Chapter 1

Introduction

1.1. A New Era of Enterprise Architecture (EA) Planning

The decade and era of Enterprise Architectures (EA) is just beginning and already architects and engineers in industry and business sectors, Department of Defense (DoD) and the Federal Agencies are becoming painfully aware of the variety and magnitude of challenges in the design and assessment of these architectures. Enterprise architectures are characterized by large-scale, legacy-rich, business-process-driven, organizationally intensive, and geographically distributed systems that must meet a vast array of functional and performance requirements while observing significant build time and funding constraints. The problem is often exacerbated by the existence of multiple legacy sub-systems that perform critical functions on a round-the-clock, continuous basis (i.e., 24x7) and cannot be simply "turned off" and replaced with new architecture components weeks or months later. Also, in the last 3–5 years the General Accounting Office (GAO), the Office of Management and Budget (OMB) and other overseeing organizations are providing recommendations and guidelines for the use of business processes, business systems, and system performance measurements that must be identified and defined at the outset of the design effort. Some existing EA frameworks, although rich in text and graphical representation, lack in formal representation, with little or no theoretical basis, thus potentially limiting their applicability and usefulness across domains.

Business, industry, and government publications show a clear and marked trend towards both business and technical solutions that address the entire enterprise, not just a part of it. In fact, these business process

and business systems drive these architecture design efforts, it is now recognized. The Internal Revenue Services (IRS), US Customs, Virginia's Veterans' Affairs and other Federal and state agencies are currently involved in enterprise-level architecture planning, design, and implementation efforts. There are a myriad of challenges to the tasks of defining, designing, and assessing architectures:

- Architectures of large-scale systems are often functionally complex, their design evolves over long time frames (years), and are difficult to assess due to changing requirements, complex business processes, large number of distributed systems, emerging new technologies and business paradigms.
- It is not crystal-clear today how to best proceed with the identification, representation, and measurement of critical EA components, including business processes, business systems, data model, and infrastructure.
- A major challenge facing the design and assessment of architectures of very-large systems today is the gathering and documentation of architectural concepts across multiple domains, the limited availability of modeling and simulation tools, as well as the presentation and publication of agreed-upon design principles in the enterprise architecture community.
- Business process models (e.g., boxes and arrows), component/COTS evaluation frameworks (e.g., checklists), business systems models (e.g., hierarchical trees), etc. all use different structural representations. Presentations, workshops, and inter-team participation then essentially provide a "unifying model" that generally is able to combine value across of those structurally different models.

1.2. What is an Enterprise Architecture?

An Enterprise Architecture (EA) is a set of business and engineering artifacts, including text and graphical documentation, that describes and guide the operation of an enterprise-wide system, including instructions for its life cycle operation, management, evolution, and maintenance. Specific content of these artifacts can include a vision or mission statement, a set of system requirements, a Business Process Architectural View, a Business Systems Architectural View, a Data

Architectural View, an Applications Architectural View, and a Technology Architectural View.

1.3. What is an Enterprise Architecture Framework?

An Enterprise Architecture (EA) framework is a business and engineering recipe (i.e., a blueprint, a set of instructions, a specification) for the construction of an Enterprise Architecture (EA).

Although this field is still evolving, there are already a number of definitions of EA in the published literature. "…there are three architectures: a data architecture, an applications architecture, and a technology architecture. Architectures in this context are like blueprints, drawings, or models …", Spewak (1992). "An enterprise … as a business association, consisting of a recognized set of interacting business functions, able to operate as an independent, stand-alone entity. There are enterprises within enterprises. For instance, a business unit within the overall corporate entity may be considered an enterprise as long as it could be operated independently…" T. Finneran (2001). The Catalyst methodology of Computer Sciences Corporation (CSC 2005) proposes eight model views to build EAs: a Business Model View, a System Engineering Model View, a Business Process Model View, an Organization Model View, a Location Model View, an Application Model View, a Data Model View, and a Technology Model View. Still earlier Zachman (1987) is among the pioneers of EA work who has described the EA framework as a "simple, logical structure of descriptive representations for identifying models that are the basis for designing the enterprise and for building the enterprise's systems".

