



Enterprise Architecture Validation

***Achieving
Business-Aligned and Validated
Enterprise Architectures***

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***Revised Version
August, 2004***



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1 Purpose of this Paper

The purpose of this paper is to provide solutions and an approach for validating what constitutes best practices in the development of Enterprise Architectures, and reviewing the state of the practice. The paper provides clear criteria for assessing and validating enterprise architecture frameworks, approaches, and implementations. Its primary source of validation is the refined Maturity model for the implementation of Enterprise Architecture Activities¹ and practitioner experience in providing enterprise architectures to large commercial and governmental organizations, either as standalone activity, or as the driver of a business change effort.

This paper is written for experienced enterprise architects how recognises the problem of measuring the effects from Enterprise Architecture Programs and that are looking for solutions to build in measurement in their Enterprise Architecture approach.

¹ 'Maturity model for the implementation of Enterprise Architecture Activities', Schekkerman Jaap, IFEAD, 2003



2 Executive Summary and Value Proposition

Good is Good Enough

An Enterprise Architect knows he has achieved the perfect solution not when there is nothing left to add, but when there is nothing left to take away. [In analogy of Saint-Exupery²]

Recent Surveys of CEO's, CIO's and other executives provide some evidence of the growing importance of Enterprise Architecture over the last few years. In one of the most recent studies of the Institute For Enterprise Architecture Developments (IFEAD)³, Enterprise Architecture was ranked near the top of the list of most important issues considered by top management, CEO's and CIO's.

The various decisions related to business development and technology innovations need to be considered in a systemic manner within the Enterprise Architecture framework of various aspect architectures.

Choices of methods and techniques have to be made in the context of the goals and objectives and a program has to be established to achieve these goals & objectives.

So what's the problem? Many organizations have been paralysed by the complexity of the business & technology and the rate of change in business & technology. Organizations that have decided to pursue IT projects still show an unacceptably high failure rate: *IT project failures in industry and Government account for an astounding \$75 billion in losses each year, according to Gartner Inc⁴.*

Our great leap forward in business & technology driven productivity has created a plethora of overlapping and confusing solutions, products and standards that increase the complexity and risks associated with every decision a CEO and CIO makes.

Exaggerated claims by vendors and standards bodies promoting the latest panacea product or standard are mind numbing. It is extremely difficult to

² Antoine de Saint-Exupery; http://www.thinkexist.com/English/Author/x/Author_1147_3.htm

³ IFEAD, Enterprise Architecture Survey 2003, <http://www.enterprise-architecture.info>

⁴ Gartner Inc.; <http://www3.gartner.com/Init>



construct an Enterprise Architecture based framework that properly relates the vast array of overlapping solutions, products and standards, much less an enterprise framework that can be explained to financial decision-makers or the end user community.

All this puts Business & IT executives at a crossroads. There are tremendous rewards for organizations that are able to harness the vast array of available options into a holistic EA framework of flexible domains and supportive technology that meet the rapidly evolving needs of their stakeholder communities. Enterprise Architecture process and framework must effectively align business & IT resources and processes that they enable.

Both government and industry have recognized the role Enterprise Architecture plays in both operational and IT effectiveness.

Unfortunately, while most Enterprise Architecture frameworks and processes that are gaining currency are able to generate good descriptive architecture models, they do not create actionable, extended enterprise architectures that address today's rapidly evolving complex collaboration environments.

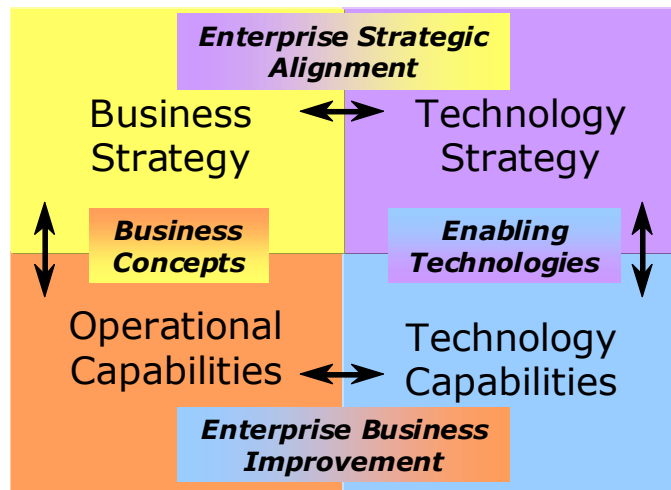
3 Enterprise Architecture, The holistic view

3.1 What is Enterprise Architecture?

Enterprise Architecture (EA) is a complete expression of the enterprise; a master plan which “acts as a collaboration force” between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organisation structures, tasks, activities and information; aspects of automation such as information systems and databases; and the enabling technological infrastructure of the business such as computers, operating systems and networks.

In a large modern enterprise, a rigorously defined EA framework is necessary to be able to capture a vision of the “entire enterprise” in all its dimensions and complexity.

Enterprise Architecture (EA) is a program supported by a framework and approach, which is able to coordinate the many facets that make up the fundamental essence of an enterprise at a holistic way.



3.2 Enterprise Architecture Definition

There are several definitions of Enterprise Architecture today. The definition of Enterprise Architecture used in the context of this paper is:

'Enterprise Architecture is about understanding all of the different elements that go to make up the enterprise and how those elements inter-relate'

The Open Group⁵

A good definition of "enterprise" in this context is any collection of organizations that has a common set of goals/principles and/or single bottom line. In that sense, an enterprise can be a whole corporation, a division of a corporation, a government organization, a single department,

⁵ The Open Group; <http://www.opengroup.org/>



or a network of geographically distant organizations linked together by common objectives.

A good definition of "elements" in this context is all the elements that enclose the areas of People, Processes, Business and Technology. In that sense, examples of elements are: strategies, business drivers, principles, stakeholders, units, locations, budgets, domains, functions, tasks, activities, services, information, communications, applications, systems, infrastructure, etc.

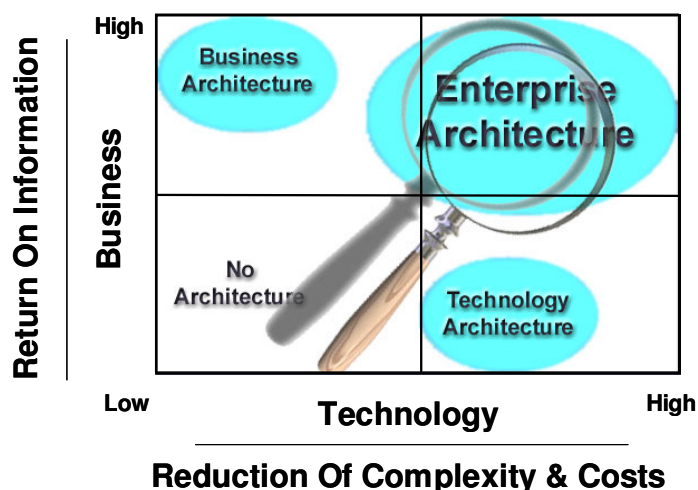
3.3 Enterprise Architecture Program

Enterprise Architecture provides a mechanism that enables communication about the essential elements and functioning of the enterprise.

It yields centralized, stable, and consistent information about the enterprise environment. In an insurance company, for example, an EA program would help executives pinpoint the companies more lucrative markets, understand how well the company's current resources are meeting customer needs in those locations, and determine what kind of systems might be needed to improve services.

