizations that employ more than 10 project or software architects.

<i>Number of architects</i>	<i>Enterprise and/or domain architect (%)</i>	<i>project and/or software architect (%)</i>
0	5.9	10.5
1	16.7	9.1
2-5	28.9	26.8
6-10	17.1	15.7
11-20	13.9	13.2
21-50	10.5	11.5
>50	7	13.2

*Table 4. Number of architects employed*

From table 5 we learn as well that more than 50% of the respondents work in organizations that employ up to 5 enterprise or domain architects and a little less than 50% work in organizations that employ up to 5 project or software architects.

Noteworthy is that some 40% of the organizations have more than 10 years of experience with architecture and that this follows closely the distribution of experience with the respondents (table 5).

<i>Years of experience with architecture</i>	<i>of the organization (%)</i>	<i>of the respondent (%)</i>
0	2.1	2.1
1	4.2	2.8
2-5	24.7	24.7
6-10	28.9	36.6
11-20	26.8	26.8
>20	13.2	7

*Table 5. Years of experience with architecture*

We checked whether a correlation existed between the two variables presented in table 5 (years of experience with architecture of the organization and years of experience with architecture of the respondent) and found indeed a statistically significant correlation ( $p=0.000$ ) with a correlation coefficient (Spearman's rho) of 0.368. It appears that experienced architects are primarily employed by experienced organizations. Though understandable, for a better distribution of knowledge it would be preferable for experienced architects to be employed by organizations with less experience in EA.

Finally, table 6 shows the focus of the enterprise architecture. Whereas about 50% of the respondents indicate that in their organisation the focus of EA is on business/information as well as on application/infrastructure, still more than 35% of the organizations focus solely on applications/infrastructure and a mere 10% focus on business/information only.

<i>Emphasis of EA is</i>	<i>Percentage</i>
on business/information	9.8
approximately equally on business/information and on applications/infrastructure	51.9
on applications/infrastructure	36.2
unknown	2.1

*Table 6. Emphasis of the architecture*

On the whole the characteristics of the respondents and their organization are in line with the results found in other surveys (see for example Foorthuis et al, 2010 and Obitz and Babu K, 2009) and as they are encountered in practice.

## **4.2 Reported benefits**

To test whether the respondents perceive benefits from EA in the various categories of the EAVF, we divided the responses in two groups. We grouped the answers 1, 2 and 3 together in one group,

representing respondents who did not perceive a positive effect of EA (i.e. a negative or neutral effect), and the answers 4 and 5 in another group, representing the respondents who perceived a positive effect of EA. The null hypothesis we want to test is that there is no positive effect from EA, which implicates that the percentage of respondents in the second group (answer 4 or 5 on the 5-point scale) is not significantly more than 40% (no bias is expected as the respondents are roughly equally divided over architects, developers and users). The alternative hypothesis is supported if significantly more than 40% falls within this second group. To test the null hypothesis we performed a one-sided binominal test for each question. The results are presented in table 7.

Statement	Phase	View	1-3 (%)	4-5 (%)	0 (#)	Sig	1-2 (%)
By developing Enterprise Architecture the organization has more insight into the costs, benefits and risks involved in changes	Development	Fin	21.9	78.1	36	0	0.4
By developing Enterprise Architecture the organization takes better account of its clients and market when making decisions		Cus	51.6	48.4	39	0.005	0.4
By developing Enterprise Architecture the organization has better insight into the current and desired structure of the organization		Int	21.8	78.2	12	0	2.2
By developing Enterprise Architecture the organization has more insight into how it can prepare for the future		L&G	17.9	82.1	13	0	2.2
By applying Enterprise Architecture in projects the organization has more insight into the costs, benefits and risks involved in projects	Realization	Fin	24.1	75.9	34	0	2.4
By applying Enterprise Architecture in projects the organization takes better account of the consequences for its clients and market when executing changes		Cus	52.5	47.5	28	0	2.3
By applying Enterprise Architecture in projects the project performance is better		Int	50	50	35	0.001	7.1
By applying Enterprise Architecture in projects the learning and innovative capacity of the organization is better		L&G	47	53	36	0.014	4
Since the organization has been using Enterprise Architecture the organization's performance is better	Use	Fin	52.2	47.8	57	0.01	2.2
Since the organization has been using Enterprise Architecture its market and client position is better		Cus	70.2	29.8	59	0.001	2.6
Since the organization has been using Enterprise Architecture the operational effectiveness and efficiency are better		Int	42.1	57.9	45	0	3.3
Since the organization has been using Enterprise Architecture the organization is better prepared for the future		L&G	22.4	77.6	28	0	1.2

