EVALUATING AND REFINING THE 'ENTERPRISE ARCHITECTURE AS STRATEGY' APPROACH AND ARTEFACTS

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ABSTRACT

Enterprise Architecture (EA) is a new discipline that has emerged from the need to create a holistic view of an enterprise, and thereby to discover business/IT integration and alignment opportunities across enterprise structures. Previous EA value propositions that merely focus on IT cost reductions will no longer convince management to invest in EA. Today, EA should enable business strategy in the organisation to create value. This resides in the ability to do enterprise optimisation through process standardisation and integration. In order to do this, a new approach is required to integrate EA into the strategy planning process of the organisation.

This article explores the use of three key artefacts – operating models, core diagrams, and an operating maturity assessment as defined by Ross, Weill & Robertson [1] – as the basis of this new approach. Action research is applied to a research group to obtain qualitative feedback on the practicality of the artefacts.

OPSOMMING

Ondernemingsargitektuur (OA) is 'n nuwe dissipline wat ontstaan het uit die behoefte om 'n holistiese perspektief van 'n onderneming te skep om sodoende besigheid/IT-integrasie en -belyningsgeleenthede regoor ondernemingstrukture te ontdek. Vorige OA waarde-aanbiedings wat hoofsaaklik gefokus het op IT kostebesparings sal bestuur nie meer kan oorreed om in OA te belê nie. Vandag behoort OA bevoegdheid te gee aan onderneming-strategie om werklik waarde te skep. Hierdie bevoegdheid lê gesetel in ondernemingso-ptimering deur middel van prosesstandaardisasie en -integrasie. 'n Nuwe benadering word benodig ten einde OA te integreer met die strategiese beplanningsproses van die organisasie.

Hierdie artikel ondersoek die gebruik van drie artefakte – operasionele modelle, kerndiagramme, en operasionele volwassenheidsassessering soos gedefinieer deur Ross, Weill & Robertson [1] – as die basis van hierdie nuwe benadering. Aksienavorsing word toegepas op 'n navorsingsgroep ten einde kwalitatiewe terugvoer te kry oor die praktiese sin van die artefakte.

1. INTRODUCTION

Contrary to the information technology and cost reduction foci of previous EA endeavours, this research is used to emphasise a new value-creation focus that includes business architecture and enables business strategy. In support of this new focus, Ross et al. [1] defined a new EA approach that incorporates EA decision-making as part of the strategic decision-making processes of an organisation. Action research is used to gain qualitative feedback on the perceived practicality of two key artefacts that are used to underpin this new approach.

2. ENTERPRISE ARCHITECTURE DEFINED

The first traces of EA were found in the publication of Zachman [2]. Zachman [3] defined EA as follows: "Descriptive representations (i.e. models) that are relevant for describing an enterprise such that it can be produced to management's requirements (quality) and maintained over the period of its useful life (change)." Zachman introduced the Zachman framework, which consists of various models that are used to define and communicate six characteristics/abstractions (What, How, Where, Who, When, and Why) for five different viewpoints/perspectives (Planner, Owner, Designer, Builder, and Sub-contractor) (Zachman [3]). The Zachman framework "is a *tool* for *managing* and *communicating* the vast amount of information needed to make broad *decisions*, those that enable the organisation to be competitive" (O'Rourke, Fishman & Selkow [4]).

Numerous EA definitions were formulated following the inception of the Zachman framework. These definitions addressed the following elements with different emphases:

- Providing a *systems view* – i.e. describing systems, their components (e.g. people, processes, information, and technology), their interaction, and interrelationships. This includes the use of decomposition strategies to ensure *holistic solutions* in terms of solution components (TOGAF [5]; Theuerkorn [6]; Gartner in Lapkin [7]; Handler [8]).
- Providing a *blueprint for directing* the company in terms of required high-level processes and IT capabilities (Ross et al. [1]; Gartner in Lapkin [7]; Boar [9]).
- Defining a *process / master plan* to explore and model the current realities and the envisioned future state, and enable its evolution (Gartner in Lapkin [7]; Bernard [10]; Schekkerman [11]).
- Defining *principles that govern* the design and evolution of systems (TOGAF [5]; Theuerkorn [6]; Gartner in Lapkin [7]; Wagter, van den Berg, Luiijpers & van Steenberg [12]).
- Using *tools, processes and governance structures* to implement enterprise-consistent IT architectures (Kaisler, Armour & Vallivullah [13]; Gartner in Lapkin [7]; Schekkerman [11]).

