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How to cite:

Clark, Michael; Hall, Jon G. and Rapanotti, Lucia (2013). Enterprise Architecture: a snapshot from practice. *International Journal of IT/Business Alignment and Governance*, 4(1) pp. 1–10.

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Version: Version of Record

Link(s) to article on publisher's website:

<http://dx.doi.org/doi:10.4018/jitbag.2013010101>

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Enterprise Architecture: A Snapshot from Practice

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ABSTRACT

Enterprise Architecture (EA) has been portrayed as one of the cornerstones of modern IT Governance, with increasing numbers of organisations formally recognising an EA function and adopting EA frameworks such as TOGAF (<http://www.opengroup.org/togaf/>) (The Open Group Architectural Framework). Many claims have been made of the benefits of EA, yet little is known as to what organisations actually do or evidence of the benefits they accrue through EA. In this paper we report on the results of a small scale survey painting a snapshot of current EA practice in large UK organisations across the private and public sectors.

Keywords: Enterprise Architecture (EA), IT Governance, Organisations, Snapshot, The Open Group Architectural Framework (TOGAF)

1. INTRODUCTION

The discipline of Enterprise Architecture (EA) (Bernus & Nemes, 1996; Ross et al., 2006) has grown over the past twenty years to become a notable part of IT Governance, the latter described by Calder (2009) as a “framework for the leadership, organisational structures and business processes, standards and compliance to these standards, which ensure that the organisation’s IT supports and enables the achievement of its strategies and objectives.” EA is often portrayed at the intersection of an organisation’s IT strategy and business strategy, with its effectiveness depending upon the specification of an IT architecture able to support adequately

the organisation’s business model (Winter & Schelp, 2008). Indeed, many claims have been made of the benefits of EA, accruing from its holistic view of the organisation, including the ability to: support business processes and deliver organisational change effectively and efficiently (Schelp & Aier, 2009), simplify and future-proof the IT infrastructure (Ross et al., 2006), optimise procurement and outsourcing, better decision making (Van den Berg, 2006), and deliver organisational change more quickly and cheaply (Aier, 2004).

Of course, business models can vary significantly and are contingent upon many factors, including organisational culture, customer type (consumer or business), product or

DOI: 10.4018/jitbag.2013010101

service variety on offer, tangibility of such an offer, and geographical diversity, to name but a few. However, a common belief that there are certain characteristics shared between the business models of diverse organisations has led to the development of generic EA frameworks and methodologies. In parallel, technical innovations in the nature of software development, such as Service Oriented Architecture (SOA), have enabled practical implementation of some of the key theoretical benefits of EA, such as cost savings in software development through re-use of existing software. This has allowed a closer association of business processes with discrete pieces of software which are specifically required to perform these processes, with EA performing a key role in realising such an association and fostering corporate agility with better adaptation of IT to changing business processes (Schelp & Aier, 2009).

EA is becoming standard practice in large organisations, often embodied as a separate and well defined function. Yet information of what individual organisations actually do and evidence of the benefits they are accruing through EA is lacking, partly because of commercial sensitivity, but also because this remains a fragmented, practitioner-led subject area, with little academic empirical work done and much of the literature aimed at a practical, self-help market (Schönherr, 2009), often relying on anecdote and supposition to support a method's effectiveness. Schönherr uses a comprehensive review of the literature between 1987 and 2008 and concludes that the large majority of published EA literature discussed theoretical approaches to EA which speculate about the areas of a business that might benefit from an EA practice. However, relatively little research has been carried out into the application and efficacy of EA as a discipline and to test the suppositions made about the EA's role in the achievement of organisational objectives.

The work in this paper is a step towards collecting evidence from practice to substantiate some of the claims made of EA. We conducted a survey within a practitioner network, with respondents from a number of (mainly

UK) large organisations from the private and public sectors. Although on a small scale, data from the survey provides a snapshot of UK EA practice, with an indication of the level of adoption of EA frameworks and approaches and perceived benefits of EA within the respondents' organisations.

The paper is structured as follow. Section 2 provides some background literature review. Section 3 gives an overview of the survey with the analysis of its data in Section 4. Section 5 discusses the results and Section 6 offers some conclusion and outlines possible future work.

2. BACKGROUND

2.1. IT Governance

There are two key facets to IT Governance. First, there is the need for a good alignment between IT and business, and greater transparency in the IT-related decision making process, so that there is real return on IT investment in delivering business value and supporting business strategic objectives. Second, there is the need for the judicious treatment of business risk, and of greater accountability and control, the latter often the result of legislation and regulation (such as the Sarbanes–Oxley Act in the US or the Data Protection Act in the UK).