In Circular A-130, the Office of Management and Budget (OMB) has defined an EA as "the explicit description and documentation of the current and desired relationships among business and management processes and information technology. It describes the 'current architecture' and 'target architecture' to include the rules and standards and systems life cycle information to optimize and maintain the environment which the agency wishes to create and maintain by managing its IT portfolio…" In the creation of an EA, Circular A-130 adds, agencies must identify and document:

(i) Business Processes - Agencies must identify the work performed to support its mission, vision and performance goals. Agencies must also document change agents, such as legislation or new technologies that will drive changes in the EA.
(ii) Information Flow and Relationships - Agencies must analyze the information utilized by the agency in its business processes, identifying the information used and the movement of the information. These information flows indicate where the information is needed and how the information is shared to support mission functions.
(iii) Applications - Agencies must identify, define, and organize the activities that capture, manipulate, and manage the business information to support business processes. The EA also describes the logical dependencies and relationships among business activities.
(iv) Data Descriptions and Relationships - Agencies must identify how data is created, maintained, accessed, and used. At a high level, agencies must define the data and describe the relationships among data elements used in the agency's information systems.
(v) Technology Infrastructure - Agencies must describe and identify the functional characteristics, capabilities, and interconnections of the hardware, software, and telecommunications.

Essentially, then, Circular A-130 requires five views or collections of definitions and component relationships in the creation of EAs and their documentation.

1.4. What is EA Planning?

> *Enterprise Architecture Planning (EAP) is the set of business and engineering methods, procedures, and activities that are applied to an Enterprise Architecture Framework for purposes of translating a "vision and strategy" into a set of system requirements and a set of architectural views leading to the construction, operation, and maintenance of an Enterprise Architecture (EA).*

1.5. Who is Doing EA Planning Today?

Many organizations in business, industry, and government are pursuing enterprise information architecture (EA) planning, design, and implementation activities today while several universities are already conducting related research and incorporating EA courses in their undergraduate and graduate programs:

Government Organizations and Corporations:

- Office of Management and Budget (OMB)
- U.S. Customs
- Internal Revenue Services (IRS)
- U.S. Army Corps of Engineers
- Department of Veterans Affairs (VA), www.fcw.com/fcw/articles/2002/0610/mgt-va-06-10-02.asp
- The MITRE Corporation

Universities:

- California State University at Los Angeles
- The George Washington University
- Universidad Autonoma of Mexico City (UNAM)
- University of Mondragón, Euskadi
- University of the Basque Country (UPV), Euskadi

Conferences:

- Enterprise Architecture in Federal Government (Telelogic Inc. foremerly Popkin Inc.), www.telelogic.com
- Enterprise Architecture Conference (EAC), www.government.popkin.com/events/events.htm

1.6. Why Organizations Are Doing EA Planning?

Economic efficiency in the implementation of business processes and systems is one reason Federal agencies are building enterprise information architectures. The Department of Veterans Affairs (VA), for example, has been actively involved in EA planning. “One of VA’s most essential yet challenging undertakings has been developing and

implementing an enterprise architecture to guide the department's IT efforts. An enterprise architecture – a blueprint for systematically and completely defining an organization's current (baseline) operational and technology environment and a roadmap toward the desired (target) state – is an essential tool for effectively and efficiently engineering business processes and implementing their supporting systems and helping them evolve. Office of Management and Budget (OBM) guidelines (OBM Circular A-130) require VA and other federal agencies to develop and implement enterprise architectures to provide a framework or maintaining existing and planned IT" (GAO-02-703, June 2002).

1.7. The Zachman Architectural Framework

The notion of looking at an architecture from several vantage points has been in the literature for a number of years already, but it was Zachman (1987) who probably best succeeded in conveying that notion with his concept and graphical representation of multiple views, as depicted on Figure 1.