3. ENTERPRISE ARCHITECTURE – CREATING GOVERNANCE ON A STRATEGIC LEVEL

EA initially aimed at modelling / describing the architecture components associated with *information technology*. EA value was limited to direct improvements in the performance of IT itself (lowering overall costs from IT). This approach demonstrated some form of return on investment (ROI) – i.e. accelerating project start-up and decreasing investment in staff, consulting, training, and tools.

Today, EA has broadened from enterprise-wide IT architecture (EWITA) to include business architecture (BA); that is, EA = BA + EWITA (Malan & Bredemeyer [14]; Bernard [10]; Ross et al. [1]). The focus is on optimisation "*across boundaries to achieve system goals*" and the "*translation of strategy into implementation*" (Malan & Bredemeyer [14]). The change in focus is closely related to the restricted contribution of previous EA value propositions. EA practitioners realised that EA could show more significant value when used to improve business performance, and with IT used to support the *execution of strategy* (Rosser [15]; Lapkin [16]).

Ross et al. [1] took one step further. They believe that EA is not only about supporting the *execution* of strategy, but should be used as a blueprint for *directing* strategy.

Figure **1** compares the previous value creation approaches with the new value creation approach of Ross et al.[1] – 'EA as Strategy'.

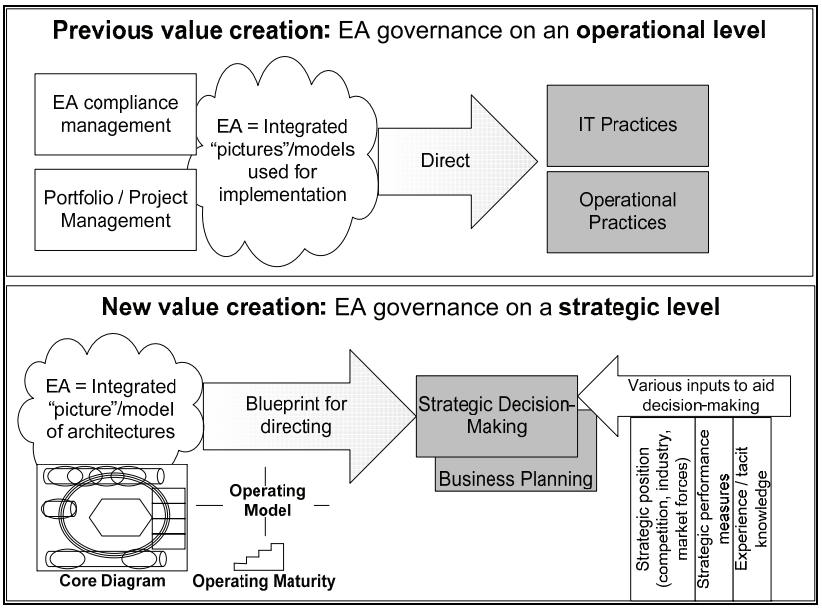

Figure 1: Different EA value creation approaches

EA should provide a directional blueprint to ensure that companies build a foundation for execution – i.e. they use their IT infrastructure and digitised business processes to automate the company's core capabilities. The rationale is that routine processes are digitised to provide reliability and predictability in business-critical processes. Once these processes have been digitised, management can shift their attention from fighting fires on lower-value activities to strategic issues. Ross et al. [1] recommend eight steps in creating a 'foundation for execution'. During the first three steps, three key artefacts are defined, which should be used in combination to establish EA objectives. The key artefacts are now discussed briefly.

3.1 Operating models

Ross et al. [1] suggest that organisations should decide on an operating model for the entire organisation on which to build a foundation for execution. The selected operating model provides a "stable and actionable view of the company" (Ross et al. [1]) and is used to shape future strategic choices.

