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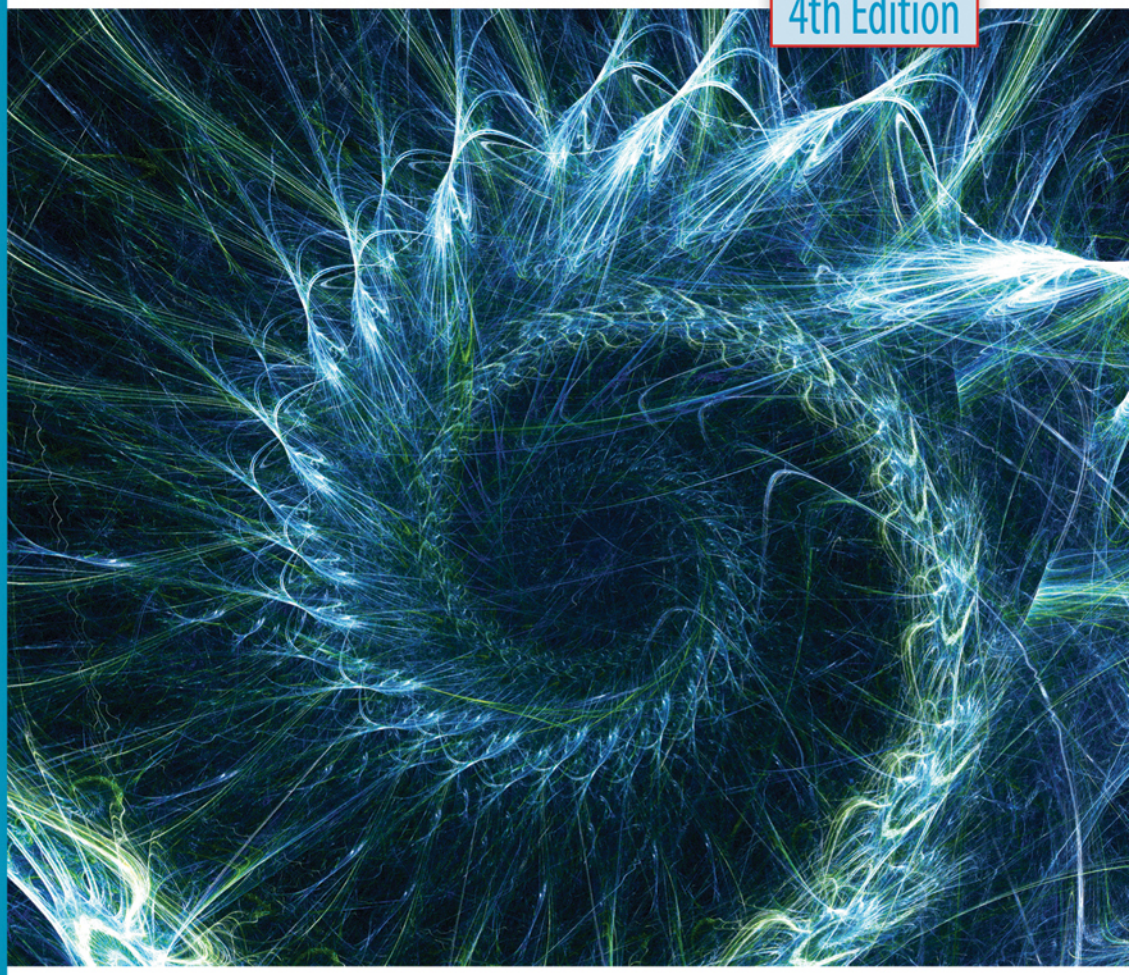
TOGAF® 9 Foundation Study Guide

Preparation for the TOGAF 9 Part 1 Examination

4th Edition



Rachel Harrison and Andrew Josey

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TOGAF® 9 Foundation

Study Guide

4th Edition

Preparation for the TOGAF 9 Part 1 Examination

Prepared by Rachel Harrison of Oxford Brookes University and
Andrew Josey, The Open Group