The seven columns in this matrix organize architecture information into the categories of Data, Function, Network, People, Time, and Motivation. The five rows in this matrix organize architecture information into the categories of Planners's View, Owner's View, Designer's View, Bulder's View, and Subcontractor's View.

1.8. Multiple Architectural Views

As stated earlier, Spewak (1992) proposes three architectural views, while Zachman (1987) proposes 7 categories of data, and the CSC Catalyst methodology for the enterprise life cycle (ELC 2005) makes use of 8 architectural views. My own work and experience in EA planning, design, implementation, assessment, and deployment, coupled with the insight reported in those three earlier works, leads me to propose the use of these five *architectural views*:

- Business Process Architectural View
- Business Systems Architectural View
- Data Architectural View
- Applications Architectural View
- Technologies Architectural View

In my opinion, these five architectural views allow for adequate and sufficient variety of architectural representation (i.e., business processes, business systems, data model, etc.), a manageable set of business and engineering activities by the EA owners and team of contractors, cost efficiency in the application of guiding business and engineering design principles to multiple EA projects, and the potential for realistic EA completion, testing, and deployment over a 3–5 year time frame. The reader is reminded, however, to become familiar with each set of views prescribed by a customer, e.g., an Agency, Department of Defense (DoD) organization, or corporation.

1.9. Objectives of this Book

Specific objective of this book are as follows:

- To define an Enterprise Architecture (EA) in terms of its basic components, their interrelationships, an initial vision that will guide the articulation of a set of requirements, a set of business processes, and a set of engineering instructions for the implementation of these components into a working architecture in a production environment;
- To identify and briefly describe major Enterprise Architecture Frameworks in the Federal Agencies, Department of Defense, and the private sector;
- To add structure and mathematical rigor to the engineering phases of Enterprise Architecture representation, planning, design, and measurement;
- To identify and select a "central core" of Enterprise Architecture components, to develop a set of concepts and basis for interrelationships among these components (EA Representation), and to develop a set of Metrics that cut across multiple architectural views that can be used to conduct Attribute Tradeoff Analysis (EA Measurement);
- To provide step-by-step procedures in the construction of the five proposed architectural views: Business Process Architectural View, Business Systems Architectural View, Data Architectural View, Applications Architectural View, and Technologies Infrastructure Architectural View;

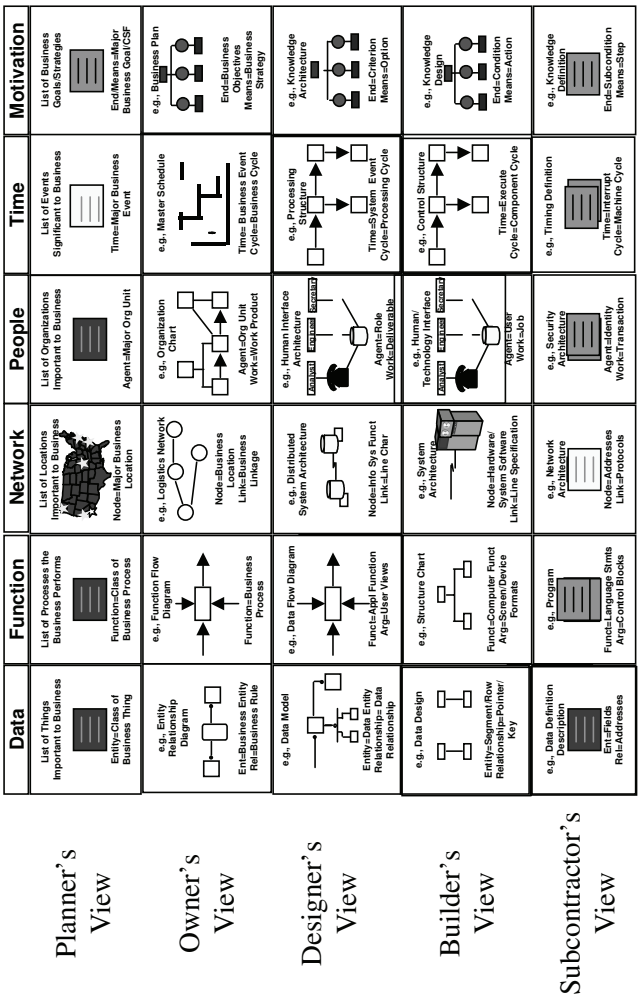

Figure 1. Zachman's Matrix of Architectural Views (Zachman 1987)