The precise, high-quality information an EA program provides also make it much easier for the organization to respond to the forces of change and make better decisions. And finally, because an EA enables organizations to reduce duplication and inconsistencies in information, they can dramatically improve ROI for future IT implementations common architecture information and building a repository to store it.

Focusing on Enterprise Architecture is focusing added value to the business in terms of ROI [Return on Information] and at the same time streamlining the technology to reduce complexity and costs.

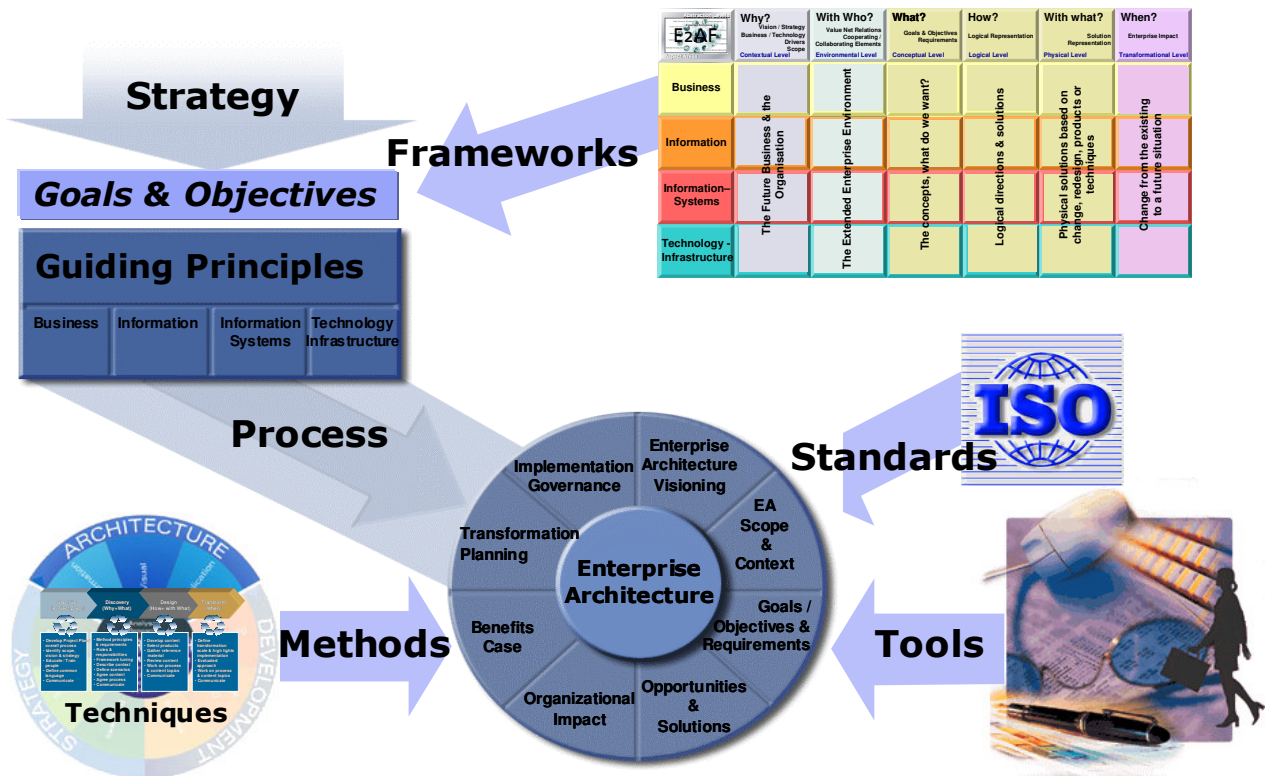




3.4 Enterprise Architecture Program View

This EA program view addresses at a holistic way the elements of strategy, frameworks, the overall EA process, methods & techniques, standards and tools.

Measurement techniques in terms of risk, costs and benefits have to be added to all elements of the enterprise architecture program to validate their contribution to the overall result.



EA Program View and its elements



4 Critical Success Factors for Enterprise Architectures

An effective Enterprise Architecture approach and accompanying framework and methodology produces Enterprise Architectures that:

- Create and maintain a common vision of the future shared by both the business and IT, driving continuous business/IT alignment
- Create a holistic, end-to-end future-state enterprise architecture process that accurately reflects the business strategy of the enterprise
- Build agility by lowering the "complexity barrier," an inhibitor of change
- Increase the flexibility of the enterprise in linking with external partners
- Develop a proactive organization capable of meeting customer demands, outpacing the competition, and driving innovation
- Reduce risk and prepare the enterprise for rapid, unplanned change
- Avoid the pitfalls of business-unit IT functions operating at odds with one another
- Institute a program of progressive technology refinement
- Create, unify, and integrate business processes across the enterprise
- Unlock the power of information, unifying information silos that hinder corporate initiatives such as customer relationship management and e-business
- Eliminate duplicate and overlapping technologies, decreasing support costs
- Reduce solution delivery time and development costs by maximizing reuse of technology, information, and business applications

To accomplish this, an Enterprise Architecture approach must be:

- **Holistic in Scope:** It must address all aspects of the Extended Enterprise and directly associated with business technology alignment: business structure, Business activities, business processes, information flows, information-systems, and infrastructure, standards, policies. The notion of "Extended Enterprising" is growing in importance, and extends stakeholder status to include external value net members. Most enterprise architecture efforts are too inwardly focused, and do not include the customer and key business partners. This results in miss-aligned enterprise architectures, and lost opportunities to gain competitive advantage and government effectiveness. The "Extended



Enterprising” focus directly supports Business 2 Business initiatives, E-Government and cross- community initiatives critical to global trading and communication today.

- **Collaboration Based:** The effort must include representatives from all key stakeholders and value net members into the EA program: Business Domains, Senior Management, Business Partners, and customers. This is critical to obtaining “buy-in,” ongoing support and business / partner, customer alignment and collaboration.
- **Alignment Driven:** It must address the need to directly align ‘extended’ business and technology drivers in a way that is comprehensible and transparent to all key stakeholders, with a continued process of tracing enterprise architecture initiatives to the business strategy.
- **Value Driven:** It must provide mechanisms to define business cases that help ensure and demonstrate the business value of enterprise architecture solutions.
- **Dynamic Environments:** It must include analytical methods that support the development of enterprise architectures that are flexible and dynamic to changing business drivers, new opportunities or roadblocks, and enterprise architectures that provide transformation options that mitigate risks and are flexible and dynamic to budget and other organizational constraints.
- **Normative Results:** It must provide the ability to define solution sets that can be measured, validated and mapped to real world solutions.
- **Non-Prescriptive:** It must not presume an implementation approach. That’s out of the scope of the enterprise architecture program.



5 Extended Enterprise Architecture

5.1 Managing the Enterprise beyond the boundaries

In a world populated by value creating and value exchanging entities, often the decision will come down to owning one of three fundamental value propositions.

You will either be able to own the customer, own the content that the customer seeks to acquire, or own the infrastructure that allows the content to be produced or the value to be exchanged.

Each has a different business model. Each exploits a unique core competence. Each employs a different means of generating economic returns. However, in the connected economy, attempting to own all of them simultaneously will increasingly become a game of diminishing returns. When the network allows competitors to fill the gaps in their offerings at no additional cost, owning all of these competencies only increases risk without necessarily increasing returns.

As the factors that make up the economic environment change under the influence of the Internet, we can begin to anticipate how and where they will alter the cohesion and boundaries of the entities that make up the connected economy. We can estimate which industries and business models will likely become threatened and which will likely survive.

In the process, we can redefine the way in which our organizations will participate and continue to create value for customers and shareholders alike. In the technology we choose the possibilities that fit best to this collaborative environment.