THE Open GROUP

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Comments relating to the material contained in this document may be submitted to:
The Open Group
Apex Plaza
Reading
Berkshire, RG1 1AX
United Kingdom
or by electronic mail to:
ogspecs@opengroup.org

Contents

Preface

This Document

This document is a Study Guide for the TOGAF® 9 Foundation qualification. This fourth edition is based on Version 3 of The Open Group Certification for People: Conformance Requirements (Multi-Level), and is aligned with the TOGAF Standard, Version 9.2.

It gives an overview of every learning objective for the TOGAF 9 Foundation Syllabus and in-depth coverage on preparing and taking the TOGAF 9 Part 1 Examination. It is specifically designed to help individuals prepare for certification.

The audience for this Study Guide is:

- Individuals who require a basic understanding of the TOGAF 9 framework
- Professionals who are working in roles associated with an architecture project such as those responsible for planning, execution, development, delivery, and operation
- Architects who are looking for a first introduction to the TOGAF 9 framework
- Architects who want to achieve Level 2 certification in a stepwise manner

A prior knowledge of Enterprise Architecture is advantageous but not required. While reading this Study Guide, the reader should also refer to the TOGAF 9 standard.[1]

The Study Guide is structured as shown below. The order of topics corresponds to the learning units of the TOGAF 9 Foundation Syllabus (see Appendix D).

- Chapter 1 (Introduction) provides a brief introduction to TOGAF certification and the TOGAF 9 Part 1 Examination that leads to TOGAF 9 Foundation, as well as how to use this Study Guide

1 The TOGAF Standard, Version 9.2 (C182), available at www.opengroup.org/library/c182.

- Chapter 2 (Basic Concepts) introduces the basic concepts of Enterprise Architecture and the TOGAF standard; this provides a high-level view of the TOGAF framework, Enterprise Architecture, architecture frameworks, the contents of the TOGAF standard, and the TOGAF Library
- Chapter 3 (Core Concepts) describes the core concepts of the TOGAF 9 framework
- Chapter 4 (Key Terminology) introduces the key terminology of the TOGAF 9 standard
- Chapter 5 (Introduction to the ADM) introduces the Architecture Development Method (ADM), the objectives of each phase of the ADM, and how to adapt and scope the ADM for use
- Chapter 6 (The Enterprise Continuum and Tools) describes the Enterprise Continuum and tools; its purpose, and its constituent parts
- Chapter 7 (The ADM Phases) describes how each of the ADM phases contributes to the success of Enterprise Architecture
- Chapter 8 (ADM Guidelines and Techniques) describes guidelines and techniques provided to support application of the ADM
- Chapter 9 (Architecture Governance) describes Architecture Governance
- Chapter 10 (Views, Viewpoints, and Stakeholders) introduces the concepts of views and viewpoints and their role in communicating with stakeholders
- Chapter 11 (Building Blocks) introduces the concept of building blocks
- Chapter 12 (ADM Deliverables) describes the key deliverables of the ADM cycle and their purpose
- Chapter 13 (TOGAF Reference Models) describes the TOGAF reference models from the TOGAF Library: the Technical Reference Model (TRM) and the Integrated Information Infrastructure Reference Model (III-RM)
- Appendix A (Answers to Test Yourself Questions) provides the answers to the Test Yourself sections provided at the end of each chapter
- Appendix B (Test Yourself Examination Papers) provides two Test Yourself examinations to allow you to assess your knowledge of the TOGAF 9 Foundation Syllabus and readiness to take the TOGAF 9 Part 1 Examination
- Appendix C (Test Yourself Examination Paper Answers) provides the answers to the examinations in Appendix B
- Appendix D (TOGAF 9 Foundation Syllabus) provides the TOGAF 9 Foundation Syllabus

How to Use this Study Guide

The chapters in this Study Guide are arranged to follow the organization of the TOGAF 9 Foundation Syllabus (see Appendix D) and should be read in order. However, you may wish to use this Study Guide during review of topics with which you are already familiar, and it is possible to select topics for review in any order. Where a topic requires further information from a later part in the syllabus, a cross-reference is provided.

