Ceisar White Paper for Architecture training

1 Objectives

The technology has become part of the business in all industries. Information systems are fully embedded in the business models and processes. Therefore, the IT organization has to partner with the business to design and set up the right solutions. This is not anymore about pure coding but it is about business strategy and architecture design.
In the coming years the whole IT industry is going to lack of highly appropriate skills.

The objectives of this white paper are to:

- Explain **what** kind of **training** is required to develop Enterprise Architecture (EA) in your Enterprise, according to the level of maturity of your Enterprise towards EA
- Explain what is expected from each kind of **Actor** to develop Enterprise Architecture, how existing jobs are impacted and what new jobs are created
- Propose a full set of **modules** to train on Architecture Training, which can be combined as necessary, depending on your own objectives

1.1 Background

Most of what will be developed in this white paper on Architecture Training is based on:

- A survey that was sent to CIOs of major companies in June 2007 on their expectations on IT skills (for beginners and experienced IT professionals)
- Our other white papers on Enterprise Architecture

We recommend reading the white paper on the “Main Concepts” of the CEISAR first, as the standard terminology will be used in this document.

1.1.1 Survey

In June 2007, the CEISAR conducted a survey to understand what company needs are in terms of training on Computer Science and Management of IS. Our objective was to understand what they expect from a young graduate from Ecole Centrale Paris, but also what they expect from our graduates when they have become experienced professionals (which might require Executive Training to complement his prior education and professional experience).
Each company had to distribute twenty points across a set of themes, which are commonly taught in most universities.
Table of the themes

Twelve major companies answered the questionnaire: Aviva, Axa, BNP Paribas, Crédit Agricole, JC Decaux, Macif, Michelin, Renault, Schlumberger, SNCF, Société Générale and TOTAL.

The results show that:

- Companies expect **less** training on **technology** and **more** on **Governance and Enterprise Architecture**
- They are looking for people who have the “**big picture**”
    - Ability to understand the business as well as the full IS/IT portfolio
    - Ability to adapt to any environment and to act as an integrator between functions in the company
    - Ability to manage IS/IT as a real asset, managing its performance and return on investment
    - Ability to analyze and design the Information Systems as a whole, to minimize complexity and proactively optimize agility of the company (Enterprise Architecture). The job of Enterprise Architect appears as a new role and is very hard to fill with existing resources, who have not always been properly trained. Although it requires experienced professionals, some fundamental knowledge is expected to be taught both in the University and later in Executive training.

1.1.2 Enterprise Architecture Maturity levels

Enterprise Architecture is a young subject, which has not been adopted in many companies. Although it is becoming increasingly known and developed, no formal description of the roles and training it requires is currently available.
Each Enterprise will require Enterprise Architecture at a different level, depending on the nature of its business and how it is organized. Nevertheless, some level of Architecture is necessary and should be looked at.
We can define four levels of maturity towards Enterprise Architecture:

- Stage 1: **No Architecture** is present and there is little or no culture on Enterprise Architecture in the company
- Stage 2: Enterprise Architecture has been **recognized** as an important subject. Some people are dedicated to developing Architecture. Nevertheless, this is usually a **very small team** (compared to the rest of the resources dedicated to IS projects), mainly focused on developing norms and standards, and **only for IS/IT** (no Business Architecture). Project teams get little benefit from Architecture and usually do not use it. Shared components across the company (Business, Organization and IT Architecture) are merely developed.
- Stage 3: Enterprise Architecture has been **correctly developed**. There are many reusable components and patterns. A clear target architecture and master plans have been designed. But Architecture value still has to be demonstrated. The wide population of IT professionals and business partners, working on projects to build or upgrade IS/IT applications still **do not use** Enterprise Architecture **to its full potential**.
- Stage 4: The Enterprise has developed Architecture to its **full potential**. Every actor in the company knows what value Architecture can deliver and how it impacts their role. The required changes have been made so that **every actor is fully trained and operational**, hence using and enriching Architecture properly.

Stepping from one stage to the next requires specific change management and training. The training modules we describe in this white paper can developed with more or less details to be used with any target audience at different stages. The training should be developed by combining the right mix of these modules according to your objectives (which stage, which audience).