An *operating model* is "the necessary level of business process integration and standardisation for delivering goods and services to customers" (Ross et al. [1]). The operating model is a "choice about what strategies are going to be supported", "a commitment to a way of doing business" (Ross et al. [1]). Although each operating model encapsulates numerous characteristics, two key dimensions are used to define four operating models (see Figure 2).

- *Business process standardisation,* defining how the processes will be executed regardless of the responsible entity or place of execution.
- *Business process integration*, connecting the efforts of organisational units through linked processes and shared data.

3.2 Core diagrams

While the operating model defines the process standardisation / integration requirements of the company, the core diagram is used to translate these requirements into the necessary organising logic for business processes and IT infrastructure. The core diagram should be used to:

- *Facilitate discussions* between business and IT managers to clarify requirements for the company's foundation for execution, and
- *Communicate the vision* (high-level business process and IT requirements of a company's operating model).

A core diagram contains four main components: (1) core business processes – the stable set of enterprise processes required to execute its operating model and respond to market opportunities; (2) shared data driving the core processes – e.g. customer data shared across product lines or business units of a company; (3) key linking and automation technologies – technologies that enable integration of applications (middleware) to shared data, major software packages such as ERP systems, portals providing standardised access to systems and data, and electronic interfaces to key stakeholder groups; and (4) key customers – major customer groups served by the foundation for execution (Ross et al. [1]). The template for a unification operating model is given in Figure 3.

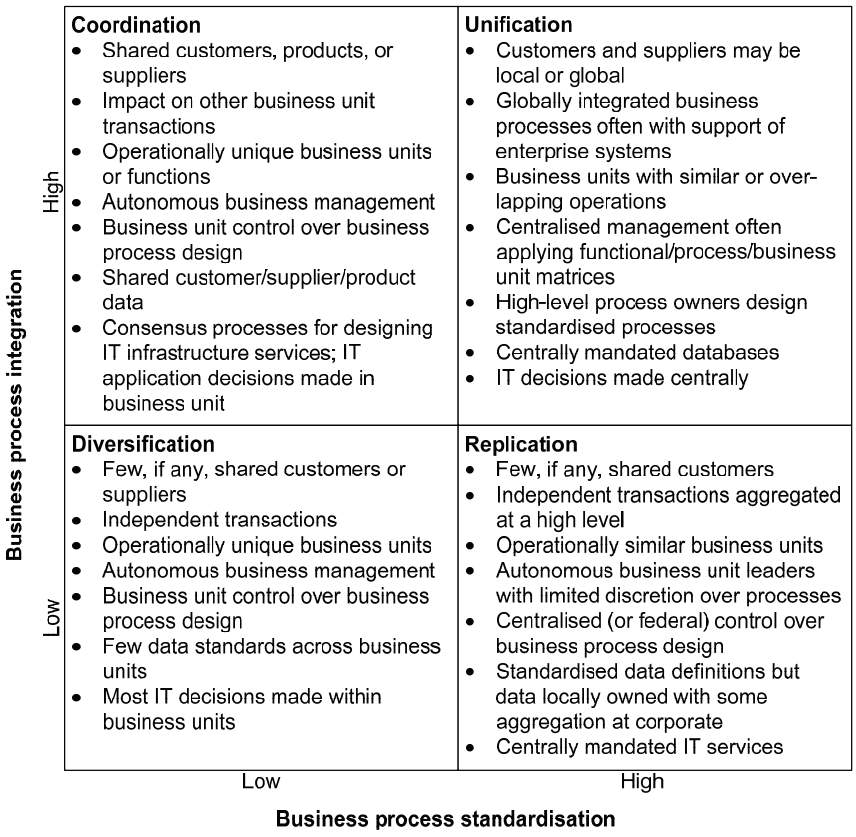

Figure 2: Characteristics of four operating models (Ross et al. [1:29])