Within each chapter are "Key Learning Points" and "Summary" sections that help you to easily identify what you need to know for each topic.

Each chapter has a "Test Yourself" questions section that will help you to test your understanding of the chapter and prepare for the TOGAF 9 Part 1 Examination. The purpose of this is to reinforce key learning points in the chapter. These are multiple-choice format questions where you must identify one correct answer.

Each chapter also has a "Recommended Reading" section that indicates the relevant sections in the TOGAF 9 documentation that can be read to obtain a further understanding of the subject material.

Finally, at the end of this Study Guide are two "Test Yourself" examination papers that you can use to test your readiness to take the official TOGAF 9 Part 1 Examination. These papers are designed to include the same question formats and a similar difficulty level to the official TOGAF 9 Part 1 Examination.

Conventions Used in this Study Guide

The following conventions are used throughout this Study Guide in order to help identify important information and avoid confusion over the intended meaning.

- Ellipsis (…)
  Indicates a continuation; such as an incomplete list of example items, or a continuation from preceding text.
- **Bold**
  Used to highlight specific terms.
- *Italics*
  Used for emphasis. May also refer to other external documents.

- (Syllabus reference: Unit X, Learning Outcome Y: Statement)
  Used at the start of a text block to identify the TOGAF 9 Foundation Syllabus learning outcome.

In addition to typographical conventions, the following conventions are used to highlight segments of text:

A Note box is used to highlight useful or interesting information.

A Tip box is used to provide key information that can save you time or that may not be entirely obvious.

About the TOGAF Standard

The TOGAF Standard, a standard of The Open Group, is a proven Enterprise Architecture methodology and framework used by the world's leading organizations to improve business efficiency. It is the most prominent and reliable Enterprise Architecture standard, ensuring consistent standards, methods, and communication among Enterprise Architecture professionals. Those fluent in the TOGAF standard enjoy greater industry credibility, job effectiveness, and career opportunities. The TOGAF standard helps practitioners avoid being locked into proprietary methods, utilize resources more efficiently and effectively, and realize a greater return on investment.

About The Open Group

The Open Group is a global consortium that enables the achievement of business objectives through technology standards. Our diverse membership of more than 580 organizations includes customers, systems and solutions suppliers, tools vendors, integrators, academics, and consultants across multiple industries.

The Open Group aims to:

- Capture, understand, and address current and emerging requirements, establish policies, and share best practices

- Facilitate interoperability, develop consensus, and evolve and integrate specifications and open source technologies
- Operate the industry's premier certification service

Further information on The Open Group is available at www.opengroup.org.

The Open Group publishes a wide range of technical documentation, most of which is focused on development of Open Group Standards and Guides, but which also includes white papers, technical studies, certification and testing documentation, and business titles. Full details and a catalog are available at www.opengroup.org/library.

About the Authors

Rachel Harrison, Oxford Brookes University
Rachel Harrison is a Professor of Computer Science in the Department of Computing and Communication Technologies at Oxford Brookes University. Previously she was Professor of Computer Science, Head of the Department of Computer Science, and Director of Research for the School of Systems Engineering at the University of Reading. Her research interests include systems evolution, software metrics, requirements engineering, software architecture, usability, and software testing. She has published over 100 refereed papers and consulted widely with industry, working with organizations such as IBM, the DERA, Philips Research Labs, Praxis Critical Systems, and The Open Group. She is Editor-in-Chief of the Software Quality Journal, published by Springer.

Prof. Harrison holds an MA in Mathematics from Oxford University, an MSc in Computer Science from University College London, and a PhD in Computer Science from the University of Southampton. She is a Member of the British Computer Society, an Affiliate Member of the IEEE-CS, a Member of the Association of Computing Machinery, and is a Chartered Engineer.