5.2 The Extended Enterprise Environment

Within the decade, we will see highly intelligent enterprises come to dominate their space. As noted, they will capitalize on the technology to withstand shocks and to maximize fit with the environment.

They must utilize their flexibility and mobility to shape and execute real-time strategic options. Make no mistake - these will not be simply "learning organizations" - but instead action-based entities that attack open space, defend instinctively, and anticipate possibilities. For organizations that do not upgrade their capabilities to competitively adaptive levels, difficulties will multiply rapidly.



Extended Enterprise Environment (E3)

Costs will appear out of control vis-à-vis the best-evolving players and historical knowledge of customers will quickly decay in value.

In defence, the smarter of these players will elect to outsource large pieces of their core businesses to superior firms and then recombine the pieces imaginatively to suit specific opportunities - thus creating a modular or plug-and-play capability that is both strong and flexible and that extends their original boundaries, addressing all elements of the extended enterprise environment.



6 Key Concepts of holistic Enterprise Architectures

An overall holistic Enterprise Architecture includes all the elements presented in the Extended Enterprise Architecture (E2A) Framework⁶ below.

While this framework is important, in that it outlines all the enterprise architectural artefacts required, it does not completely address the actionable aspects of an enterprise architecture, which deal with business technology alignment, validation and actual integration into the organization.

These must be supported with an effective combined approach for enterprise program management and enterprise architecture to implement.

Abstraction Levels Aspect Areas	Why? Vision / Strategy Business / Technology Drivers Contextual Level	With Who? Value Net Relations Cooperating / Collaborating Elements Environmental Level	What? Goals & Objectives Requirements Conceptual Level	How? Logical Representation Logical Level	With what? Solution Representation Physical Level	When? Enterprise Impact Transformational Level
Business	Business Goals, Drivers and Concepts <ul style="list-style-type: none"> Corporate Strategic Plans Extended Business Drivers Extended Guiding Principles Scope of Collaboration Environmental Dynamics, e.g. Laws Business Goals & Objectives, KPIs Viewpoints = Competition, Value Net, etc. Ends/Means = As-Is / To-Be Business Situation 	Extended Enterprise Value Net <ul style="list-style-type: none"> Collaborative Value Parties Scope of the Collaborative value Collaboration Contracts, Service Levels Law & Regulations Collaborative Business Goals & Objectives Viewpoint = Collaborative Value, etc. Ends/Means = As-Is / To-Be Collaborative Environment 	Level of Business Collaboration <ul style="list-style-type: none"> Program Goals & Objectives Business Requirements Business Relationships Budget of Change Stakeholders / Win-Win Conditions Quality of Services Characteristics = Time, Flexibility, Availability, Security, Maintainability, etc. End = Business Purpose 	Type of Business Collaboration <ul style="list-style-type: none"> Organization Structure Business Area Structure Role Players / Actors Value Net Position Business Culture Business Commitment Business Rules Viewpoint = Business Perspective End = Business Behaviour 	Solutions of Business Collaboration <ul style="list-style-type: none"> Business Functions structure and relations Business Tasks / Activities Business Objects Business Resources Business Knowledge Business Benefits Technology Possibilities End = Business Outcome / Business Solutions 	Granularity of Change <ul style="list-style-type: none"> Enterprise Business Case Enterprise Transformation Roadmap Enterprise Priority Plan Enterprise Budget Plan Enterprise Governance Plan e.g. Business Process Redesign or Outsourcing End = Enterprise Business Transformation
Information	Activities the Business Performs <ul style="list-style-type: none"> Enterprise Information Policy Responsibilities & Competencies Ownership of Information Internal / External Dependencies Activities out of Scope Activities = Generic or Specific Activities = Critical / Overhead End = Information Situation 	Extended Enterprise Information Exchange <ul style="list-style-type: none"> Extended Information Exchange Services Extended Information Ownership Parties Information Confidentiality Extended Dependencies Activities out of Scope Information = Generic or Specific Information = Critical / Overhead End = Ext. Enterprise Information Exchange 	Level of Information Interaction <ul style="list-style-type: none"> Functional Requirements Non-Functional Requirements Quality of Services Information Relations Information Characteristics Policy = Business Purpose Domains = Functional Areas ID = Business Resources End = Information Resources 	Type of Information Interaction <ul style="list-style-type: none"> Information Tasks / Activities Information Objects & Relations Information Interaction Information Flow Characteristics Information Resources Information Locations Viewpoint = Interaction Perspective End = Information Behaviour 	Solutions of Information Interaction <ul style="list-style-type: none"> Type of Information Exchange Formal / Informal Grouping of Information Objects Grouping of Information Resources Type of Triggers / Events Grouping of Information Types Priority = Dependency of Information Relation = Information Flow End = Information Solutions Sets 	Impact of Change <ul style="list-style-type: none"> Business Case Information Systems Roadmap Security Plan Selection = Set of ICT Supported Objects e.g. Information Roadmap Interface = Type of Information Exchange End = Activities to be supported by ICT
Information – Systems	Systems Goals, Drivers and Concepts <ul style="list-style-type: none"> System Development policy Enterprise Interoperability Policy Business - Technology Enablers Enterprise Responsibility of IS Enterprise Application portfolio Enterprise Guiding Principles End = As-Is / To-Be Information-System landscape Node = Major Enterprise Business Location 	Extended Enterprise Interoperability <ul style="list-style-type: none"> Enterprise Interoperability Standards Enterprise Interoperability Governance Enterprise Interoperability Quality of Services (e.g. Security) Enterprise Interface portfolio Enterprise Collaboration Principles End = To-Be Interoperability Definitions 	Level of Interoperability <ul style="list-style-type: none"> As-Is Information Systems Environment Functional Requirements Non-Functional Requirements Information-Systems Behaviour Abstraction & Precision of Data Quality of Services Characteristics = Time, Availability, Security, Maintainability, etc. Structure = Interfaces 	Type of Interoperability <ul style="list-style-type: none"> Product-Independent Reference Solution (PIRS) IS Functions & behaviour Choice of Middleware Technologies Shared & Pluggable IS Services / Solution sets Interface Definitions & Standards Official & De-facto IS Standards Standards = IS Interoperability Standards End = PIRS 	Solutions for Interoperability <ul style="list-style-type: none"> Product-Specific Reference Solution (PSRS) Map PSRS to Product Solutions and options, etc. Interface Solutions Implementation of Quality of Services Refinement Technical Reference Model Viewpoints = Selection of a Product Solutions Structure = Spectrum of Styles & Solutions sets Quality = Solution Interface Characteristics End = PSRS 	Timeframe of Change <ul style="list-style-type: none"> Business Case Make or Buy Decision Implementation Roadmap Tools for Development / Implementation Governance Plan Security Impact e.g. Design of Application & Components Priority = Dependencies End = Roadmap for realization
Technology - Infrastructure	Technology Goals, Drivers and Concepts <ul style="list-style-type: none"> Locations in which the Business Operates Enterprise Technology Infrastructure policy Enterprise Business - Technology Enablers Enterprise Responsibility of TI Enterprise TI Portfolio Enterprise Guiding Principles Node = Major Enterprise Business Location 	Extended Enterprise Inter-Connection <ul style="list-style-type: none"> Enterprise Inter-Connection Standards Enterprise Inter-Connection Governance Enterprise Inter-Connection Quality of Services (e.g. Security) Enterprise Inter-Connection portfolio Enterprise Inter-Connection Principles End = To-Be Inter-Connection Definitions 	Level of Inter-Connection <ul style="list-style-type: none"> As-Is Enterprise Infrastructure TI Principles Functional Requirements Non-Functional Requirements Quality of Services Characteristics = Time, Availability, Security, Maintainability, etc. Link = Enterprise Business System Connection Node = Enterprise Business System Environm. 	Type of Inter-Connection <ul style="list-style-type: none"> Enterprise Technology Standards Enterprise Infrastructure Profile Enterprise Hardware Systems Profile Enterprise Communication Profile Enterprise Security Profile Enterprise Governance Profile Technical Reference Model & Standards Positioning = Allocation of IT Services = TEM Interaction = Concepts of Service Layering 	Solutions of Inter-Connection <ul style="list-style-type: none"> Technology Overview Solutions & Products for Inter-Connection Formats of Communication Security Integration Refinement Technical Reference Model Node = Hardware + System Software, etc. Connectivity = Middleware / Messaging, etc. End = Structure of Relations, Products + Specifications 	Timeframe of Change <ul style="list-style-type: none"> Business Case Enterprise Transformation Plan Enterprise Priority Setting Enterprise IS Alignment Impact e.g. Blue Print of Technology Implementation Portfolio of Products and Components. Catalogues of used Standards End = Roadmap for Enterprise Implementation