- To encourage and promote the creation and adoption of EA-related courses, training programs, and workshops in colleges and universities, both undergraduate and graduate programs; and
- To make these concepts and procedures available to business modelers, architecture designers, engineers, architecture owners, and designers of EA toolsets in the vendor community to help expedite the many activities involved in the design of modern, web-based enterprise information architectures.

1.10. EA Vision and Concept

How does an organization go about the business of modernizing its enterprise architecture? Is a "vision" or plan truly needed to gather the many resources required and the many activities that will be carried out in the months and possibly years that it takes to build an enterprise architecture? And should the "vision provider" be the owner of the future enterprise architecture, or can it be made up of consortium, a group if you will of enterprise owners, architects, engineers, decision makers? Well, yes, it makes both business and engineering sense to begin with an idea, vision, or high-level plan that lists the 5-10 major attributes of the future architecture, including a desire to modify and improve existing business practices in the current organization, to bring in and adopt new technologies, to increase market penetration, and to possibly re-structure the human side of the existing architecture through changes in its decision-making processes, its organizational structure, and the geographical distribution of components of the new enterprise architecture across departments, divisions, service centers, geographical regions, if applicable.

1.11. EA Representation

By EA representation I mean the application and use of concepts, notation, methods, step-by-step procedures, and tools already developed and available in several areas of discipline, including business, engineering, economics, and decision making. Already there are in the market today very fine works that address the basics of enterprise architecture planning (Spewak 1992, Zachman 1987). These works, however, although rich in text that describes those concepts and step-by-

step procedures, they lack design detail and the mathematical representation that offer the potential for uncovering and capturing additional insight into the development of business processes, business systems, the adoption of new technologies, and the trade-offs involved, in my opinion.

1.12. EA Design Teams and Work Products

Once the vision or plan has been formulated, the architectural effort can proceed to the creation of the various *business and engineering teams* that will be responsible for the implementation of that vision into a set of *work products*. Generally, an enterprise engineering organization will be made up several teams:

- Business Processes Team
- Business Systems Team
- Enterprise Standards Team
- Data Model Team
- Systems Engineering Team
- Infrastructure team

The Business Processes Team is responsible for translating the Vision and Strategy document (i.e., work product) into a set of business processes that describe the day-to-day business of the enterprise, e.g., preparing and submitting an order electronically to a vendor to replenish an inventory item, gathering information on the demographics of a particular region to support marketing goals, and applying payments to a customer account in the enterprise database; typically, there may be 100–200 business processes and each one will be represented in text form with 2–3 flowcharts that show the decomposition of a business process into 4–6 *business activities*. A Business Process Team is often made up of 4–8 people and their business modeling activity will produce the Business Processes Work Product.

In turn, the *Business Systems Team* will receive the Business Processes work product and use it as a basis to modify and extend the existing set of logical business systems into the new set of logical enterprise business systems. These business systems will provide the business services needed by the various business processes, so that typically one business process will require business services provided by

several business systems in a one-to-may working relationship; for example, the business process "Apply payment to customer account in the database" will require the existence and application of the business services "Receive electronic payment", "Authenticate sender of payment against existing database account", "Apply payment against account balance", "Update database account", and "Send receipt to customer via FAX". Again, the Business Systems Team will often be made up of 3–6 individuals with basic skills in business modeling, systems engineering, network services, and possibly database design. This is a particularly difficult and challenging endeavor as the members of this team must not only create a long list of appropriate business systems that will enable the enterprise architecture to carry out the many business processes already identified, and do so with a desired set of existing and new business and engineering frameworks, i.e., web-based processing if called for in the Vision and Strategy document, a relational or object-oriented database management system, encryption of messaging, other options. The work product of this team is a list of 200–300 business systems complete with business definitions, their representation in *a business system hierarchical tree* with appropriate interface definition and content. A substantial undertaking, indeed.