1.2 Method

To help defining the impact of Enterprise Architecture on jobs and the required training, we will define:

- **The roles of the various actors** needed in the industry, and **skills** required
- **Training Modules** that should be provided
- Link the roles with the training modules (depending on the level of maturity or the Enterprise)

We will focus on skills which are specific to designing and developing a good Enterprise Architecture. We will not concentrate on other skills, like interpersonal skills (leadership, team spirit …), which are also very important but not specific to our subject.
The roles we describe are generic and can be embodied in many different jobs. We will remain general. For instance, we will not detail the differences between people who build and people who maintain the architecture.

1.3 The dimensions

Enterprise Architecture impacts the whole enterprise. The roles we will describe can be analyzed on three dimensions:

- Functional (Business + Organization) and IT
- Decide Architecture, Build Architecture and Use it
- Level of responsibility in the Enterprise

2 Training Modules

What skills are required to develop Architecture in the Enterprise ?

- **Three key questions :**
- **Why invest in Architecture and to what extent ? For which benefit ?**
- **What Architecture for our Enterprise ?**
- **How to use Architecture ?**

➢ **Three categories of roles :**

➢ **Executives**

➢ **Enterprise Architects**

➢ **Any role linked to IT :**

- **Executives**
- **Build : Business Analyst, Project Manager, Software Developer …**
- **Run : Application Manager, Operations manager …**

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Each of these three key questions will required a specific training module.

Training Plan

Module A

Why ?

A1:Your context : What is an Enterprise / Different types of Enterprises / Information Age
A2: Complexity of IT systems : some examples and impact on business Performance
A3: Enterprise Architecture : a solution to the challenge of complexity

Module B

What ?

B1: Main Concepts on Enterprise Architecture : what is an Enterprise System and what is an Architecture ? Different Enterprises = Different Architectures
B2: What is a Functional Architecture ? (Entities/Processes)
B3: What is an IT Architecture ? (what is an IT System/Block Cartography/Component Based Architecture)

Module C

How ?

C1: How to decide an Architecture ? (Business Case of Architecture/Roles and responsibilities/ROI)
C2: How to implement an Architecture ? (Process and best practices)
C3: How to promote and support the Architecture ? (Communication and training)
C4: How to use an Architecture ? (Governance/Impact on the build and the run)

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2.1 Why Architecture

- **Session A.1 : Your Context**
  - What is an Enterprise ?
    - Essential purpose and core components
  - Different types of Enterprises (Elements of Strategic Management)
    - Context of the Enterprise, industry life cycle, type of growth strategies …
    - History of the Enterprise and culture build-up
    - Key features to win against competition (time to market, productivity, innovation, flexibility …)
  - From the industrial era to the Information Age
    - Impact of IT in the 21st century economy : IT is everywhere
    - Some examples of IT as a business enabler or blocker

- **Session A.2 : Complexity of your IT system**
  - Examples of complex IT systems
    - How IS have been built so far ? Lack of coordination between projects and technologies over time driving to a chaotic IS landscape and the impact on the flexibility of the Enterprise
    - On the contrary, some IT systems which are exemplary in agility and performance (best practices)
  - Complexity of the Enterprise & IT
    - (Unneccessary) complexity drives delays, costs and non quality
    - How to measure it ?
    - Impact on business performance
    - The “ideal” IT system should reduce complexity to become fully reliable, cheap, quick & easy to change
    - **Session A.3 : Enterprise Architecture is the solution to this challenge**
  - Value of Architecture
    - The most impacting complexity does not appear at the level of a single application
    - Architecture as the only way to reduce complexity on a large scale

2.2 Global presentation of an Architecture

- **Session B.1 : Global Presentation of Enterprise Architecture**
  - Enterprise Architecture Main Concepts :
    - the 3 architectures and related concepts
    - Extended Definition of Architecture as the common & reusable part of the enterprise system
    - Example of some architecture deliverables
  - Different enterprises = Different Architectures
    - How should EA adapt to the Enterprise culture & strategy
    - Types of Enterpises :
      - local/global
      - big/small
      - centralized/federal/decentralized
      - Internal/external growth
      - public/private
    - Which Architecture fits each type of Enterprise ?