Extended Enterprise Architecture (E2A) Framework

The Extended Enterprise Architecture (E2A) Framework is developed to meet existing and future evolving complex enterprise collaboration environments.

⁶ Book 'How to survive in the jungle of Enterprise Architecture Frameworks', Schekkerman Jaap, published January 2004.



6.1 Focusing on Alignment, Validation and Ability to Implement

Developing a complete enterprise architectural model of every element in the organizational value net is a daunting task. If done as part of an Enterprise Architecture effort, it will tend to divert the focus away from alignment and validation. It also has the strong potential for impeding the important cross-business area collaboration process critical to the overall successful definition and implementation of the enterprise architecture.

This is not to say that a complete enterprise architectural description of the various solutions is not valuable, but rather to say that their comprehensive definition is better done outside the scope of the Enterprise Architecture effort. The level of enterprise architectural detail within the Enterprise Architecture should be governed by the overall objectives of achieving collaboration, alignment, validation and the ability to implement and assess risk:

- **Business Layer Definition:** Business structures, relations, tasks and activities should be defined to the level of detail for which their performance metrics can be validated and their technology support needs identified.
- **Information Layer Definition:** This activity defines key information flows and characteristics within a business area at a level of detail that can be used to assess their affinities and properly align them in the overall enterprise architecture, and provide a description of information movement and security services required from the information-systems and technology infrastructure.
- **Information-Systems Layer Definition:** Level of detail is derived from the business and information layer definition effort, which defines the required solution structure set, functions, features and standards.
- **Technology Infrastructure Layer:** This layer defines the technology services provided, not how they are implemented.

The above level of detail is **enough**⁷ to develop a holistic Enterprise Architecture that leads to the proper alignment, validation and implementation of changing business strategies, tasks and activities, information and technology. Additionally, the Enterprise Architecture elements can easily be extended on in more detailed domain specific solution architectures.

⁷ See the quote 'Good is good enough' in chapter 2

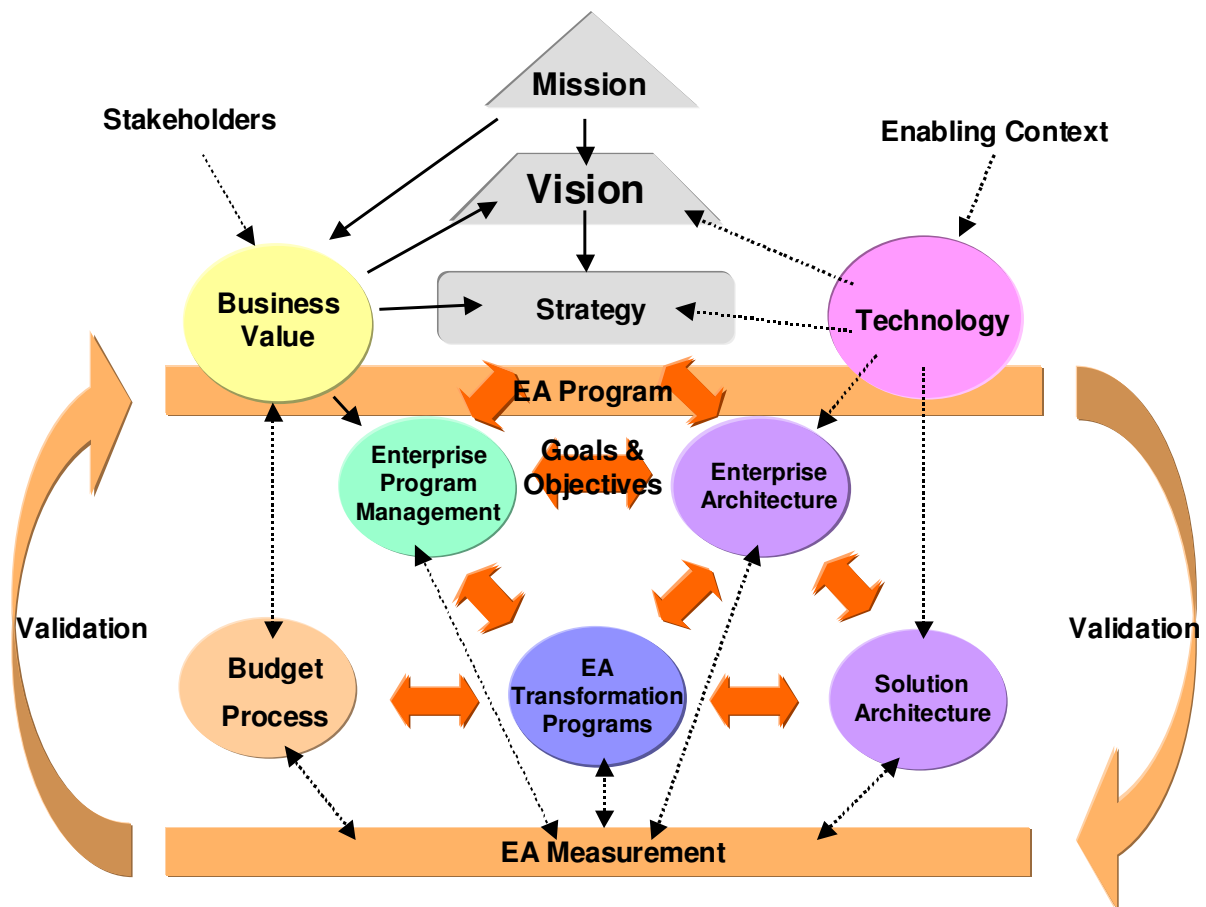
7 The Validation, EA Program & Measurement Process

7.1 Validation

While every organization's budgeting and capital planning process is different, and the Enterprise Architecture integration with these processes will vary, there are several critical success factors associated with a successful Enterprise Architecture implementation.

- The EA implementation is funded as a separate program in itself;
- There is a budget process for "incorporating" the Enterprise Architecture to other capital programs;
- There is a feedback loop with metrics for measuring value and compliance.

The figure below outlines IFEAD's view on the relationships among Enterprise Architecture, Enterprise Program Management, Solution Architectures, and the Budgeting Process integrating into the overall EA Validation, Program & Measurement Process.