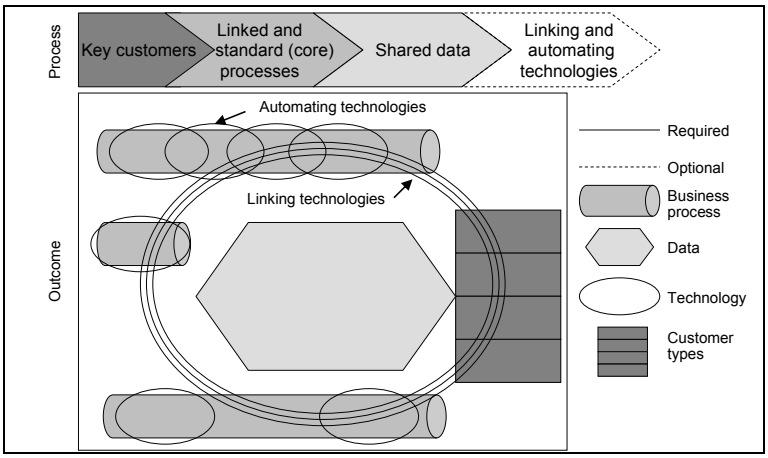

Figure 3: Core diagram template for a unification operating model (Ross et al. [1:54])

3.3 Operating maturity assessment

Ross et al. [1] also defined four operating maturity levels. In terms of IT management, each level requires different business objectives, IT capabilities, IT funding priorities, and management capabilities. Usually immature organisations will start with a focus on IT efficiency / cost reduction. For instance, research performed by Gartner (Kreizman, Knox & James [17]) indicated that research respondents still ranked IT cost reduction as the most important driver for justifying EA investments. This merely reflected their current operating maturity (stage 1 or 2 according to Figure 4 and its associated cost reduction business objectives. The IT cost-focus of the respondents also correlated with the comparatively low number of business architects (compared with other full-time equivalent architects) employed by the organisation (Kreizman et al. [17]). As organisations mature, business operational efficiency and strategic agility become more important (see Figure 4, stages 3 and 4).

The operating model should be used in combination with the current operating maturity of the organisation to identify realistic EA objectives. If an organisation is, for example, at the first stage of operating maturity, the organisation needs to standardise all technology infrastructure (elevating to stage two) irrespective of the operating model of the organisation. However, elevating from stage two (standardised technology) to stage three (optimised core) requires that the organisation define process standardisation and integration objectives according to the required operating model.

4. ENTERPRISE ARCHITECTURE AND STRATEGIC MANAGEMENT

Ross et al. [1] believe that the key artefacts that were discussed in the previous sections could be used to direct the strategic decision-making processes and to shape future strategic choices. Strategic decision-making is, according to Johnson, Scholes & Whittington [18]), one of three components of strategic management. The three components consist of (1) defining the strategic position (e.g. current strategic capability, the environment, expectations and purposes); (2) defining *strategic choices* (e.g. corporate-level / international decisions, business level decisions); and (3) defining strategy execution (e.g. organising, enabling, and managing strategic change). One would require inputs from two of these components (strategic position and previous strategic choices) to define the three key artefacts. The modelled artefacts should then be used in combination to influence the direction of future strategic choices and the subsequent strategic objectives. The set of strategic objectives may then be converted to strategic initiatives / projects with various strategic conversion mechanisms, such as those defined by Kaplan & Norton [19, 20, and 21]

(balanced scorecards, strategic themes, and strategy maps). The conceptual process is delineated in Figure 5.

	Stage 1: Business Silos	Stage 2: Standardised Technology	Stage 3: Optimised Core	Stage 4: Business Modularity
Business Objectives	ROI of local business initiatives	Reduced IT costs	Cost and quality of business operations	Speed to market; strategic agility
IT Capabilities	Local IT applications	Shared technical platforms	Companywide standardised processes or data	Plug-and-play business process modules
Funding Priorities	Individual applications	Shared infrastructure services	Enterprise Applications	Reusable business process components
Management Capabilities	Technology-enabled change management	Design and update of standards; funding shared services	Core enterprise process definition and measurement	Management of reusable business processes

Figure 4: Learning requirements of the architecture stages (adapted from Ross et al. [1:83])

5. RESEARCH PURPOSE AND DESIGN

5.1 Purpose

The purpose of this research was to receive feedback on the perceived practicality of defining the first two key artefacts – the operating model and the core diagram. Action research was used to receive qualitative feedback on the difficulties experienced in defining the current operating model and the core diagram for an organisation / sub-division.