Andrew Josey, The Open Group
Andrew Josey is VP Standards and Certification, overseeing all certification and testing programs of The Open Group. He also manages the standards process for The Open Group. Since joining the company in 1996, Andrew has been closely involved with the standards development, certification, and testing activities of The Open Group. He has led many standards development projects including specification and certification development for the ArchiMate®, TOGAF®, POSIX®, and UNIX® programs.

He is a member of the IEEE, USENIX, and the Association of Enterprise Architects (AEA). He holds an MSc in Computer Science from University College London.

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- Andras Szakal
- Robert Weisman
- Ron Widitz

References

The following documents are referenced in this Study Guide:

- Analysis Patterns – Reusable Object Models, M. Fowler, Addison-Wesley
- Bill Estrem: "TOGAF to the Rescue" (www.opengroup.org/downloads)
- EU Directives on the Award of Public Contracts
- Interoperable Enterprise Business Scenario, October 2002 (K022), published by The Open Group; refer to: www.opengroup.org/library/k022
- ISO/IEC/IEEE 15288:2015, Systems and Software Engineering – System Life Cycle Processes
- ISO/IEC/IEEE 42010:2011, Systems and Software Engineering – Architecture Description
- The Clinger-Cohen Act (US Information Technology Management Reform Act 1996)
- The Open Group Certification for People: Certification Policy for Examination-Based Programs, April 2016 (X1603), published by The Open Group; refer to: www.opengroup.org/library/x1603
- The Open Group Certification for People: Program Summary Datasheet, 2018, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_cert_summary.pdf)
- The Open Group Certification for People: TOGAF® Conformance Requirements (Multi-Level), Version 3.0, April 2018 (X1810), published by The Open Group; refer to: www.opengroup.org/library/x1810
- The Sarbanes-Oxley Act (US Public Company Accounting Reform and Investor Protection Act 2002)
- The TOGAF® Standard, Version 9.2, a standard of The Open Group, April 2018 (C182), published by The Open Group; refer to: www.opengroup.org/library/x1810
- TOGAF® 9 Foundation Datasheet, 2018, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_foundation.pdf)
- TOGAF® Series Guide: Business Scenarios, September 2017 (G176), published by The Open Group; refer to www.opengroup.org/library/g176
- TOGAF® Series Guide: The TOGAF Integrated Information Infrastructure Reference Model (III- RM): An Architected Approach to Boundaryless Information Flow™, November 2017 (G179), published by The Open Group; refer to www.opengroup.org/library/g179

- TOGAF® Series Guide: The TOGAF Technical Reference Model (TRM), September 2017 (G175), published by The Open Group; refer to www.opengroup.org/library/g175
- Why Does Enterprise Architecture Matter?, White Paper by Simon Townson, SAP, November 2008 (W076), published by The Open Group; refer to: www.opengroup.org/library/w076

The following web links are referenced in this Study Guide:

- The Open Group TOGAF 9 Certification website: www.opengroup.org/certifications/togaf
- The TOGAF information website: www.togaf.info

Chapter 1

Introduction

1.1 Key Learning Points

This document is a Study Guide for students planning to become certified for TOGAF 9 Foundation. This edition is aligned to the approved syllabus for the TOGAF Standard, Version 9.2. It will familiarize you with all the topics that you need to know in order to pass the TOGAF 9 Part 1 Examination.

It gives an overview of every learning objective for the TOGAF 9 Foundation Syllabus and in-depth coverage on preparing and taking the TOGAF 9 Part 1 Examination. It is specifically designed to help individuals prepare for certification.

This first chapter will familiarize you with the TOGAF 9 certification program and its principles, as well as give you important information about the structure of the TOGAF 9 Part 1 Examination.