1.13. EA Measurement

How do the owner of the enterprise (i.e., the Customer) and the builder of the enterprise (i.e., the Contractor) know that the design and building of the enterprise architecture is progressing in effective and efficient ways? Measurement and assessment are essential. One way is to have each of the work products that document the evolution of the EA undergo a review and assessment process. Essential to this measurement process are two things: (a) scale of measurement, and (b) measurement criteria.

Nominal Scale: This is the most basic scale of measurement and it is used to differentiate one thing or object from another, e.g., personal names such Peter, Helen, or Iñaki; telephone numbers; architectural components such as portal, web server, and database; etc.

Ordinal Scale: This scale can be used to convey the relative merit, importance, or preference of one object (e.g., attribute, objective, plan, component) over another object. There is no meaningful numerical value assigned to the various objects being measured according to this scale.

Accordingly, we may opt for a scale that reads "Very Poor", "Poor", "Fair", "Good", "Very Good" and "Excellent" to assess the reliability of a Web server, for example. When using this scale with regards to the attribute RELIABILITY we can only say that server brand A with an assessment of "Very Good" is preferred to server brand B with an assessment of "Good", but we cannot say by how much. The intensity of preferences cannot be quantified in ordinal scales.

Ranking of objects also makes use of ordinal scales. A method can be said to rank-order a set of architectures or architectural components:

Architecture	A	D	C	B
Evaluation	Very Good	Good	Poor	Very Poor
Ranking	1	2	3	4

So that Architecture A is preferred to Architecture D, Architecture D is preferred to Architecture C, and so on. In this manner one would also say that "Architecture A out-ranks Architecture D", "Architecture D out-ranks Architecture B" and so on.

Cardinal Scale: This scale assigns numerical values to the objects being measured so that addition, subtraction, and multiplication are meaningful operations. Differences between values, for example, convey precise meaning about the intensity of a preference. Assignment of weights to attributes by a planner or decision maker is often performed on a cardinal scale, and the meaning of this scale should be communicated to the decision maker. Furthermore, cardinal scales can be of two types: *Interval* and *Ratio* scales.

Interval scale: This scale has an arbitrary "zero point" or reference point to allow addition, subtraction, and multiplication by a constant to yield meaningful results. The planner may want to use a scale for attribute weight assessment with values from 0 to 10, for example, but other ranges also apply:

Attribute	**Weight**
Reliability	8
Interoperability	6
License Terms	10
Standards Compliance	3
Performance	5
Security	5
Cost	6

In this example the planner INTEROPERABILITY was assigned a weight value of 6 and STANDARDS COMPLIANCE was assigned a weight value of 3. Thus, in this case the planner perceived the attribute INTEROPERABILITY to be twice as important as attribute STANDARDS COMPLIANCE and assigned weight values accordingly. The Celsius temperature scale is another example where the "zero point" was arbitrarily but conveniently taken to be the freezing point of water.

Ratio scale: This scale requires the adoption of a non-arbitrary "zero point". The Kelvin temperature scale is a good example of a scale with a non-arbitrary, absolute zero point, 0.0 degrees Kelvin. In fact, the lowest temperature that could be measured is 0.0 degrees Kelvin. Ratios of individual scale values have true meaning:

Architecture	A	B	C	D
Performance (Queries/Second)	15	8	10	20

We note that if the ratio scale for measurement is applied to the attribute PERFORMANCE (queries/second), then for D/C the ratio 20/10 = 2.0 means that "20" is to be 2.0 times as large as "10". Questions in a survey or questionnaire also generally make use of a ratio scale. Ratio scales, therefore, are said to be ratio-preserving scales with a non-arbitrary anchor point of zero.