Enterprise Architecture Program & Measurement

7.2 Enterprise Architecture Program

7.2.1 Using Business Behaviour instead of Business Processes as part of the EA Framework

Most frameworks have business processes as an element of the enterprise architecture, when in fact a business process as an organizational entity typically has more to do with the decomposition of functions, or the needs of structuring the organisation, then it have to do with modern enterprise architecture.

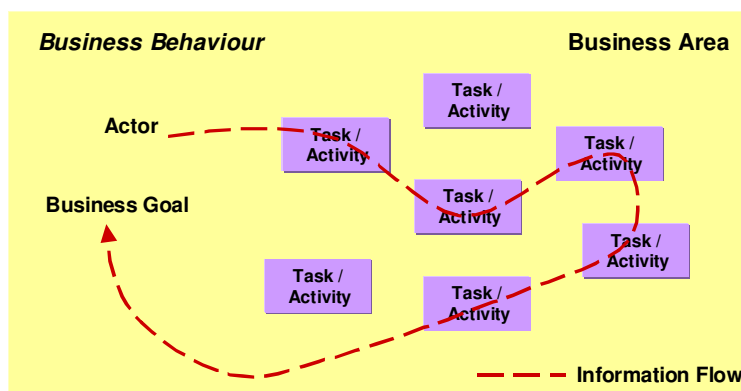
Using business processes as an organizing entity in enterprise architecture will most likely lead to inflexibility and fixed structures. Do you recognise the quick implementation of fixed inflexible business processes in ERP systems? It's like a foundation of reinforced concrete.

So instead of addressing traditional well described business processes it is better to focus on what is called business behaviour when dealing with enterprise architecture.

7.2.1.1 Business Behaviour ⁸

Business behaviour (BB) is an ordering of tasks and/or activities that accomplish business goals and satisfy business commitments. It may include manual or automated operations that complete units of work.

Business behaviour can be triggered by events in the environment or by internal initiatives or conditions. It is justified because it either generates value for the business or mitigates costs to the business.



Business behaviour is what produces the outcomes that fulfil the purpose of the business. Behaviour is governed by commitments.

Actors perform it. As an end-to-end set of activity, behaviour can invoke various functions within

the business. Behaviour manipulates various resources in the business in

⁸ 'A Standard for Business Architecture description' by D.W. McDavid, published in IBM Systems Journal 1999.



order to produce the desired result, and resources of all kinds enable it. Business behaviour is quite recursive, although various reasons and methods for imposing specific structure on aspects of business behaviour will be discussed.

The enterprise architectural purpose for understanding business behaviour stems from the opportunity to support or replace it by automated functions. From an enterprise architectural point of view we are looking for structures that can help us organize the work of selecting, buying or building information-systems and create interfaces from one system environment to another and from the technology world to the world of human activity.

It is important to stress that we are talking about business behaviour of all kinds. Both physical behaviour and information-bearing behaviour are involved. We are generally only interested in physical behaviour to the extent that it is accompanied by information or provides an opportunity to capture useful information about the business. Humans perform much of the business behaviour that is covered by this concept, whereas some subset is either supported or performed by information-systems.

Behaviour can be seen as having structure by the fact that a sequence of tasks / activities performs this behaviour. Changing the sequence or the type of activities performs business flexibility. Technology has to support this type of flexibility.

7.2.2 Using Solution Sets⁹ instead of Information Systems itself as part of the E2A Framework

Most frameworks have information-systems itself or applications as an element of the enterprise architecture, when in fact an application as an organizational entity typically has more to do with the marketing strategy of a vendor, or the needs of a software development effort, then it has to do with the goals and objectives of a value generating enterprise.

Using information-systems it self as an organizing entity in enterprise architecture will most likely lead to misalignment. The aspect area of Information-Systems architecture is useful; however don't refer to applications it self rather than to solution sets that can be supported by information-systems.

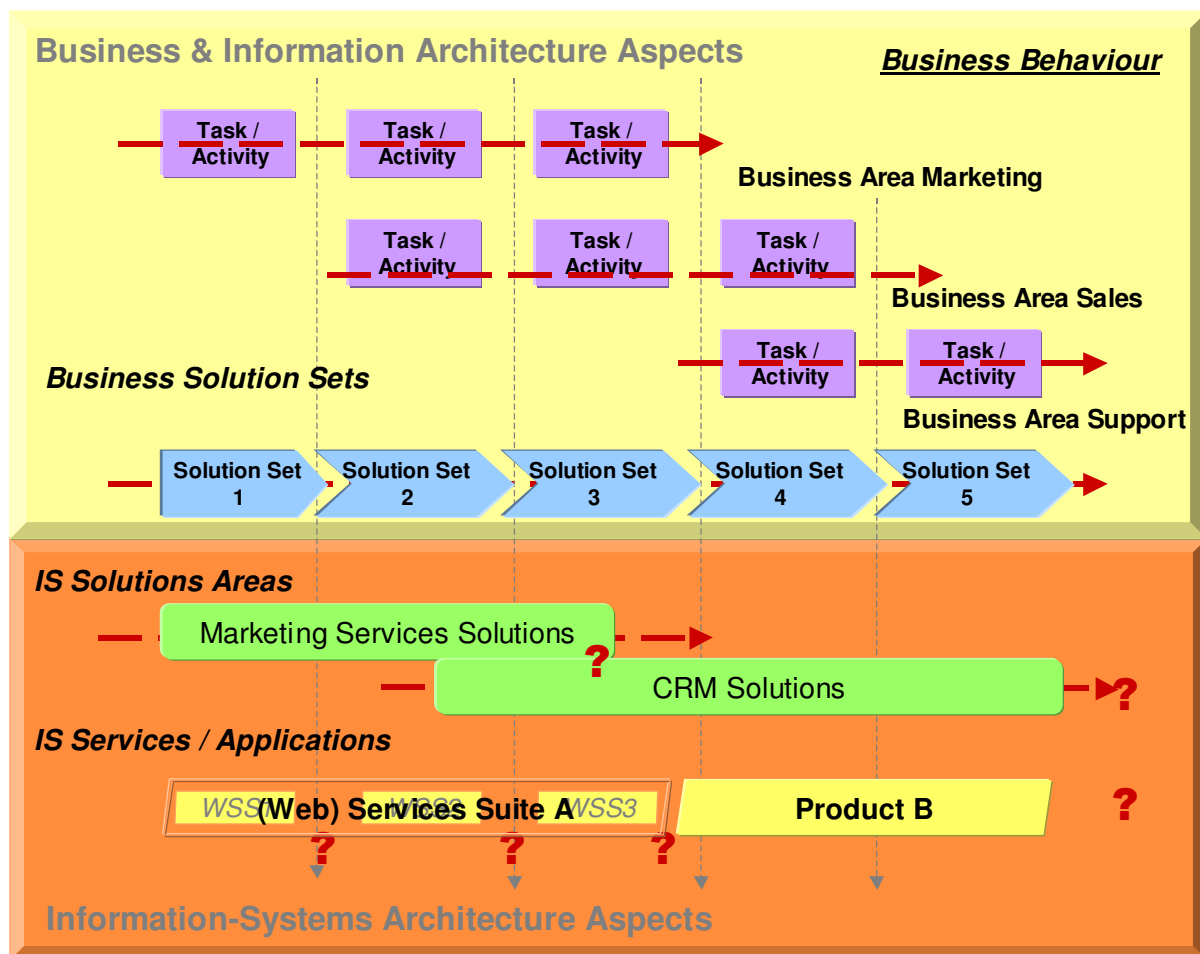
⁹ Idea of 'Solution Sets'; White Paper, Interoperability Clearing House, USA, 2002.



Using applications as constructs in an enterprise architectural framework made more sense in the past when there was a closer alignment between applications and processes.