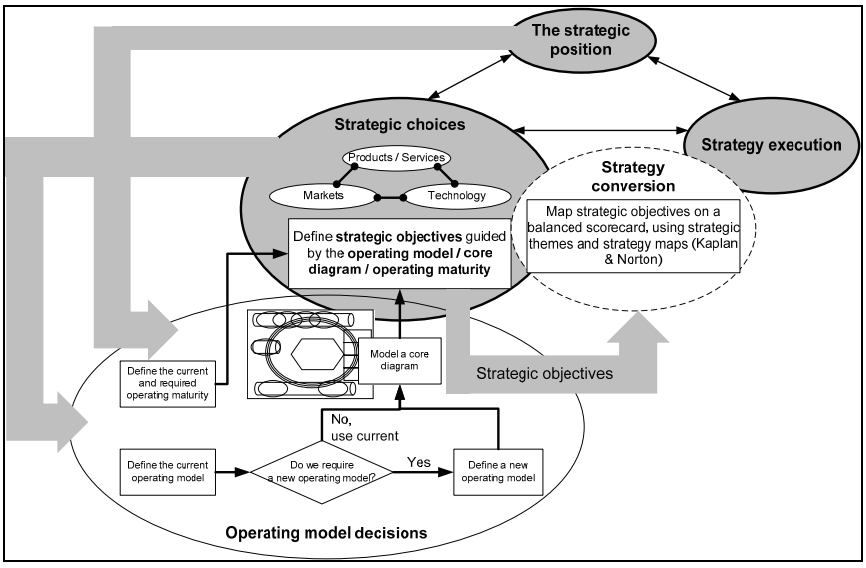

Figure 5: Key artefacts contextualised in terms of strategic management components

5.2 Research design

Action research was selected for qualitative research for the following reasons:

- The 'EA as strategy' approach of Ross et al. is still new (published in 2006). Research respondents needed to have a good understanding of EA in general and of the new 'EA as strategy' approach. The 'Business Architecture' post-graduate course was used as a vehicle to convey knowledge about EA and the 'EA as strategy' approach, techniques, and artefacts to students, who were then used as respondents.
- The action research process provided the opportunity to assess the students' understanding of the course content, and guide them towards the correct use of the 'EA as strategy' approach, techniques, and artefacts.

The action research process that was followed is based on the work of specialists (referred to by Hodgkinson and Maree [22]):

- *Planning* – A literature study was conducted in the field of EA to design the course content and assessment mechanisms. Special emphasis was placed on strategic management, the 'EA as strategy' approach, techniques and artefacts, the business architecture domain, and the development of an EA plan.
- *Implementation* – Live presentations from the course presenter and industry speakers, course notes, and literature references were used to convey the course content to students. Students then had the opportunity to work individually or in pairs and to select an organisation in which to implement some of the techniques presented in the course. An interim project report was submitted for assessment. Students also wrote a semester test to assess their understanding of EA principles and of the 'EA as strategy' approach, techniques, and artefacts defined by Ross et al. [1].
- *Observation* – The course presenter observed/assessed the students' understanding of the course content. Feedback was given to the students in the light of their semester test and interim project report. Students now had the opportunity to improve/update their project reports and submit a final project report. Based on the final report, they had to submit a completed survey.
- *Evaluation* – The final reports were assessed and surveys were analysed. Analysis of qualitative survey feedback gave new insight into the practicality of two key artefacts (operating models and core diagrams). New insights were used to define suggested improvements, recommendations, and an agenda for further research.

The survey consisted of twenty-eight questions. Some of the questions were taken from the on-line survey used by the Institute for Enterprise Architecture Developments (IFEAD) (Schekkerman [23]). Categorisation of business activities was taken from the *Oracle Magazine* subscription form (*Oracle Magazine* [24]). Questions were categorised according to parameters that could have a significant influence on the perceived practicality of defining the two key artefacts – the operating model and the core diagram (see Figure 6).