1.14. Multiple Criteria

So once a determination is made about the type of measurement scale to use in EA assessment, how does one choose attributes (i.e., criteria, factors, dimensions) for EA assessment? By now the EA community has accumulated experience on categories of criteria and questions to ask in the assessment of alternative architectures as presented in Chapter 16, EA Evaluation and Assessment.

1.15. How this Book is Organized

The contents of this book are organized into 20 Chapters, 2 Appendices, and 1 CD-ROM as depicted in Figure 2.

- *Chapter 1, Introduction*: This chapter presents definitions for an Enterprise Architecture (EA), Enterprise Architecture Planning (EAP), gives credit to and brings to the attention of the reader earlier work by J. Zachman, S.H. Spewak, the Computer Sciences Corporation (Catalyst methodology), and MITRE Corporation, addresses the need for EA Vision and Strategy, and presents one list of criteria for architecture assessment.
- *Chapter 2, Motivation and Impetus for Enterprise Architectures:* This chapter discusses de origins of EAs in the Department of Defense (DoD) and its symbiotic relationship with agencies in the Government Sector and corporations in the Private Sector.
- *Chapter 3, The Business Process Architectural View*: It introduces the reader to the sequence of concepts and planning activities leading to the creation of a set of business processes and activities that reflect the vision of the owners of the enterprise architecture.
- *Chapter 4, The Business Systems Architectural View*: It guides the reader through the definition of the business systems and business services that are needed to implement and support each of the business processes and activities listed in Chapter 3.
- *Chapter 5, The Data Architectural View*: This chapter addresses data flows across components of the enterprise architecture, their storage, retrieval, and management within a data model and database management system (DBMS).
- *Chapter 6, The Applications Architectural View*: It introduces the reader to the basics of a software application architecture that houses the various categories of software components that implement the business services listed in Chapter 4. Applications reside within logical business systems and make possible the business services needed to carry out the business processes of the enterprise.
- *Chapter 7, The Unified Modeling Language in EA Design:* Software development is a crucial necessity in the process of planning, designing, and building enterprise architectures. This chapter discusses salient features of the Unified Modeling Language (UML), its use in the representation of the software design (Applications Architectural View), and essential role in the effective communication among the various design teams that must work together to make the EA happen. Use Case Diagrams,

Activity Diagrams, Diagram of Classes, and Sequence Diagrams are produced by the Enterprise Architect UML tool (by Sparx Systems) to illustrate the use of UML in EA design.

- *Chapter 8, The Technology Architectural View*: It discusses salient features of the hardware components that will house the applications. Salient hardware components include web-based portals, web application servers, security firewalls, transaction processors, database management systems, data warehouses, and tools for system management and decision support.
- *Chapter 9, Distributed Database Design with Multiple Criteria:* Enterprise architectures are data intensive by nature and design. In this chapter I review the pros and cons of multiple, geographically distributed small data stores versus a single data store; selection of data elements across multiple databases; strategies and rationale for database segmentation; and multiple criteria optimization techniques in distributed database planning and design.
- *Chapter 10, System Capacity and Performance:* This chapter highlights the importance of the enterprise architecture meeting both the functional and non-functional (i.e., performance) requirements. Organizations are learning the hard way the importance of having a system capacity and performance plan early in the EA program.
- *Chapter 11, Disaster Recovery Strategies in EA:* This chapter reflect s on real-life experience in the planning, design, and assessment of the disaster recovery (DR) component of EAs today (e.g., Air Force's Global Transportation System, IRS Modernization, US Customs, other). DR capability is "a must" in EA work, both from an economic and functional standpoint – Federal and DoD EA are mandated to have DR capability.
- *Chapter 12, An Overview of the TOGAF Architecture:* This chapter presents basic principles and main development elements of the Open Group's Architectural Framework (TOGAF), including the Standards Information Base (SIB), Technical Reference Model (TRF), and the steps in the Architectural Development Method (ADM). An example of a manufacturer and distributor of confection goods is borrowed (Perks and Beveridge 2003) to illustrate each of the seven phases of ADM.