However, in the solution and package driven environment of today, it is dangerous. The misconception of the alignment between applications and traditional business processes is a major reason for the high failure rate for CRM implementations for example. CRM is a thin layer of functions and features that cross a very wide range of traditional business processes. "Architecting" CRM as a standalone application usually results in misalignment. That's why traditional business processes and applications will be no longer part of future EA frameworks.

As illustrated below, a properly described solution-driven approach, which abstracts from the business behaviour, designs the function and feature requirements for this behaviour into "solution sets". This will result in much better alignment and will reduce inefficiencies from gaps and overlaps that result from a more typical application centric approach.

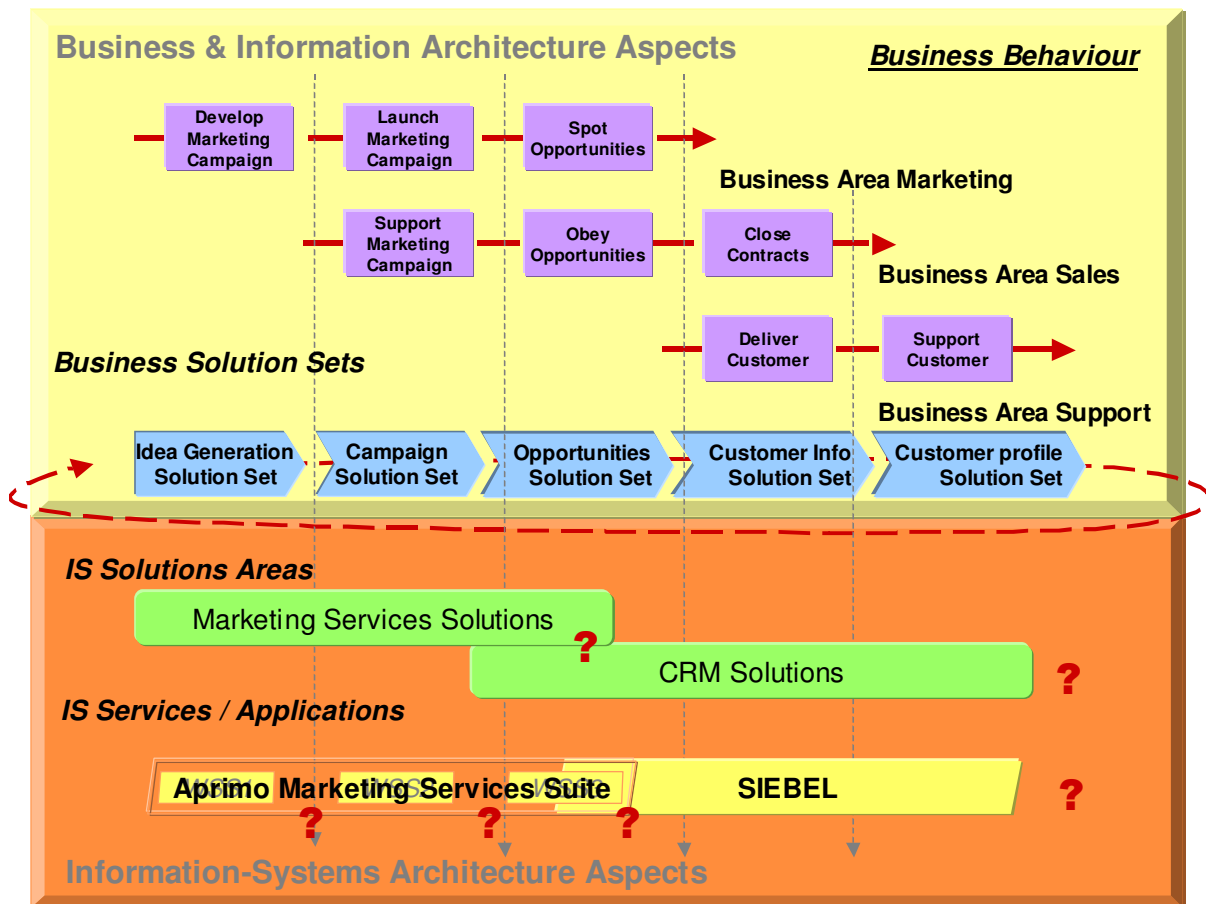


Enterprise Architecture Solution Sets

7.2.2.1 Mapping Solution Sets and IS Services / Applications

A Solution Set contains a description of the common required functions and features required by the tasks / activities of different business areas it supports. Translating those functions and features into IS solution areas and IS services / applications determine gaps and overlaps within existing or future products, will help the organisation in defining the best IT solution support.

The next figure is an example of using solution sets to transpose marketing and sales functionality and features to supporting IT solutions.



Mapping of Solution Sets

7.2.3 Alignment and Traceability

A successful Enterprise Architecture provides a mechanism for mapping business drivers to significant architectural solution areas that make up



the overall enterprise model of the future state. That mapping should eliminate any ambiguity that exists about the reason for implementing that solution. The alignment also will provide the basic construct for building the business case for the solutions justification. Building the business case for an architectural solution area requires that that solution can be mapped to a business or organizational driver, and that its benefits, cost, risks, and interdependencies can be quantified.

7.2.4 Enterprise Architecture Framework Solutions decomposition

A business solution set is a part of the overall framework that is significant enough in itself to be considered from a design, costing or implementation standpoint. Decomposing the enterprise architecture into business solutions is key to enabling the analysis process. It allows for multidiscipline teams to iteratively work together creating an enterprise view, while at the same time, dispersing into discipline specific teams performing detailed analysis and validation.

7.3 EA Measurement Process

7.3.1 Value Net¹⁰ Based Assessment

Interrelationship among the solution sets can be maintained using cross-reference models, tables and matrices. Those matrices must properly allocate the benefit, cost and risk contributions of each enterprise architectural solution.

Misallocation can lead to major disasters, as can be witnessed by the mistake made by a large industry company. The industry company embarked on a \$50 million plus effort to build a business-to-business (B2B) portal environment to do business transactions with their trading partners. They knew that the B2B technology was risky, but thought the risk worthwhile given the perceived benefit. The fact is that the architecture methodology used mapped the trading transactions directly to business drivers, rather than to the solution sets it supported. The result was that the focus was on doing business transactions rather than how solutions sets can interact with each other in an extended environment. By the fact that all trading partners have their own definition of business transactions, the lack of focus on a common overall definition language was due to the result that this project failed.

¹⁰ Value Net; Book 'Architectuur, besturingssysteem voor adaptieve organisaties' Rijsenbrij, Schekkerman, Hendrick, Publisher Lemma, 2002



A post-mortem mapping of the various architectural solutions using the prescribed structure showed that the real gains were from less risky EDI automated transactions, not from enabling the trading partners with a B2B portal solution.

The logical way of doing this is to organize the various disciplined enterprise architectural solutions in conformance with their position in the value net.

7.3.2 Measurement and Valuation

Each enterprise architectural solution sets must include metrics for evaluating its contribution and cost to the overall enterprise value net. Both quantitative and qualitative benefits and cost metrics can be captured for each discrete solution or product and their contributions to the value net allocated.

		Business Activities					
	Solution Set / Cost Allocation	Total Costs	Task/activity	Task/activity	Task/activity	Task/activity	Task/activity
			Solution Set 1	Solution Set 2	Solution Set 3	Solution Set 4	Solution Set 5
Technology Support	WSS1	€€€€€	%	%			
	WSS2	€€€€€€		%			
	WSS3	€€€€€			%		
	CRM Product B	€€€€€€€			%	%	%

Solution Set - Measurement & Validation

In the above example, IS Services / application costs are allocated at both the Solution Set level and at the Task / Activity level. Cost would be allocated at a Task / Activity level when those Task / Activities have serious cost impacts on there own, and need to be evaluated separately.

