

## Preface

This book is about Enterprise Architectures (EA), how to plan them, how to design them, and how to assess their capabilities in a team effort. It also presents a list of the new Technologies of Information and Communication (TICs), their main characteristics, their utilization in Digital Administration, and how they fit within the larger framework of Enterprise Architectures. An Enterprise Architecture is a business-and-engineering data repository and a roadmap, and both are used today by Federal Agencies, organizations in the Department of Defense (DoD), and corporations in the private sector in order to conduct their day-to-day businesses in a timely and cost effective manner.

This book reflects on the contributions of many individuals and organizations in those major EA-user communities and proceeds to highlight some of the steps involved in the planning, design, and assessment of these enterprise architectures. These steps, as we shall see, include the formulation of a statement of vision or mission by the owners of a current architecture that is to be modernized or one to be created, the translation of that statement into a set of system requirements, the development of a set of views or layers of “architectural knowledge” (e.g., a Business Process Architectural View, a Business Systems Architectural View, a Data Architectural View, an Applications Architectural View, and a Technology Architectural View), guidelines for organizational change, the design of sub-systems within those layers, the building of performance capabilities into the overall system, and a set of procedures for the operation and maintenance of such an enterprise architecture.

I wanted to write this book to share skills and experience with my students, the future architects and builders of EAs. The didactic approach and content in this book borrows from the author’s own work and experience in several organizations in the last 20 years in the USA,

Europe, and Latin America, while benefiting greatly from the many leading-edge contributions and experiences of dedicated engineers, computer scientists, and program managers in those organizations and countries. The summers of 1979 and 1980 as a NASA-ASEE Research Fellow at the Jet Propulsion Laboratory of the California Institute of Technology (Cal-Tech) allowed me the opportunity to begin to appreciate simplicity and purpose in engineering system design while observing the complexity of resource allocation and funding mechanisms in Government. It was however during my years of tenure with the U.S. Army Corps of Engineers at Ft. Belvoir, Virginia (Resident Scholar, 1980–1985) that concepts in “trade-off analysis” and “cost efficiency” captured my curiosity and became part of my box of tools and way of looking at and evaluating alternative designs on a given project.

The Corps’ “incremental approach” to learning from the design, construction, and fielding of a sub-system first, followed by the gathering of lessons learned before proceeding to the next, larger, more complex sub-system also became part of that tool box and mind set. Still, it took a few more years before I began to assess and appreciate the challenges and importance of engineering design and organizational change (OC), one working with the other, as a crucial collaborative effort in the design of large-scale business and engineering systems such as the Strategic Defense Initiative Program, otherwise known as the “Star Wars” program (NAVY-ASEE Research Fellow, Naval Research Laboratory, Washington, D.C., summers of 1988 and 1989). Other work experience also related to ways and means to mitigate risks in the engineering and management of data-centric space programs (NASA-ASEE Research Fellow at the Goddard Space Flight Center, Greenbelt, Maryland).

Later, it was gratifying to be able to translate these real-world experiences into case studies and examples in the classroom and to note that undergraduate and graduate students related well to those examples in terms of their own work and experience (Adjunct Professor, School of Business, George Washington University, 1990–Present; Research Associate Professor, School of Engineering, George Mason University, 1983–1990; and Research Associate Professor, School of Engineering, George Washington University, 1980–1983).

A pattern began to emerge in my approach to learning and doing things. I would be teaching for 4–5 years, next I would go back to industry to design and build systems with a team of people for 4–5 years, again go back to teaching for another 4–5 years, and so forth. At times

the cycles could be shorter. From 1997 to 1999 as lead performance engineer in the Global Transportation Network (GTN) program at Lockheed Martin, Manassas, Virginia, I was given the task of putting together the first Capacity and Performance Group in that organization. This task gave me the experience in that often underestimated yet crucial engineering function, capacity and performance engineering, that I would carry with me as I joined the MITRE Corporation in McLean, Virginia in 1999 to work in the planning, design, building, and assessment of large enterprise architectures. As a government designated federally funded research and development center (FFRDC), MITRE has major contractual agreements with many Federal Agencies (Internal Revenue Services (IRS), Home Security Agency, other) and government agencies in the armed services (Air Force, Army, Navy, other) to provide engineering oversight in the modernization of their respective enterprise architectures.