The objectives of this chapter are as follows:

- To provide an understanding of TOGAF certification and why you should become certified
- To learn key facts about the TOGAF 9 Part 1 Examination

1.2 The Open Group Certification for People Program

(Syllabus Reference: Unit 13, Learning Outcome 1: You should be able to briefly explain the TOGAF certification program, and distinguish between the levels for certification.)

Certification is available to individuals who wish to demonstrate they have attained the required knowledge and understanding of the TOGAF Standard, Version 9.[2]

2 This edition of this Study Guide covers Version 3 of The Open Group Certification for People: TOGAF Conformance Requirements (Multi-Level), which are aligned to the TOGAF Standard, Version 9.2.

There are two levels defined for TOGAF 9 People certification, denoted Level 1 and Level 2, which lead to certification at TOGAF 9 Foundation and TOGAF 9 Certified, respectively. This Study Guide covers the first of these – TOGAF 9 Foundation. Studying for TOGAF 9 Foundation can be used as a learning objective towards achieving TOGAF 9 Certified, as the learning outcomes in TOGAF 9 Foundation are also required in TOGAF 9 Certified.

Table 1: Certification Levels and Associated Labels

Certification Level	Certification Label
Level 1	TOGAF 9 Foundation
Level 2	TOGAF 9 Certified

Why is TOGAF certification important?
The existence of a certification program for the TOGAF standard provides a strong incentive for organizations to standardize on the TOGAF standard as the open method for Enterprise Architecture, and so avoid lock-in to proprietary methods. It is an important step in making Enterprise Architecture a well-recognized discipline, and in introducing rigor into the procurement of tools and services for Enterprise Architecture.

The two certification levels are summarized in Figure 1. Figure 1 shows the relationship between Level 1 and Level 2. Level 2 (TOGAF 9 Certified) is a superset of the requirements for Level 1 (TOGAF 9 Foundation).[3]

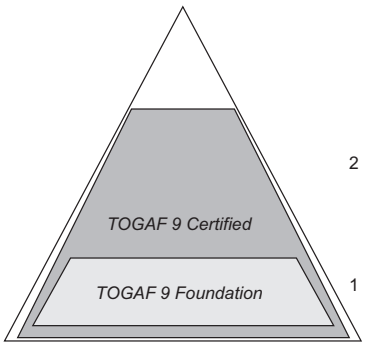


Figure 1: TOGAF 9 Certification Program Overview

3 The gap at the top of the pyramid is to signify that additional credential-based certification is planned beyond Level 2.

1.2.1 Certification Document Structure

The documents available to support the Program are as shown in Figure 2.

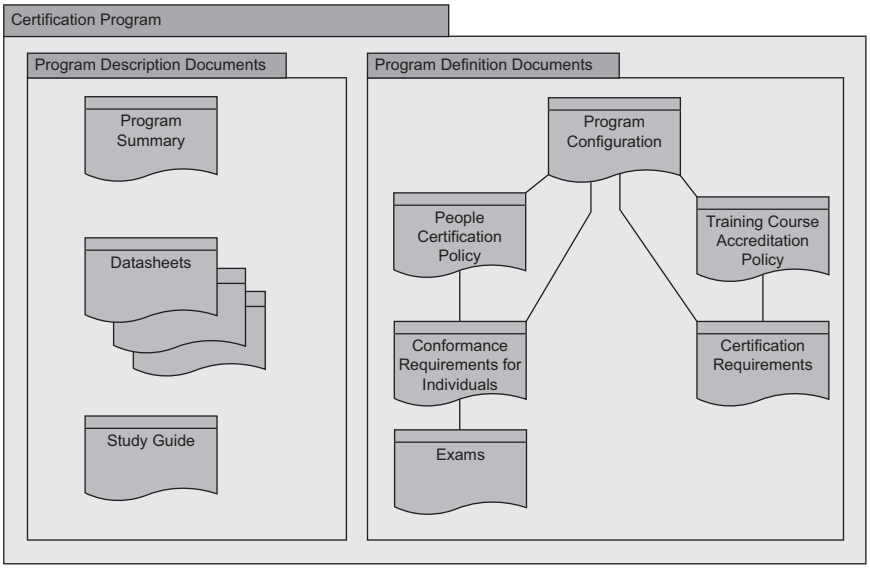


Figure 2: Certification Document Structure

Program description documents, such as this Study Guide, are intended for an end-user audience including those interested in becoming certified. The Program definition documents are intended for trainers, examination developers, and the Certification Authority. All these documents are available from The Open Group website.[4]

Why become certified?