- *Chapter 13, An Overview of the C4ISR (DoD) Architecture*: A large body of organizations in the Department of Defense (Dod) have developed principles, guidelines, data repositories, and Web sites for EA planning, design, building, and application in mission-critical environments. This chapter presents highlights of selected EA resources in DoD and their representation and management in highly useful tools such as System Architect (by Telelogic Inc.). Lessons learned on how to save time and money following successful strategies while avoiding costly pitfalls when meeting C4ISR requirements.
- *Chapter 14, The SENA Enterprise Architecture:* This chapter presents an illustrative example in the design of an enterprise architecture for the *Servicio Nacional de Aprendizaje* (SENA) in Bogotá, Colombia, made up of 114 vocational centers distributed throughout this county. Beginning with a set of system requirements, the design is detailed across the 5 architectural views.
- *Chapter 15, Multiple Criteria for EA Selection and Tailoring:* A variety of Enterprise Architecture (EA) frameworks are emerging today in response to an array of needs in organizations in the Federal Agency, Department of Defense (DoD), and the Private Sector. These needs reflect a rich mosaic of institutional settings, congressional mandates, capital availability for public investment, timeframe, complexity of business processes involve, system processing and performance requirements, stakeholders composition, and system release strategies, to mention a few. To a significant extent, the decision on which EA framework to select will impact the ability to plan for, design, and deliver a successful system to the customer on a timely and cost efficient manner.
- *Chapter 16, EA Evaluation and Assessment*: Enterprise Architectures need to be evaluated at several points in time in the life cycle in order to understand how well the planning, design, and implementation of the EA are proceeding, i.e., how well EA work is progressing against a set of goals and scheduled targets. This chapter presents examples of evaluation factors, including highlights of the set of EA indicators used by the General Accounting Office (GAO) to evaluate and classify EAs of 93 government agencies.

- *Chapter 17, Digital Administration:* This chapter presents a framework for the study of new the technologies involved in the recent phenomena of e-Government, e-Business, e-Learning, e-Democracy, e-Commerce, and other enterprises. Almost every business activity wants to have the letter *e* as a prefix to that business activity as if to communicate a new approach to doing business with implied economic and technological advantage. If so, why, where, when to do it, when not to do *e-Something*, what are the business and economic advantages, the costs, what does this paradigm mean about efficiency, how does it relate to the new technologies of information and communication (TICs), how does it relate to enterprise architectures (EA), who is doing it, and who is paying for it? These are some of the questions addressed in this chapter.
- *Chapter 18, Lessons Learned:* There are many challenges to the planning, building, and implementing of enterprise architectures today. We have learned that there are some things to do in a certain manner and that there are other things not to do and the reasons why. Reasons why EA work may not progress under time and budget constraints can include: Resources needed to support multiple, parallel activities are not in place; release strategy tried to release big chunks of functionality that required long time intervals (e.g., 2–3 years), lack of adequate integration among program components; lack of control points/gating; lack of performance planning, others.
- *Chapter 19, EA Implementation Strategies*: Because an enterprise architecture is a major engineering and organizational undertaking, it becomes necessary to "break it" into smaller pieces that are subsequently constituted as "projects" to be built by a community of contractors. Although the current state-of-the-art does make use of experience and sound engineering practices, there is not a well-defined, repeatable, and efficient basis or rationale for architectural decomposition and allocation to projects. This chapter takes the reader through a sequence of steps intended to allocate business systems into groups so that each group can later be constituted into an EA project. In the process, an Enterprise Systems Engineering Board (ESEB) plays a significant and crucial role in guiding planning, design, and implementation efforts within each project and the interfaces required.