Cost and risk interdependencies would flow up. Correspondingly, benefits justifying the expenditures would flow down. So this approach is showing at the appropriate Enterprise level the individual costs spread over different Business areas. Evaluating these costs, risks and benefits as part of the EA measurement cycle at an ongoing base will deliver the validation for the added value to the business.



7.3.3 Enterprise Architectures: Normalized Solutions

An Enterprise Architecture that uses solution sets and normalization to analyze business needs and IT opportunities allows the development of a neutral cost / risk analysis. This cost / risk analysis allows you to understand how brittle or adaptive your chosen transformation will be.

This enables business & IT managers to see not only the benefits and limitations of particular IS services or software applications packages and standards choices. It enables them to understand the underlying risks and limitations associated with these choices; how flexible and extensible or how dependent on particular infrastructure or hardware or vendor-specific products an enterprise architectural choice makes them.

This analysis process:

1. Provides a mechanism for determining how adaptive your enterprise architecture is: Is there any one solution that's failure would bring down the companies activities like a house of cards? What are potential contingencies around that dependency?
2. Clearly segments enterprise architectural solutions so that they can be analyzed for cost and risk. The cost and risk analysis can then be traced back to the business drivers for a comparison to benefits and added value.
3. Divides the enterprise architecture into manageable pieces facilitating its continued evolution.
4. Provides an EA framework and structure for building a knowledge base of enterprise architectural solution requirements and characteristics that can be used to evaluate new opportunities in a continuous improvement EA program.

Additionally, normalization and solutions provides a mechanism for communicating pieces of the enterprise architecture to teams doing product and solution selection, detailed business behaviour and workflow design, or more detailed architectural descriptions that are beyond the scope of the Enterprise Architecture.

7.3.4 Effective Deployment via Enterprise Program Management

A major predictor of the extent to which enterprise architecture influences the actual business & IT asset base is the quality of the transformation



plan. The plan factors in the competing forces impacting transformation, which typically include:

1. Potential ROI;
2. New opportunities provided by recently developed technology enablers;
3. Organizational and budgetary constraints;
4. The need to amortize existing and ongoing business & IT investments;
5. Maturity of the organisation and the capabilities of the people;
6. Maturity of technological alternatives and other implementation related risk factors.

Being able to decompose Enterprise Architectures into normative solutions provides a mechanism for experimenting with various implementation scenarios in an effort to reduce risk and adaptability.

A typical approach would be to develop a decision model containing varying scenarios, allowing benefit, cost and risks to be analysed.

7.3.5 Non-Prescriptive Objectivity

Many of the Enterprise Architecture Frameworks that are gaining currency today very much resemble the early phases, and, in some cases, the later phases, of a software development life cycle. This leads to a fair amount of unnecessary work and a loss of focus, as the level of specificity goes way beyond what is required at the Enterprise Architecture level. The E2A framework prevents you to drill down to this level.

7.3.6 Expected results from an Enterprise Architecture Program

The ultimate operational goal of any organization is to optimise the alignment of their customer & partner needs, business strategy, organizational culture, business, people, processes and technology. This optimisation, not only provides for efficient and cost effective performance, but also helps ensure proper execution of the defined organizational goals and objectives.

However, by itself, an Enterprise Architecture program is not a panacea for success.

It requires that:

- (1) The organizational goals and objectives are the right ones.
- (2) There are no inhibiting organizational, cultural, budgeting process, and people compensation issues.



These above items are beyond the scope of Enterprise Architecture. Therefore, even a fully enabled Extended Enterprise Architecture effort may only achieve incremental results, because the organizational issues presented above could limit the enterprise architecture's effectiveness. This is not to say that Enterprise Architecture efforts are not integral in themselves, and don't bring exceptional value. However, if the hope is for revolutionary change in an organization, a more comprehensive business concepts innovation approach, that includes an Enterprise Architecture program might be required.

7.3.7 Enterprise Architecture Program Maturity Model

The table below provides a maturity model for the implementation of the Enterprise Architecture Program¹¹ that can help organisations to identify the level off roll out of the Enterprise Architecture program.