Becoming certified demonstrates clearly to employers and peers your commitment to Enterprise Architecture as a discipline. In particular, it demonstrates that you possess a body of core knowledge about the TOGAF standard as an open, industry standard framework and method for Enterprise Architecture. The Open Group publishes the definitive directory of TOGAF Certified individuals, and certified service and product offerings, and issues certificates.

4 Available from the TOGAF 9 Certification website at www.opengroup.org/certifications/togaf9, or from The Open Group Library at www.opengroup.org/library.

1.2.2 Program Vision and Principles

The vision for the Program is to define and promote a market-driven education and certification program to support the TOGAF 9 framework. The Open Group certification programs are designed with the following principles in mind:

Table 2: The Open Group Certification Program Principles

Principle	Certification Aspects
Openness	Certification is open to applicants from all countries.[5]
Fairness	Certification is achieved only by passing an examination that is equivalent to that taken by any other candidate.
Market Relevance	Each Program is designed to meet the perceived needs of the market.
Learning Support	Training courses are provided by third parties, according to the needs of the market.
Quality	Training course providers may choose to seek accreditation from The Open Group for their courses. Accredited courses are listed on The Open Group website.
Best Practice	The Programs are designed to follow industry best practice for equivalent certification programs.

1.2.3 TOGAF 9 Foundation

The purpose of certification to TOGAF 9 Level 1, known as TOGAF 9 Foundation, is to provide validation that the candidate has gained an acceptable level of knowledge of the TOGAF terminology, structure, and basic concepts, and understands the core principles of Enterprise Architecture and the TOGAF standard.

The learning objectives at this level focus on knowledge and comprehension. Individuals certified at this level will have demonstrated their understanding of:

- The basic concepts of Enterprise Architecture and the TOGAF framework

5 Subject to compliance with applicable United States laws, regulations, or orders including those relating to export including but not limited to International Traffic in Arms Regulations (ITAR) and/or Export Administration Act/Regulations (EAR).

- The core concepts of the TOGAF standard
- The key terminology of the TOGAF standard
- The ADM cycle and the objectives of each phase, and how to adapt and scope the ADM
- The concept of the Enterprise Continuum; its purpose, and its constituent parts
- How each of the ADM phases contributes to the success of Enterprise Architecture
- The ADM guidelines and techniques
- How Architecture Governance contributes to the Architecture Development Cycle
- The concepts of views and viewpoints and their role in communicating with stakeholders
- The concept of building blocks
- The key deliverables of the ADM cycle
- The two example TOGAF reference models
- The TOGAF certification program

Examination

Certification for TOGAF 9 Foundation is achieved by passing the TOGAF 9 Part 1 Examination. This is a multiple-choice examination with 40 questions.[6]

What is the relationship between TOGAF 9 Foundation and TOGAF 9 Certified?
The learning outcomes for TOGAF 9 Foundation are a subset of those for TOGAF 9 Certified. Candidates are able to choose whether they wish to become certified in a stepwise manner by starting with TOGAF 9 Foundation and then at a later date TOGAF 9 Certified, or alternately to go direct to TOGAF 9 Certified by taking the combined examination.

1.2.4 The Certification Process

This Study Guide is aimed at preparing you to become certified for TOGAF 9 Foundation.

The TOGAF 9 Foundation Syllabus for the examination is contained in

6 For the latest information on examinations, see the TOGAF 9 Certification website at www.opengroup.org/certifications/togaf9.