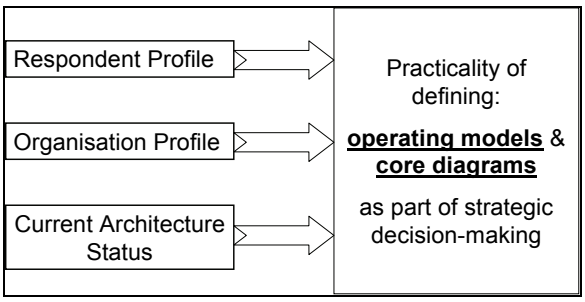

Figure 6: Parameters that influence the practicality of defining two key artefacts

6. RESULTS

Thirty post-graduate students took part in the final assessment mechanism. As students had the opportunity to work in pairs, a total of twenty-one final project reports and completed surveys was submitted.

6.1 Student profile

Figure 7 indicates that fifty-two percent (52%) of the students had previously obtained an engineering degree, thirty-two percent (32%) a technical diploma, twelve percent (12%) a Bachelor of Science (BSc) degree, and four percent (4%) a Bachelor of Commerce (BCom) degree. Tertiary qualifications also correlated with the working positions of the students. Most of the students held positions that were related to business process planning and improvement. Questions regarding prior knowledge about information systems indicated that sixty-seven percent (67%) of the students had previously enrolled for information system-related courses, while thirty-eight percent (38%) indicated work-exposure in the field of information systems.

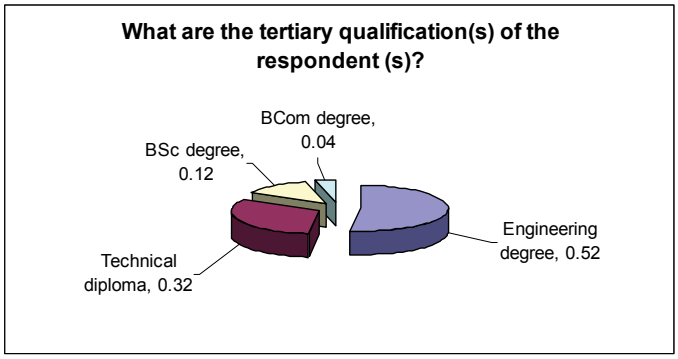

Figure 7: Tertiary qualifications of the students

Finally, students had to indicate the main reason(s) for course enrolment. Students could provide additional reasons if the standard categories were not sufficient. Most of the students (19 out of 21) selected the course as part of their Honours studies. They also showed significant interest in the management / improvement of business processes (18 out of 21) and organisational management / governance (12 out of 21).

6.2 Organisation profile

Most of the companies that were used for analysis purposes by the students employed fewer than 10,000 employees (see Table 1).

Number of people working in the organisation	Number of companies
96 000	1
33 000	1
10 000 - 24 999	2
100 - 9 999	12
1 - 99	5

Table 1: Size of the entire company

The 21 analysed companies were involved in a wide spread of 19 different business activities. Note that a company could be involved in multiple business activities. These included automotive manufacturing (5 out of 21), the consumer sector (4 out of 21), high-

technology manufacturing OEM (3 out of 21), industrial manufacturing (3 out of 21), professional services (3 out of 21), research (3 out of 21),other business services (5 out of 21) and 12 remaining business activities (17 companies out of 21). None of the analysed companies was in the financial/insurance services industry. According to Matthee, Tobin & Van der Merwe [25], the financial sectors usually invest in EA endeavours owing to their high dependency on IT.

6.3 Current architecture status

Figure 8 indicates that a large number of companies (9 out of 21) managed their divisions in silos. A significant number had progressed to the level of standardised technology (7 out of 21) and optimised core (5 out of 21). None of the companies operated according to a modular business design. According to Table 2, business architecture was well-established at 11 out of 21 companies. The perceived level of business architecture activity may also be explained by the process inclination of the students.