Table 7. Distribution of answers



In this table, Phase and View refer to the rows and columns of the EAVF (see figure 1), 1-3 to the percentage of the respondents (0's excluded) which has given a 1, 2 or 3 as an answer (no positive effect), 4-5 to the percentage of the respondents which has given a 4 or 5 as answer (positive effect), 0 to the number of respondents who have answered 'unknown' and Sig to the p-value found. To show how many respondents experience a negative effect of EA, we added a column showing the percentage of respondents answering 1 or 2 (negative effect).

Table 7 shows that all null hypotheses are rejected with a p-value below 0.05 (with the exception of one statement, all p-values are even below 0.01). In all statements we see a positive effect of EA, except for the customer perspective in the use phase: 'Since the organization has been using Enterprise Architecture the organization's market and client position is better'. The number of respondents perceiving this benefit in their organization is smaller than expected. However, as can be seen from the small number of respondents answering 1 or 2, this is due to the fact that most respondents see neither a positive nor a negative effect. For this statement, however, we cannot accept the alternative hypothesis, that there is a positive effect.

On the whole we see that the percentage of respondents who found a negative effect of EA on the organization (column 1-2) is very small. The largest percentage (7.1) is found for the statement whether since implementing Enterprise Architecture in projects the project performance is better. The reason for this might be that respondents feel that projects are made more complex because of the extra requirements put upon them by EA.

In figure 2 the percentage of respondents who held the opinion EA has a positive effect on the organization (column 4-5 in table 7), has been summarized. In this figure, the cells where the majority ( $\geq 50\%$ ) of the respondents have answered that they perceive EA benefits in that category, are highlighted.

<u>Phase</u>	<u>BSC-perspective</u>	Financial	Customer	<u>Internal</u>	<u>Learning &amp; Growth</u>
Development		78.1	48.4	78.2	82.1
<u>Realization</u>		75.9	47.5	50	53
<u>Use</u>		47.5	29.8	57.9	77.6

Figure 2. Percentage of respondents who found EA has a positive effect

From figure 2 it is clear that the Customer perspective scores (far) lower than the other perspectives. Less respondents perceive positive effects of EA on the interaction with customers and the market – an observation which is consistent with the findings of Boucharas et al. (2010) who hardly found any benefits for this perspective.

Most benefits are reported in the Architecture Development phase. It seems that merely discussing architectural questions in the organization may already result in benefits, for instance by creating awareness and mutual understanding. However, the benefits at this level are primarily related to providing insight. Turning this insight into action is more difficult. This is clearly illustrated in the Financial perspective (leftmost column), where we see a difference between EA providing insight in costs and risks at the first two levels and achieving a better financial performance (bottom cell). This is consistent with similar findings by Foorthuis et al. (2010).

In the Learning & Growth perspective (rightmost column) we see a much larger percentage of respondents perceiving a positive effect in the Use phase (bottom cell). From this perspective we learn that respondents not only perceive better insight in how their organization can prepare for the future

(topmost cell), but also that since having an architecture their organization is indeed better prepared for the future (bottom cell). In the internal perspective the majority of respondents perceive benefits in the use phase as well, perceiving more operational effectiveness and efficiency. It appears that projects benefit less than organizational operations.

We expected differences in perceived benefits between the three target groups (architects, developers and users). However, only in one cell (as discussed in the next section) we found a significant difference between the three target groups. It seems that the different groups of respondents more or less agree on the benefits of EA in the different phases and towards different perspectives.

### 4.3 Reported benefits compared to the background of respondents

To establish whether a correlation exists between benefits reported in the cells of the EAVF and the characteristics of the respondents or their organizations, we performed a number of chi-square tests. In table 8 and 9 below we present the relations found with a p-value < 0.05. In these tables, 0 means unknown and these cases have been excluded.

As table 8 shows, we did not find many significant differences. For the aspects target group, economic sector and years of experience with architecture we found significant differences for just one of the twelve cells. These results seem too sporadic to draw firm conclusions.