The first facet is much portrayed in the work of Weill and Ross (2004), which defines IT Governance as “specifying the decision rights and accountability framework to encourage desirable behaviour in using IT.” This strategic perspective is mainly concerned with management and organisational design rather than with the operation of IT, and makes a clear distinction between the taking of individual decisions and the framework created to facilitate effectively that decision making.

The second facet is present, for instance, in Calder (2009), which portrays risk management at the core of effective IT Governance, with IT-related risk including: interruptions (whether from project failure or unplanned disruption) to business processes and customer services;

overspending placing the company at a cost disadvantage compared to its competitors; and operational risk deriving from an organisation's failure to deliver IT services or lack of internal control. Key standards which take a risk-centric view of IT Governance include BS ISO/IEC 20000 and BS ISO/IEC 27001 series, addressing the principles and best practice implementation of, respectively, service management systems and information security management systems.

These two facets are closely related and effective IT Governance critically depends on both. Moreover, the focus on decision rights, and accountability and risk management puts an emphasis on stakeholder involvement: effective IT Governance must incorporate formal decision making involving all affected stakeholders in an organisation. This view is also embodied in BS ISO/IEC 38500, a standard stating the fundamental principles for the corporate governance of IT.

The complexity and wide scope of influence of IT Governance within an organisation has led to the emergence of a great number of frameworks to help organisations address various aspects of IT Governance effectively, the better known being: COBIT (<http://www.isaca.org/COBIT/Pages/default.aspx>), for overarching IT corporate governance; ITIL (<http://www.itil-officialsite.com/home/home.asp>), for service management; PRINCE2 (<http://www.cabinetoffice.gov.uk/resource-library/best-management-practice-portfolio>), for project management; and the already mentioned TOGAF, for enterprise architecture, which is the focus of this work. It should be noted, however, that while adoption appears to be on the rise, such frameworks are currently more finely tuned to the needs and resources of blue chip corporations, with small enterprises, non-for-profits and the public sector lagging behind (Ayat et al., 2011; Begg & Caira, 2012).

2.2. Enterprise Architecture and TOGAF

Ross et al. (2006) define Enterprise Architecture (EA) as “the organising logic for core business

processes and IT infrastructure reflecting the standardisation and integration of a company's operating model,” which emphasises the match between IT and business processes. This definition has a substantial overlap with the emphasis that Weill and Ross (2004) put on the strategic aspects of IT Governance: EA could be viewed as the conceptual result of successful IT Governance at a strategic level. It also aligns with Van den Berg's analogy of EA as a ‘city plan’ (Van den Berg, 2006), and his view that EA “exists at a very high conceptual level, has a broad scope and serves as a support for senior management in its high-level decision making.”

Many EA frameworks and methodologies have been developed in the last twenty years, and the role of Enterprise Architect is now well understood, at least in large organisations. Early EA frameworks (Bernus & Nemes, 1997) were either proprietary tools offered by consultants, e.g. the Zachman Framework (<http://www.zachmaninternational.com/index.php/home-article/89#maincol>), or had grown out of best practices specified by government agencies, e.g., DoDAF (<http://dodcio.defense.gov/dodaf20.aspx>), the US Department of Defense Architecture Framework. More recently, the Open Group, a consortium of over 300 academics, practitioners and suppliers, have developed TOGAF, The Open Group Architectural Framework, using the principles of open source collaboration: the core material is freely available on the internet for use by practitioners, although there are commercial restrictions on trade-marking and training. The first enterprise edition of TOGAF was released in 2002, and as a result of contributions from the Open Group's large body of practitioners, has grown since and evolved from a collection of practices into a step-by-step method – the Architecture Development Method (ADM) – on how to build, maintain, and implement an enterprise architecture.

While TOGAF appears to be growing in popularity among practitioners, very little evidence or academic work has been published. Of the few articles we could locate: Dietz et

al. (2011) and Zadeh et al. (2012) discuss the need for a theoretical underpinning of TOGAF; Buckl et al. (2009) propose the use of Enterprise Architecture Management Patterns to tailor what they see as the 'highly generic' TOGAF to specific practitioners' needs; and Chaczko et al. (2010) give a narrative account of the creation of a middleware integration model in the health sector using TOGAF.