It was during those 5 years at MITRE that I had the opportunity to work with and learn from many EA architects and engineers in the validation and verification (V&V) of EA system requirements, the design of sub-systems in the various engineering teams (e.g., business systems team, applications architecture team, the infrastructure and technology team, the organizational team (OC), the performance engineering team, and so on), the testing of software code, prototype development, and the testing of the overall system for capacity and performance capabilities. There were many challenges to meet in enterprise architectures to be modernized or created from scratch. I had the opportunity to work with brilliant EA planners and engineers in many of the organizations involved: MITRE Corporation, the Federal Agencies (e.g., Internal Revenue Service, US Treasury, others), Armed Services (e.g., US Army, US Air Force, others), universities, and the Contractor community (e.g., Computer Sciences Corporation). These were all individuals that not only had formal training in multiple disciplines, years of experience in many projects, and utmost dedication, but were also great communicators. Great communicators, I say it again. Each one would do its homework first, and when their time came they were able to stand in front of a room filled with either 4–6 or 40–60 other professionals and convey knowledge, insight, and self-assurance. They were able to convey a vision of things to would come with the new enterprise architecture being proposed at the time. Engineering, business processes, and communication. Success of the EA work to be done depends greatly in

the ability of planners, engineers, and would-be users of the new architecture to do well these three things.

The Technical Exchange Management (TEM) series at MITRE. While many objectives of the MITRE oversight function were met with each new EA to design and build, many of us felt that there was room for improvement and so, encouraged by management, we designed and produced six one-day conferences in 2003 and 2004. We had *carte blanche* to propose and address any EA topic and we all had a ball in the process. Soon we had a group of 15–25 EA architects from all the engineering and management departments within MITRE and together we identified areas where EA work (i.e., planning, design, business modeling, testing, performance, EA compliance, other) was involved to identify issues, invite speakers, organize each TEM, and gather comments and lessons learned from each of the speakers, as these papers were presented in an auditorium and broadcasted to 12 MITRE centers in the USA and Europe. With each TEM, comments and lessons learned were communicated to management. Well, success came about much faster than many of us in the organizing committees had anticipated and, as it happened, the change came about torrentially and swiftly. Before the 2003–2004 TEM series had concluded over 8 departments within MITRE were significantly re-organized in terms of engineering and business responsibilities, peoples, skills sets, and corporate commitment to be received. Notably, the business modeling and performance engineering functions that many of us had advocated during those 5 years were promoted to the “top of the list” by management executives. MITRE had changed for the better, for the benefit of the EA community, many of us felt.

From 1994 to 2004 many enterprise architecture efforts had been funded, and while their completion was well underway in several agencies (Government Sector) and corporations (Private Sector) there was increased awareness of the need to assess the value of these large-scale engineering and business efforts. By 2004, “EA value assessment” had become the new thing to do. The Office of Management and Budget (OMB), for example, had begun to publish four large volumes of “reference models” to inquire into the business and engineering value of the EAs and to promote the use of indicators to measure such value. The EA community and the taxpayers both felt it was time to find out whether all those millions of taxpayer dollars spent in EA work during the last 10 years were going to produce the goods promised or whether

“mid-course” corrective action would have to take place. The mood of the EA community and a nation had begun to change and to reconsider things. I, too, felt it was time for me to go back to academia and share with others this experience.

This time, however, I felt it was time for me to share this engineering and business experience in EA work with folks in the “old country”, Euskadi, the Basque Country. So I joined the Computer Sciences Department at the Mondragon University in February 2004. In the USA we had learned to do EAs and soon enough digital and Web-based services would be all over the landscape. And what about Europe? Are towns, cities, and countries in Europe also experiencing this interest in enterprise architectures and digital services, and if so where, how, who is paying the bills, and are the taxpayers getting the goods? Over the next 5 years I hope to find out and share my answers to this questions.