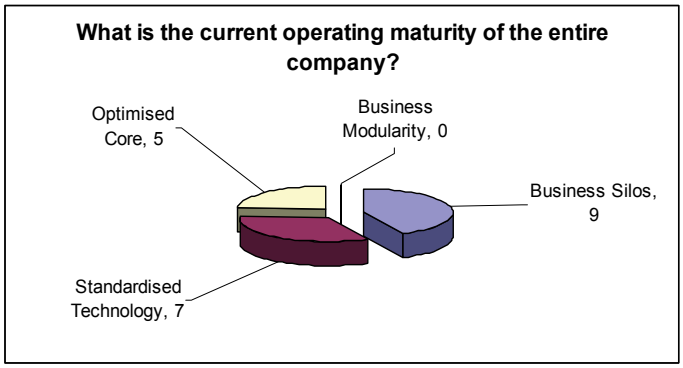

Figure 8: Operating maturity of the companies

Architecture Levels	Number of companies
Business Architecture	11
Information-System Architecture (Applications Architecture)	7
Enterprise Architecture	6
Security Architecture	6
Information Architecture	5
Technology Infrastructure Architecture	5
Governance Architecture	3
Software Architecture	3

Table 2: Established architectural levels

EA governance activities were performed at thirty-eight percent (38%) of the analysed companies. Students believed that a company should invest in EA governance owing to its decision-making support (7 out of 21), system development support (6 out of 21), and delivery of insight and overview of business & IT (5 out of 21).

Only four students indicated the use of architecture modelling technology that includes a repository. Tools include ARIS, Casewise, and Systems Architect. According to Figure 9, eight companies (38%) did not use a framework.

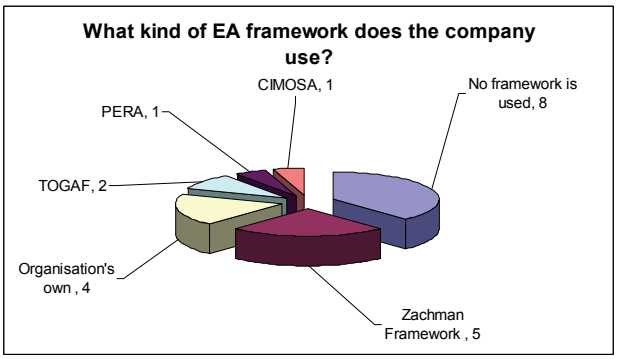

Figure 9: Enterprise architecture frameworks in use

6.4 The perceived practicality of operating models and core diagrams

6.4.1 The analysis level for defining an operating model

Students preferred to apply the 'EA as strategy' approach on a business unit level (17 out of 21) rather than a corporate level (4 out of 21). The different types of operating models were well-represented: diversification (7 out of 21), unification (6 out of 21), replication (5 out of 21), and coordination (3 out of 21).

6.4.2 Difficulties in defining the current operating model

Students indicated their difficulty in deciding on one specific operating model (14 out of 19). A few students (4 out of 19) indicated minimal difficulty in identifying the operating model. Qualitative feedback was tagged according to emerging themes:

- Difficulty was experienced in deciding on a single operating model (8 out of 14 who experienced difficulty). Students had difficulty in establishing the degree of process standardisation / integration that would be required to classify an organisation according to a specific model. Companies (especially on a corporate analysis level) exhibited behaviours of multiple operating models.
- Students (5 out of 14 who experienced difficulty) conveyed their difficulty in finding the correct information to perform a classification. This was also attributed to the limited knowledge and awareness of EA in the company.
- Some difficulty (1 out of 14 who experienced difficulty) occurred in defining an operating model on a business unit level due to fuzzy boundaries between the corporate level and business unit level.

6.4.3 Difficulties in compiling a core diagram

Qualitative feedback was tagged according to emerging themes:

- Half the students (10 out of 20) experienced difficulty in selecting the main components of the core diagram. These students had trouble in identifying the shared technologies (4 out of 10 who experienced difficulty), shared data (3 out of 10), shared processes (3 out of 10), and the key customers (1 out of 10). The problematic identification of shared technologies may be attributed to the student profile / limited exposure to technology infrastructure.
- Some students (6 out of 20) had difficulty in understanding the generic core diagram templates provided by Ross et al. [1] or relating the diagram components to their company. They also questioned the validity of their own core diagram designs.
- Another concern was the availability and/or the consolidation of available information (4 out of 20 students).

7. SUMMARY AND INTERPRETATION OF RESULTS

It was found that most of the students had an engineering background, held positions related to business process planning and improvement, and showed significant interest in the management / improvement of business processes and organisational management / governance. Students also had sufficient knowledge of information systems.