None of these articles contains much empirical work, and we could not locate any empirical evidence that has been published as to TOGAF's actual adoption and benefits, perceived or otherwise, in practice. In fact, as already noted in the introduction, empirical evidence around EA in general remains very sparse, with few notable exceptions in the case study work of Schelp et al. (Winter & Schelp, 2008; Schelp & Ariel, 2009), and Schöenherr (2009), in his survey of the many published articles which refer to EA, concludes that they resemble 'a horrible mess,' with no common understanding of the term, no core topic or underlying theory and most approaches still exhibiting a low level of maturity; the paucity of best practice and empirical evidence is also noted.

3. SURVEY

With the aim of collecting empirical evidence, we conducted a small scale survey in the context of the Corporate IT Forum (<http://www.corporateitforum.com>), a UK based "independent organisation that brings together practitioners from large, well-established businesses to share and document their unique insights and experiences into Enterprise IT problems and solutions." The Forum is a wide practitioner network with more than 320 organisations as members, including some of the largest IT user organisations in the UK, many with international operations. It runs regular 'Reality Checkers,' monthly series of online questionnaires on topical subjects of relevance to the IT user community, with results made available to the Forum's members at the end of each month. Our survey was proposed as the Forum's Reality Checker in October 2010.

The survey was hosted on the Forum's website and advertised to all Corporate IT Forum members, regardless of job discipline through their monthly membership email, which has a reach of about 30,000 members. In addition, e-mails with links to the survey were sent to employees in the Forum's member companies who had registered an interest in Enterprise Architecture in their online membership profiles. The survey was also referenced in communication with the Forum's wider membership population, such as newsletters. Therefore, although theoretically any of the 30,000 members would have been able to answer the survey, a particular effort was made to target those who had self-expressed an interest in EA on their profile information.

Among other things, the survey questions were designed to gather some evidence as to:

- The perceived benefits of EA in practice;
- The extent of use and adaptation of TOGAF and other EA frameworks in practice, and relative to the adoption of other IT Governance frameworks;
- The involvement of key stakeholders within the EA function, these been widely regarded as a key success factor in IT Governance in general.

The full list of survey questions can be found in Clarke (2011). Data collected were mainly qualitative, through the use of Likert scales; free text comments were also invited.

4. DATA ANALYSIS

There were thirty-eight responses to the survey from twenty-five separate organisations (listed in Appendix A) spanning both public and private sectors and across a number of domains from finance, transport, retail, publishing to engineering. Responses to all questions can be found in Clarke (2011). In this section, we summarise the results pertaining to the key issues listed above.

4.1. Benefits of EA

In this part of the survey, the focus was on claimed benefits of specific EA initiatives and functions, as stated in the literature, including: improved IT Governance (e.g. Architecture board), improved working relationship between business and IT, increased IT agility, more effective introduction of new architectures (e.g. SOA), reduced complexity of IT architecture, and simplified infrastructure.

The aim of the question was to ascertain to which extent such benefits were experienced in practice by the surveyed participants. A four-point Likert scale was used in this question (Significant, Some, Little, None). Responses indicated that:

- 84% of respondents reported that EA provided at least some benefit on the overall IT Governance, with 35% reporting it had a significant impact;
- 84% of respondents also reported that EA had at least some benefit in improving the working relationship between business and IT, with nearly 50% reporting it had a significant impact;
- Respondents also reported some impact on the introduction of new architectures (35%), reducing complexity (61%), and simplifying infrastructure (48%);
- In free text comments, opinions from the whole the spectrum were expressed, including one respondent stating that EA was the focus of IT strategy alignment, and another reporting that EA was seen as a failed experiment in the company.

4.2. Benefits to Organisation

In this part of the survey, the focus was on claimed beneficial effects of EA to the wider organisation, including: enabling the deployment of new business strategy or the re-engineering business, reduced overall IT costs, increased IT's added value, more effective purchasing practices, improved offshoring/outsourcing

relationships, improved management information, enabled more effective regulatory compliance, and improved risk management.

As for the previous question, the aim was to ascertain to which extent such benefits were experienced in practice by the surveyed participants. A four-point Likert scale was used in this question too (Significant, Some, Little, None). Responses indicated that:

- The top three benefits (when Significant and Some responses were combined) were: increasing IT's added value (83%); enabling new business strategy or re-engineering (73%); reducing overall IT costs (70%);
- 57% respondents believed that EA has some benefits in enabling better risk management, while 27% thought it had little effect, and only 7% thought had a significant impact;
- The factors where the majority of respondents believed EA had little effect were: more effective purchasing practices and improving offshoring/outsourcing relationships;
- In free text comments one respondent indicated that EA had a beneficial effect on "Shaping projects so that they better fit longer term requirements rather than immediate imperatives;"
- From the free text comments it also emerged that while the role of Enterprise Architect was common, a separate EA function was less so, with organisations not having that specific function or only in the process of introducing one.