2.3 What is a Functional architecture (Business + Organization)

- **Session B.2 : What is a Functional Architecture**
  - Difference between Business and Organization

        - Split between « What » is achieved and « Who » does it ? Concentrate on the « What »
    - Define Entities
        - How to identify Business Entities & Domains ?
        - How to identify Organizational Entities ?
        - Examples of maps and models
    - Define Processes
        - How to indentify and map Core Business Processes (and Domains) and Business Functions
        - How to translate Business Processes into Organizational Processes (and vice versa) ?
        - How to identify Organizational Functions and Activities ?
        - Examples of maps and models

2.4 What is an IT Architecture

- **Session B.3 : What is an IT Architecture ?**
    - What is an IT System ? IT Architecture Overview
        - Main concepts definition (Software Service, Class, Block + Application structure / layers)
        - Examples of some models
        - Operation Environment
            - Hardware and networks / OS, DBMS, Middleware
            - How applications and data are spread on systems
            - Operation Tools: tuning, load balancing, change management, error management, back-up & restore
        - Development Environment
            - Modeling tools / Programming tools / Other tools for test, integration, mapping, documentation, tuning, …
        - Operating Model : Manage Present IS (Run) or Build future IS (Build)
    - Block Cartography
        - How to model the 3 architectures on different levels
        - Architecture maps (cartography) as a means to understand your assets (business and IT) and communicate at the right level of detail
        - Links between the different architectures and between the different levels of block cartography – Way to align IT with the business and develop a common language/continuity between business & IT partners
        - Examples of some models
    - Component Based Architecture
        - Definitions : black components/white components
        - Analysis & Design Patterns : Examples
        - Current issues : versioning, interfaces, integration and testing …

2.5 How to manage an Architecture

- **Session C.1 : How to decide an Architecture ?**
    - Value and cost of Architecture :
        - How much to spend on Architecture ? For what benefit ?
    - Organization :
        - People : Role and responsibilities of architecture teams and other IT and business teams
        - Which organization ? (actors, decision bodies, review cycles …)
    - Performance tracking :

- Check quality of architecture and ROI : How to monitor the usage and benefits of Architecture ?

- **Session C.2 : How to get an Architecture ?**
  - Define a Target
  - Buy and/or Make
  - Iterative process
    - Think Big, Start Small and iterate, increasing breadth (scope) and depth (successive versions)
    - Start with Entities
    - Then Development environment, Operation environment
    - Find a first positive internal customer
  - How to make the best use of Architecture
    - Architecture should not be just norms & standards
    - Use your best and most experienced people as architects to build generic and reusable elements
    - Develop Architecture presence in the projects by delivering an increasingly rich set of Architecture elements, that are simple to understand and available to everyone through an easy to use reference tool
  - some example of Architecture Frameworks (TOGAF, SEAM, Zachman …)
  - Package or internal developments: which rules
  - Migration approach and tools
  - Interface approach and tools
  - Software control quality control tools
  - Which criterias for Development Environment ? for Operations Environment ?

- **Session C.3 : How to promote and support an Architecture ?**
  - Promote Reuse => Change Management (Communication and training)
    - Evangelize through a network of opinion leaders (top managers, architects, project directors)
    - Train Business and IT professionals widely
    - Advertise success stories
    - Define reuse metrics and incentives

- **Session C.4 : How to use an Architecture ?**
  - Governance :
    - Impact on the IT planning process : how Architecture is taken into account in the projects and application portfolio management ?
  - Impact on the development process (Build)
    - Short reminder on Software Engineering and project Management
      - Examples of some development process (Merise V cycle, Y cycle, RAD, RUP) and project Management phases (like PMI or PRINCE2) : Requirements gathering, analysis, design, programming, test, integration, pilot, deployment, support, close
      - Comparison between a solution implemented from scratch and reusing the IT Architecture components
    - How to build a solution from existing architecture components or build generic objects that can be reused ?
      - How to define Requirements?
      - How to ensure upward compatibility between successive versions of an application?
      - How to stop requirements for a given version?
      - How to iterate inside a version: progressive requirements and progressive prototype
      - How to help and check component reuse?
      - How application developers may improve components?