Concerning the organisation profile, most of the companies that were used for analysis purposes employed fewer than 10 000 employees, and were involved in a large number of business activities *excluding* the financial sector. Results further indicated a relatively low level of operating maturity – most of the analysed companies displayed business silo behaviour, while none of the companies operated according to a modular business design. The study indicated that business architecture was well established at the analysed companies. Use of architecture modelling technology was limited.

The perceived practicality of the operating model and core diagram artefacts could not be evaluated on a corporate level, as most of the students defined operating models at a business unit level. According to Ross et al. [1], this should not be a hurdle in validating the artefacts *per se*, as operating models and core diagrams may be defined at various levels of the organisation. The interpretation of the various difficulties experienced follows:

- Difficulty in selecting a single operating model is linked to the identification of the degree of process standardisation / integration for the analysed organisation / business unit. Extensive implicit/explicit knowledge is implied during the evaluation of the operating model characteristics that define the degree of process standardisation / integration.
- Students had difficulty in finding the correct information to perform an operating model classification or select core diagram components. Identification of operating model characteristics and core diagram components requires knowledge about the strategic choices (markets, products/services), operating/organising logic, business processes, and main databases and technologies of the organisation. Some baseline architectures are thus required, and this knowledge is not necessarily available or in an explicit format.
- Students experienced difficulty in selecting the main components of the core diagram and understanding the core diagram templates. This may be related to the limited set of examples provided in the textbook. Case studies would be required to demonstrate inputs that would be required (e.g. baseline architectures) to define the core diagram components.

8. CRITICAL EVALUATIONS AND INFERENCES

Based on the qualitative feedback received from the action research effort, the researcher revisited the main objectives of the operating model and core diagram:

- To aid the main stakeholders / users of these artefacts (business and IT managers) in guiding them during their strategic decision-making processes.
- To communicate architecture vision to other stakeholders (in terms of process standardisation / integration requirements).

If the main stakeholders are to use these artefacts to guide them during the strategic decision-making processes, the artefacts should be based on a more rigorous approach to attaining the artefact outputs. This will increase their validity and reliability. The researcher also believes that process standardisation / integration requirements should be based on a more scientific approach to define optimal standardisation / integration requirements for an organisation. Porter [26], for instance, believes that decisions regarding process standardisation / integration are complex and require detailed analysis based on the strategic intent of the organisation (e.g. cost leadership / differentiation / focus-driven for target segments). Cost leadership companies, for instance, would have to

assess the impact that process standardisation / integration could have on overall cost, while differentiation-focused companies need to assess if process standardisation / integration could increase the uniqueness of an activity or lower its cost of differentiation.

9. CONCLUSIONS

This study emphasised the limited value gained from EA when measured in terms of ROI due to cost reductions alone. Today EA practitioners realise that new value propositions emerge when EA is used to support the strategic direction of the organisation. This new focus was used to introduce a new approach towards EA value creation, called 'EA as strategy'. The approach incorporates EA planning as part of the strategic decision-making process using three key artefacts: operating models, core diagrams, and an operating maturity assessment.

Action research was used to assess the practicality of two key artefacts (operating model and core diagram), which highlighted some difficulties that were experienced and led to some critical evaluations and recommendations regarding the artefacts. It is believed that the operating model and core diagram could be useful in visualising the process standardisation / integration requirements of an organisation / sub-division. The artefacts should, however, be supported by a more scientific approach to their derivation, to increase their validity/reliability.

Further research has been initiated to perform a case study at an organisation. The case study incorporates processes to model baseline architectures, current strategic choices (markets, products/services), operating/organising logic, business processes, main databases, and technologies of the organisation. This will be followed by various analyses (e.g. value chain analyses) to identify process standardisation / integration opportunities. Current artefact designs (e.g. operating model and core diagram) may need to be adapted to convey the process standardisation / integration requirements to strategic decision-makers. The new artefact designs will be distributed to different strategic decision-makers to gain feedback about their usefulness during strategic decision-making.

10. ACKNOWLEDGEMENTS

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