Contrary to our expectation, there exist no statistically significant differences (p-value < 0.05) between the answers of the different target groups, with the exception of the Financial perspective in the Development phase, where developers respond more positively than implementers and implementers more positively than users. This is a trend found in other surveys (Foorthuis et al., 2010), but it is not clear why it should only be exhibited in this cell of the EAVF.

Concerning economic sector, the only significant difference found was in the Financial perspective in the Realization phase, where a more positive outcome was found for the other (i.e. non-governmental/non-financial) sectors. This is not in line with Steenbergen et al. (2011) where a clear difference between economic sectors was found. This may be an indication that EA is becoming more common, making the differences between organizations smaller.

A negative correlation was found between the experience with architecture of the respondent and the Customer perspective in the Realization phase: increasing experience correlates here with a decreasing judgement on benefits. An explanation might be increasing disappointment with the effect of EA over the years, but again there is no reason why this should emerge only in this particular cell.

<i>Statement</i>	<i>Organizational role</i>	<i>Developer (%)</i>	<i>Implementer (%)</i>	<i>User (%)</i>	<i>0 (#)</i>	<i>p</i>
By developing Enterprise Architecture the organization has more insight into the costs, benefits and risks involved in changes		89.4	71.2	69.3	36	0.001

<i>Statement</i>	<i>Economic sector</i>	<i>Government (%)</i>	<i>Financial (%)</i>	<i>Other (%)</i>	<i>0 (#)</i>	<i>p</i>
By applying Enterprise Architecture in projects the organization has more insight into the costs, benefits and risks involved in projects		73.3	66.7	84.9	34	0.011

<i>Years of experience with architecture</i> <i>Statement</i>	<i>Less than 6</i> <i>(%)</i>	<i>Between 6</i> <i>and 10 (%)</i>	<i>More than</i> <i>10 (%)</i>	<i>0</i> <i>(#)</i>	<i>p</i>
By applying Enterprise Architecture in projects the organization takes better account of the consequences for its clients and market when executing changes	58.8	47.5	39.1	28	0.048

Table 8. Results of chi-square tests for organizational characteristics

With regard to the focus of EA we found more significant relations (table 9). A focus on applications and infrastructure alone leads to fewer benefits than a focus that includes business and information. This is a clear motivation for organisations to emphasize their business and information architecture Especially, there seems to be a positive effect on the Customer perspective if business and information are included in the EA.

<i>Focus of architecture</i> <i>Statement</i>	<i>Bus/info</i> <i>(%)</i>	<i>Appl/infra</i> <i>(%)</i>	<i>Both (%)</i>	<i>0</i> <i>(#)</i>	<i>p</i>
By developing Enterprise Architecture the organization takes better account of its clients and market when making decisions	54.2	34.9	56.7	43	0.006
By developing Enterprise Architecture the organization has better insight into the current and desired structure of the organization	71.4	70.7	84.7	16	0.022
By applying Enterprise Architecture in projects the organization takes better account of the consequences for its clients and market when executing changes	54.2	36.6	53.6	32	0.031
Since the organization has been using Enterprise Architecture the organization is better prepared for the future	78.9	69.4	84.2	31	0.025

Table 9. Results of chi-square tests for focus of EA

All in all our survey results do not suggest large differences between types of respondents or the types of organizations they work in.

## 5 Discussion

The survey results show a number of interesting outcomes. First of all, we find that a relatively low percentage of the respondents perceive EA benefits regarding the customer perspective. This is in line with other academic research into the benefits of EA, where we also find little mention of benefits in this category. Tamm et al. (2011) do not include this perspective in their classification, Boucharas et al. (2010) find only 2 out of 100 benefits belonging to the customer perspective and Foorthuis et al. (2010) only mention the benefit of ‘enabling the organization to respond to changes in the outside world in an agile fashion’, which we might relate to the customer perspective, but does not find confirmation of this benefit. Only Obitz and Babu K (2009), in their survey among IT leaders, find that the number one benefit quoted is ‘increased customer satisfaction’. They suggest that this may be related to issues created by incorrect data.

The reason for this lack of perceived customer perspective benefits might be that EA does not focus directly on the customer perspective, but is more concerned with the internal workings of the organization than with its products and services to the outside world. The fact that still 35% of the respondents indicate that the focus of their EA is on applications and infrastructure may point in this direction. The impact of EA on customers and market may therefore be more indirect. This suggestion is strengthened by the fact that we found a negative correlation between focus on only application and technical architecture and two of the three customer perspective related benefits.