E2AMM	Level 0: No Extended Enterprise Architecture	Level 1: Initial	Level 2 Under Development	Level 3: Defined	Level 4: Managed	Level 5: Optimized
Business & Technology Strategy Alignment	No awareness of aligning business strategies, business drivers & principles and IT strategies, drivers & principles.	Initial alignment of business strategies, drivers & principles and IT strategies, drivers & principles.	First activities to align business strategies, drivers & principles and IT strategies, drivers & principles.	Formal alignment of business strategy, drivers, principles & functional / non-functional requirements and IT strategies, drivers, principles and functional / non-functional requirements.	Frequently reconsideration of business strategy, drivers, principles & functional / non-functional requirements and IT strategies, drivers, principles and functional / non-functional requirements.	Business –Technology cost / benefits validation metrics for end-to-end value chain examination. [E2-Grid]
Extended Enterprise Involvement	No involvement of Extended parties; No collaboration agreements.	Incidental involvement of Extended parties.	Awareness of collaboration with extended parties. First initiatives to involve extended parties in the E2A program	Extended parties involved in E2A program. Definition of collaboration levels and information exchange standards	Extended Enterprise management & governance structure in place.	Measurement structure in place to manage Extended Enterprise environment.
Executive-Management Involvement	E2A is not for us. We do not need to be involved. We know how to do our job. Don't tell me about.	What is Extended Enterprise Architecture about? I have heard something about E2A	Little awareness by management of Extended Enterprise Architecture possibilities. Spread skepticism to adopt Extended Enterprise Architecture.	Executive management aware of Extended Enterprise Architecture benefits. Executive management supports proactive Extended Enterprise Architectural program.	Executive management evaluates periodic the Extended Enterprise Architecture program and results.	Executive management participating in the E2A optimization process.
Business Units Involvement	Extended Enterprise Architecture is not recognized by any business unit.	Some Business Units support the Extended Enterprise Architecture program and will deliver some added value to the Business – IT alignment process	Identification that it is hard to maintain too many different business processes and supporting technologies in a dynamic business world.	Identification that an Extended Enterprise Architecture program can reduce complexity and can enhance business flexibility. Adaptive Business – IT alignment is the answer to business dynamics.	Enterprise wide business units are actively involved in the Extended Enterprise Architecture program.	Extended Enterprise Architecture is established in all business units and part of their decision making process.
Extended Enterprise Architecture Program Office	E2A program does not exist.	First out of E2A program in place. E2A architects identified.	E2A program being actively defined. E2A program office established.	E2A program established. E2A program office actively working together with business and IT units in defining E2A value.	Extended Enterprise Architecture program office is involved in the line of business and the Enterprise budget process.	Continuously measurement of E2A program activities and results. E2A measurement, process of the overall Enterprise improvement activities.
Extended Enterprise Architecture Developments	No Extended Enterprise Architecture recognition.	Some Extended Enterprise Architecture activities are started. Recognition about focusing on business value and IT standards – cost reduction activities. Ad hoc alignment of Business and IT.	Extended Enterprise Architecture program is set up. Business and IT strategy and standards are developed and linked. EA framework and methodology are chosen but not yet widely spread.	Extended Enterprise Architecture program established. Business & IT principles, drivers and strategies are defined and communicated. Extended Enterprise Architecture and Solution Architecture areas are defined and aligned.	Extended Enterprise Architecture program managed by E2A steering committee. Reference models are rolled out and accepted by business units. E2A program office involved in the definition of new projects. Extended Enterprise Architecture reflects current and future state	Extended Enterprise Architecture program office manages projects portfolio landscape and aligns continuously the overall activities and initiatives.
Extended Enterprise Architecture Results	None.	E2A results are documented in a single way. No access to the results for others.	E2A results are shared with others. Most results are documented using traditional office tools. Access to the results is limited. Sharing of information in a traditional way. Modeling and visualization techniques are developed.	Extended Enterprise Architecture results are updated frequently. Standards, modeling methods and visualization techniques are used. E2A repository is set-up.	Extended Enterprise Architecture results are controlled and managed regularly. Business units are using the E2A results in their planning business. E2A results are accessible in an electronic way for all participants.	E2A results are mandatory used in the Enterprise wide strategic planning and governance activities. Continuous improvement of strategic planning and decision making cycle based on E2A results.
Strategic Governance	Strategic Governance is not in place.	Strategic Governance is in place and the first activities are set up to link the E2A program and Strategic Governance.	E2A results are part of the Strategic Governance process. The Enterprise Program management office and the Extended Enterprise Architecture office are working together on an incident base.	Strategic decision making and governance are based on the E2A results. The E2A program office is involved in the formal governance processes.	Formalized strategic governance of all business & IT investments based on E2A results.	Value measurement techniques are adopted to continuously measure the business and IT value of investments based on the E2A results and in line with the governance strategy.
Enterprise Program Management	Enterprise Program management not recognized.	Project management upgraded to program management. Recognition of the added value of Enterprise Program management. Program management executed almost in isolation.	Enterprise Program management and Extended Enterprise Architecture linked together. Enterprise Program management office responsible for the transformation part. Extended Enterprise Architecture office responsible for the Content part.	Enterprise Program management office and Extended Enterprise Architecture office, officially working together. Program management approach and E2A program aligned. Accountability on responsibility of activities defined.	Project and program initiatives under auspices of the Enterprise Program management office with participation of the Extended Enterprise Architecture office. Procedures, standards and methods are aligned.	Enterprise Program Management Office and Extended Enterprise Architecture Office are participating in the enterprise strategic planning process. Measurement techniques are in place to determine the added value to the business of all initiatives.
Holistic Extended Enterprise Architecture	Awareness of aligning business and technology not present.	Awareness of aligning business and technology present. First initiatives set up to align business and technology activities, based on the Enterprise its mission, vision strategies and business drivers.	Activities are set up to continuously align business and technology initiatives. Alignment of business and information modeling methods with the technology modeling methods.	Extended Enterprise Architecture framework is used to define the business and IT alignment areas. Results of business and IT modeling methods are stored in a repository. Traceability of business and IT alignment.	Every project or program initiative is measured against the added value to the business and the cost of investments. The current and future state Extended Enterprise Architectures are used as a management tool to plan transformation initiatives. Business and Technology are operating on the same level of maturity.	The holistic E2A approach is part of the organizations culture. Business initiatives are continuously reflected to the technology impact and IT possibilities are driving new business activities.
Enterprise Budget & Procurement Strategy	Separated Business & IT budget & procurement strategy.	Almost no awareness about aligning and managing the Enterprise business & IT budget and procurement strategies.	First awareness about the alignment and management of the Enterprise business & IT budget and procurement processes.	The extended Enterprise Architecture office is participating in the enterprise budget and procurement strategy. Request for information or proposals are defined in co-operation with the enterprise architecture office.	The future state Extended Enterprise Architecture acts as a blueprint for investments, is formalized and part of the enterprise budget process.	All investment plans and initiatives are related to the Extended Enterprise Architecture results, the budgets and procurement strategy.

Enterprise Architecture Implementation Maturity Model

¹¹ Refined version of the “Enterprise Process Maturity Model and the SEI Model” by Schekkerman Jaap, 2003



8 Conclusion: Today's Practice

Both industry and government all over the world have recognized the special value of Enterprise Architecture. The US government's embrace of Enterprise Architecture driven by the mandates of the Clinger – Cohen Act and OMB Circular A130, is also driven by the growing complexity of their current IT environments, and the movement from platform-based data processing into value-based services. In Europe several EA initiatives are started some sponsored by the European Union, to define EA rules for governments and in other areas of the world like Japan, South-Korea and Australia/New Zealand EA efforts are ongoing.

Industry has been motivated by the simple reality that they need Enterprise Architectures to remain competitive and support business continuity as they consolidate their long spending efforts on disparate IT resources.

While this is a positive move, a fundamental problem remains. In the rush to implement Enterprise Architectures, most current frameworks and methods are in need of updating to address today's realities.

The virtual plethora of options and overlapping products and standards, and the focus on package integration, create a much more complex environment than the environment that most of these frameworks and processes were designed to address. Most frameworks are focused on providing detailed modelling of systems and activities that are only moderately relevant at the enterprise level. Many of these descriptive models and frameworks have their pedigree in the systems engineering arena, and so much of what is prescribed is more suitably addressed in either domain specific solution architectures or software design efforts.

This level of detail in the Enterprise Architecting effort can be a significant impediment to engaging the stakeholders effectively in the enterprise architecture team.

Finally, while most Enterprise Architecture frameworks and processes do a fairly good job at providing a means for describing current and future state enterprise architectures, and typically prescribe significant participation from key stakeholders in the effort, they do not effectively address the enterprise value net, alignment, traceability, performance measurement and the need for extended enterprise architectures that are actionable.



9 Acronyms & Glossary

ADM	Architecture Development Method	TOGAF Architecture Development Method [http://www.opengroup.org/architecture/]
AF	Architecture Framework	Typically a collection of guidance for developing and or documenting Architectures.
BB	Business Behaviour	
B2B	Business to Business	
CADM	Core Architecture Data Model	A formal model defining the data organization for a repository of C4ISR/DoDAF-compliant architecture products.
CEO	Chief Executive Officer	
CIO	Chief Information Officer	
Clinger-Cohen	The Clinger-Cohen Act of 1996	Also known as the Information Technology Management Reform Act, or ITMRA [http://www.oirm.nih.gov/policy/itmra.html]
COTS	Commercial off the Shelf	
CRM	Customer Relationship Management	
EA	Enterprise Architecture	The collection of information, models, technologies, processes, and plans that underlies organizational functions.
E2A	Extended Enterprise Architecture	An EA program that extends to the boundaries of collaborating parties
E2AF	Extended Enterprise Architecture Framework	
E3	Extended Enterprise Environment	
EAESC	Enterprise Architecture Executive Steering Committee	
EAM	Enterprise Architecture Measurement	
EAP	Enterprise Architecture Planning	
ERP	Enterprise Resource Planning	
FEA	Federal Enterprise Architecture (US)	[http://www.feapmo.gov]
FEAF	Federal Enterprise Architecture Framework (US)	
GOTS	Government off the Shelf	
IEEE	Institute of Electrical and Electronics Engineers	[http://www.ieee.org]



IS	Information Systems	
IT	Information Technology	
ISO	International Organization for Standardization	[http://www.iso.ch]
NDI	Non-Developmental Items	
OMG	Object Management Group	
Solution Set	Set of functional requirements and features to support tasks / activities	
WSS	Web Services Solution	



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11 About the author



Jaap Schekkerman, B.Sc. (1953) is the founder and president of the 'Institute For Enterprise Architecture Developments' (**IFEAD**).

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