4.3. EA Frameworks Adoption

In this part of the survey, the focus was on gaining an understanding of EA frameworks adoption, with a four-point Likert scale measuring the level of successful application. The survey also considered the combination of EA frameworks with other IT Governance frameworks or standards adopted by the organisation. A list of

main frameworks and standards was provided to participants, who could also add others not included in the list. A four-point Likert scale was used to characterise the level of adoption. Responses indicated:

- There was widespread experience of TOGAF: 27% of respondents were using TOGAF successfully, and 46% had used it in the past. Only 27% of the respondents said they had not used TOGAF at all;
- Comparably to TOGAF adoption, ad-hoc developed in-house approaches had been successfully used by 31% of the respondents, and 31% of them had used them in the past. From the free text comments it emerged that some of those approaches did include some elements of TOGAF, in combination with elements of other frameworks or ad-hoc organisational practices;
- The Zachman Framework was not currently used by the respondents, but had been used in the past by 40% of them;
- Largely (62%) there was some adaptation of any framework adopted: from the free text comments, it emerged that most organisations were taking a pragmatic approach, adopting elements of frameworks and standards in a pick-and-mix fashion and tailoring them to the needs of their organisation. One respondent stated that TOGAF was only used because there was nothing better around;
- Combined with EA frameworks, the only other IT Governance framework that had significant (i.e., widespread or mandatory) use was ITIL (57%), while CoBIT was used significantly only by 16% of the respondents. PRINCE2 was used by most respondents – with 60% reporting significant use, and BS ISO/IEC 27001 was used by many – with 42% reporting significant use. There was little knowledge of BS ISO/IEC 38500 – only 16% respondents had used it at all.

4.4. Stakeholders

As discussed previously, IT Governance emphasises stakeholder involvement as a key success factor. Hence, this part of the survey aimed to ascertain stakeholder participation in EA practice. A list of fourteen stakeholder roles (informed by TOGAF recommendations) across the organisation, from business to technical, were provided to participants, who were asked to estimate how frequently the EA function interacted with each of them on a five-point Likert scale.

Responses indicated:

- The stakeholders with most frequent interaction, with over half respondents reporting it as Very frequently, were Enterprise Architects and Solution Architects, followed by CIO/IT Director and IT Project Management;
- Less frequent but still substantial interaction was reported with some stakeholders outside the IT organisation. When Very frequently and Often responses are combined, a significant level of interaction includes Senior Business Management (65%) and Business End Users (70%). 30% of respondents reported interacting often with Board Members although a similar level of interaction with the CEO was rare (10% when Very frequent and Often responses are combined).

5. DISCUSSION

5.1. Results

The survey results confirmed that, by and large, practitioners perceived a number of benefits of EA. Among all claimed benefits, the EA scored the highest impact on: IT Governance structures, improving working relationship between business and IT, enabling new business strategy or re-engineering, reducing overall IT costs and increasing IT value. It is notable that these are

all generic benefits claimed of IT Governance. In term of risk management, although some beneficial effects of EA were recognised, their impact was not seen as particularly significant.

On the other hand, and perhaps surprisingly, EA appeared to have a lesser impact on the introduction of new technical architectures, or in simplifying and reducing complexity of infrastructure. In other words, EA appears to have a greater effect on business-IT alignment, and a lesser one on technological choices. This seems to indicate that, in practice, the relation between EA and technology is weaker than, for instance, what has been portrayed for EA and SOA (Schelp & Ariel, 2009).

There was also a sense that EA is still immature in organisations, despite the notion having being around for a couple of decades, with many only just starting to implement a separate EA function. This confirms similar observations by Schönheerr (2009). (This is also supported by the number of respondents claiming to have experimented with frameworks that were not actively used for governance purposes).

In terms of framework adoption, the survey results indicate that TOGAF is the most widely known and used framework, only rivalled by ad-hoc, in-house approaches. The Zachman Framework appears to have been significant historically, but its adoption seems to have declined. Significantly, only certain parts of TOGAF were often adopted by the surveyed organisations and much adaptation was going on, which seems to point to a lack of maturity of the existing framework and some level of dissonance from the needs of practice. More striking yet, the rate of successful use was only 27% for TOGAF and 31% for ad-hoc, in house approaches.