Secondly, we find that the EA development phase, i.e. the process of formulating the EA, generates the highest percentages of perceived EA benefits. The percentages of respondents perceiving EA benefits in their organization related to the application of EA in projects are lower, especially in the internal perspective and the learning & growth perspective. An explanation for the lower perception of benefits for projects may be that many organizations are still in the process of moving towards their target architecture, which may pose extra requirements on projects. In contrast, the benefits of greater insight in various aspects of the organization can be realized just from developing the EA, without having to implement it first. This finding is in line with Foorthuis et al. (2010) who, in their survey, found more benefits reported on organization level than on project level. However, they also found that EA delivers better on providing insight than on providing higher organizational performance, whereas our survey indicates that for the internal and learning & growth perspectives a relatively high percentage of respondents perceive EA benefits also in the use phase, i.e. after implementation.

Regarding the roles of the respondents we had expected to find more differences between the three roles distinguished. Foorthuis et al. (2010) for instance, show a tendency for what they call EA creators to be more positive about the effects of EA than EA users. We only find this difference for one of the twelve statements. Not finding a difference between stakeholders may be an indication that over the past years EA is becoming better integrated in the organization, making the views of different stakeholders converge. This has to be further investigated, though.

## **6 Conclusions and further research**

In this paper the Enterprise Architecture Value Framework (EAVF) is used for classifying benefits of Enterprise Architecture. The EAVF makes it possible to classify benefits in a unequivocal and straightforward way. Based on this framework a survey has been developed which shows that in the eyes of employees who are involved with architecture, their organization on the whole benefits from having an Enterprise Architecture (see figure 2). But it looks as if EA is very much oriented towards the organization itself and not to its environment (the Customer perspective). Benefits are more often perceived in the EA development phase than in the other phases.

We did not systematically find statistically significant differences between the different roles of our respondents (architects, developers and users) which may imply that the overall view on architecture is consistent among stakeholders. Neither did we find any meaningful differences with regard to the other characteristics of respondents or their organisations. This may be indicative of EA becoming more integrated. As far as the focus of EA is concerned, our results indicate that it is important to include the business, the information, the applications and the infrastructural aspects in the architecture for maximum benefits.

Our research has its limitations. Most importantly, the survey asks for the opinion of the respondents so the information gathered is subjective. This is, however, frequently the case with surveys and has for long been an accepted approach. Previous research has shown that subjective measures can provide reliable results (Wall et al. 2004). Besides, the survey was completed from different perspectives: the respondents were equally divided over persons defining the EA, persons having to apply the EA and persons supposed to benefit from the application of EA. A second limitation is the representativeness

of our sample. Because there are no registers from which we could draw a random sample, we had to resort to broadly advertising our survey, leading to self-selection by the respondents. We found, however, that the respondents are evenly distributed over the various roles and that their distribution over economic sectors is in line with that found in other surveys. A third limitation is that the survey is limited to the Netherlands and the results may not be valid for other countries. Finally, a slight bias might occur in the answers because all our statements are positively formulated. Because of these limitations the results of our study must be regarded with caution.

For practitioners the findings of our survey suggest two courses of action. First of all, the realization that benefits can already be gained from the developing phase of EA, suggests that it is worthwhile to incorporate communication and engagement of the organization as an integral part of the EA development approach. Secondly, architects should reflect on the extent their work is related to the outside world and whether they need to change to a more outside-in way of thinking.

An interesting venue of further research might be to investigate to what extent and in what manner EA benefits can be realized regarding the customer perspective. In the existing research on EA benefits, this perspective is underdeveloped. Especially in this age of individualization and customerization it seems worthwhile to dedicate more research to the potential impact of EA on achieving more customer satisfaction and a better market position. In addition it would be valuable to investigate how we can make projects benefit more from EA.

In future research we will look for more precise indicators for every cell of the framework and in this way, we expect to gain a better insight in which benefits are most important for organizations. It will be interesting to see whether more differences occur when comparing more fine-grained answers with the background of the respondents (and the organization they work for). A long-term goal of our research is to be able to give an answer to the question how EA brings value to organizations and translate that into actionable recommendations for practitioners.

## **Acknowledgement**

We want to thank the anonymous reviewers for their valuable comments. Their suggestions definitely helped us to improve the presentation of our research.

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