- *Chapter 20, A Mathematical Framework for EAs:* This chapter introduces a new mathematical foundation of concepts, notation, and analytical artifacts for the representation, design, and measurement of enterprise architectures. For the first time in the literature, this chapter presents a unifying perspective of the five architectural views: Business Process Architectural View, Business Systems Architectural View, Data Architectural View, Applications Architectural View, and the Technology Architectural View. Ultimately, the goal of this framework is to improve communication among the various design teams and to achieve economic efficiency in the design and construction of enterprise architectures.
- ***Appendix A:*** CD ROM of *System Architect (SA)*, student version, the leading tool in the market today for representation, storage, management, and report generation of data across the 5 EA architectural views, courtesy of Telelogic Inc., www.telelogic.com (Formerly Popkin Inc.). Also, CD ROM of *the Enterprise Architect (EA) UML Tool,* a leading tool for UML representation of software design in EA work today, courtesy of Sparx Systems, www.sparxsystems.com, to assist both the instructor and the students with exercises and the design of software systems in the Applications Architectural View.

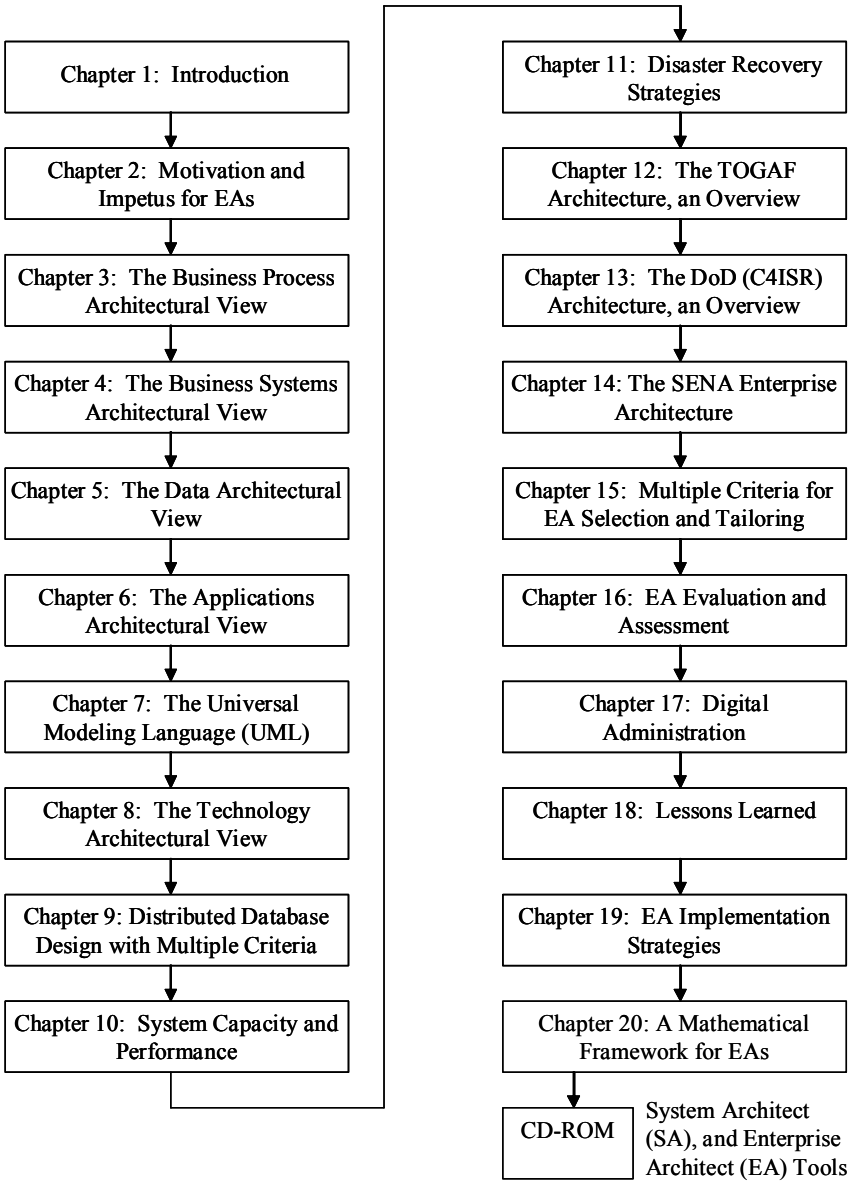

Figure 2. Flow of Chapters in this Book