EA frameworks were commonly applied in organisations in combination with other IT Governance frameworks, primarily ITIL, PRINCE2 and BS ISO/IEC 27001. This bears the question as to whether it is actually sensible or possible to single out the impact and benefits deriving from one specific framework application out of the combined effect of applying them all within an organisation.

Finally, the survey results indicated that in EA functions projects interaction was most common with stakeholders within the IT department, as well as with business specialist stakeholders, while access to strategic business stakeholders (e.g., CEO, board members) was reported as being much less frequent. As board-level buy-in and involvement is cited as a critical success factor and recommended by most framework and standards, this bears the question of how problematic it is in practice to consult regularly with all key stakeholders.

5.2. Threats to Validity

The survey was made available to the members of an IT professional network, the Corporate IT Forum, regardless of job discipline, although members who had registered an interest in EA in their profile information were explicitly targeted by e-mail. The Corporate IT Forum draws its membership from organisations with more traditional corporate IT departments or which are more likely to follow methodological processes, such as TOGAF. The survey was completed by a self-selecting sample of those practitioners and it is possible that there could be an inbuilt bias in the sample of the population that responded. In particular, although there was no intention to target EA practitioners exclusively, it is likely that only respondents with an interest in EA would have chosen to participate. It is also quite possible that EA sceptics could have contributed their views.

Moreover, although the response level was good for a survey of this kind, the sample size is relatively small. However, looking at the spread of the respondents' organisations, key UK players are well represented across a wide variety of industries, hence providing some level of confidence that the data collected paint a realistic snapshot of UK EA practice.

6. CONCLUSION AND FUTURE WORK

The work in this paper provides some evidence from practice in the area of EA in general, and

the adoption of specific EA frameworks in particular.

Empirical data from this study seems to confirm claimed benefits of EA as to improving governance structures, working relationships between business and IT, enabling new business strategy or re-engineering, reducing overall IT costs and increasing IT value. However, a key insight from the survey is that, in practice, EA appears to have a greater effect on business-IT alignment than on technological choices. This seems to contradict some of the claims in the literature and indicate that in current practice the relation between EA and technological choices remains weak. It would be interesting to investigate the root causes of such a disconnect. For instance, we may speculate that legacy technological practices and infrastructures within an organisation might prevent EA from having a transformative effect, when compared for instance to more modern SOA-based systems. It may also be possible that technology suppliers with vested interests in maintaining vendor lock-in to a product set have worked outside the influence of weak IT governance structures. A much more in-depth study of organisations would be required to address this issue than the small scale survey discussed in this paper, and this remains the subject of future work.

The survey data confirms Schöenherr's opinion (Schöenherr, 2009) that despite two decades of EA effort, its adoption in practice is still patchy and that current frameworks and approaches remains immature and often inadequate, leading organisations to take more pragmatic and ad-hoc approaches to EA, although respondents appear generally supportive of EA's worth. In particular, the data indicate that ad-hoc, in-house approaches remain widespread and that TOGAF is the most widely known and adopted EA framework, although this is often adapted to suit the needs of the organisation. It would be interesting to track whether increased standardisation of EA methods will be witnessed in the future.

Despite an acknowledged improved working relationship between business and IT as a result of EA practices, the survey results indicate

that interactions remain confined primarily to IT and business specialist stakeholders, with only limited access to strategic business stakeholders. Given the critical IT Governance role of these stakeholders it might be time to rethink stakeholder participations in EA initiatives and functions, to ensure that what is recommended in theory is also effective and practically feasible.

Finally, while the results start to paint a picture of current EA practice in large UK organisations, more and much larger scale studies are required to build a much more comprehensive picture. Such studies should look beyond qualitative data, which may be subject of bias, and introduce and apply more objective quantitative measures. This is, however, not a trivial task, both because of the intrinsic complexity of what needs to be measured and because of possible resistance in organisations to disclose potentially commercially sensitive information.

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APPENDIX

Respondents' Organisations

- Aviva Plc
- BAE Systems Plc
- Balfour Beatty plc
- Cambridge Assessment
- Centrica plc
- European Bank for Reconstruction and Development
- Friends Provident
- GlaxoSmithKline plc
- HM Land Registry
- HM Revenue and Customs
- J D Williams And Co Ltd.
- John Lewis Partnership
- Leicestershire County Council
- National Grid
- National Policing Improvement Agency
- Network Rail
- Office for National Statistics
- Ordnance Survey
- Reed Elsevier Technology Services
- SABIC UK Petrochemicals Limited
- Severn Trent Water
- Syngenta Crop Protection AG
- TUI Travel plc
- Virgin Atlantic Airways Limited