        - How to manage Tests, Versioning ?
    - Promote Reuse
        - How to compute reuse rate?
        - How to train developers to reuse?
        - How to train Business Analysts to reuse common specifications?

- **Session C.4 : How to use an Architecture ?**
    - Impact on the maintenance process (Run)
        - Analyze your current IS
            - Inventory and map your assets (baseline cartography)
            - Identify your baseline maintenance and operating costs
            - Assess the level of complexity of your application portfolio
            - Measure the level of your current Architecture
            - Estimate the benefits of reducing complexity
        - Prioritize simplification projects according to ROI and Business Priorities
        - Big Bang versus Incremental simplification : pros and cons
        - Run simplification projects of legacy systems
            - Describe legacy system to the right level / Define Target
            - Choose between Transformation & Replacement
            - Data Migration issues
            - Plan and budget carefully / Get a formal Approval for the project
        - Include simplification in the IT Governance
        - How can an automatic code analysis or conversion tool help ? Examples
        - How to use a rule engine to gain flexibility in a legacy system ?

3 The profiles or jobs

We do not try to classify by **level of responsibility**: like “Project manager” and “Developer” which have specific definitions in each organization. We define all topics useful for the full job.
Depending on the Enterprise Culture and Organization, a subset of the topics can be delivered to each detailed job defined by each Enterprise:

- **Decider**: executive involved in Enterprise Architecture decisions
    - Group decider
    - Company decider
- Business people
    - **Business Architect**
    - **Business Analyst**
    - Users
- IT
    - IT Architect
        - “City planner” (Enterprise Architect)
        - **Software Architect**
        - Technical Architect or **Infrastructure Architect**: Development and Operation Systems
    - IT Developer
        - **IT Developer**

3.1 Decider

3.1.1 Main responsibilities

- Decide which architecture level for the Enterprise and decide budget
- Check Architecture development
- Promote and check its usage (including for himself)

3.1.2 Modules

To be defined for each Enterprise, depending on the context.

3.2 Business Architect

3.2.1 Main responsibilities

- Define Business Entities
- Define common Functions (business or organization)
- Define Process Models

3.2.2 Modules

Module A, B1 and C1

3.3 Business Analyst

3.3.1 Main responsibilities

- Define Business Processes and Organization Processes
- Define specific Entities
- Define specific Functions
- Build test cases
- Test software and accept it
- Document for end users
- Train Users
- Help data migration

3.3.2 Modules

Module A, B1, B2 and C1

3.4 City Planner

3.4.1 Main responsibilities

- Decompose present Block cartography: structure and interfaces
- Define future Block cartography
- Define migration path

3.4.2 Modules

Modules A, B, C1 and C2

3.5 Software Architect

3.5.1 Main responsibilities

- Develop or buy reusable **Data services** and **Software Services**
- Organize **access** to these Services
- Prepare **Development System** for “white components” (inheritance)
- Define tools and approach for **integration** of specific developments

3.5.2 Modules

Modules A, B and C

3.6 Infrastructure Architect

3.6.1 Main responsibilities

- Define OS, DBMS, middleware
- Define hardware structure
- Define where store Software and Data
- Define IT Operations processes and management tools

3.6.2 Modules

Modules A, B1, B3, C

3.7 IT developer

3.7.1 Main responsibilities

- Understand requirements
- Design its software reusing Software Services and White components
- Program
- Iterate with Business Analyst
- Produce technical documentation
- Test
- Integrate
- Deliver new components to Architecture team

3.7.2 Modules

Modules B1, B3 and C4

3.8 Summary

	Why ?			What ?			How ?			
	A.1	A.2	A.3	B.1	B.2	B.3	C.1	C.2	C.3	C.4
Executive	X	X	X	X			X			
Business Analyst	X	X	X	X	X		X			
Project Manager	X	X	X	X	X	X				X
Developer				X		X				X

Business Architect	X	X	X	X	X	X	X	X	X	X
City Planner	X	X	X	X	X	X	X	X		
Software Architect	X	X	X	X	X	X	X	X	X	X
Infrastructure Architect	X	X	X	X		X	X	X	X	X