Appendix D. Certain topic areas are weighted as more important than others and thus have more questions. The 11 topic areas covered by the examination together with the number of questions per area in the examination follow:

1. Basic Concepts (3 questions)
2. Core Concepts (3 questions)
3. Introduction to the ADM (3 questions)
4. The Enterprise Continuum and Tools (4 questions)
5. ADM Phases (9 questions)
6. ADM Guidelines and Techniques (6 questions)
7. Architecture Governance (4 questions)
8. Architecture Views, Viewpoints, and Stakeholders (2 questions)
9. Building Blocks (2 questions)
10. ADM Deliverables (2 questions)
11. TOGAF Reference Models (2 questions)

1.2.4.1 Format of the Examination Questions

The examination questions are multiple-choice questions. These are very similar in format to the Test Yourself questions included in each chapter. Note that the exact format for display is test center-specific and will be made clear on the screens when taking the examination.

Exam Tip

Please read each question carefully before reading the answer options. Be aware that some questions may seem to have more than one right answer, but you are to look for the one that makes the most sense and is the most correct.

1.2.4.2 What do I need to bring with me to take the Examination?

You should consult with the exam provider regarding the forms of picture ID you are required to bring with you to verify your identification.

1.2.4.3 Can I refer to materials while I take the Examination?

No; it is a closed-book examination.

1.2.4.4 If I fail, how soon can I retake the Examination?

You should check the current policy on The Open Group website. At the time of writing, the policy states that individuals who have failed the examination are not allowed to retake the examination within one (1) month of the first sitting.

1.2.5 Preparing for the Examination

You can prepare for the examination by working through this Study Guide section-by-section. A mapping of the sections of this Study Guide to the TOGAF 9 Foundation Syllabus is given in Appendix D. After completing each section, you should answer the Test Yourself questions and read the referenced sections from the TOGAF documentation. Once you have completed all the sections in this Study Guide, you can then attempt the Test Yourself examination papers in Appendix B. These are designed to give a thorough test of your knowledge. If you have completed all the prescribed preparation and can attain a pass mark for the Test Yourself examination papers as described in Appendix C, then it is likely you are ready to sit the examination.

1.3 Summary

The Open Group Certification for People: TOGAF Certification Program is a knowledge-based certification program. It has two levels, Level 1 and Level 2, which lead to certification for TOGAF 9 Foundation and TOGAF 9 Certified, respectively.

The topic for this Study Guide is preparation for taking the TOGAF 9 Part 1 Examination that leads to the TOGAF 9 Foundation certification. The examination comprises 40 simple multiple-choice questions to be completed in one hour.[7]

Preparing for the examination includes the following steps:

- You should work through this Study Guide step-by-step
- At the end of each chapter, you should complete the Test Yourself questions and read the sections of the TOGAF documentation listed under Recommended Reading

7 Additional time is allowed for candidates for whom English is a second language where the examination is not available in the local language. For further information see the advice to candidates sheet on The Open Group TOGAF 9 Certification website.

- Once you have completed all the chapters in this Study Guide, you should attempt the Test Yourself examination papers given in Appendix B
- If you can attain the target score in Appendix C, then you have completed your preparation

1.4 Test Yourself Questions

Q1: Which of the following describes the TOGAF 9 Part 1 Examination?

A. It is an open book examination
A. It has 40 simple multiple-choice questions
B. The exam policy requires you to wait 60 days before a retake
C. It contains at least four questions related to building blocks

Q2: Which one of the following is the entry-level certification for an individual?

A. TOGAF 9 Certified
B. TOGAF 9 Foundation
C. TOGAF 9 Professional
D. TOGAF 9 Architect

Q3: Which one of the following describes three principles of The Open Group Certification for People: TOGAF Certification Program?

A. Integrity, Scalability, Flexibility
B. Objectivity, Robustness, Simplicity
C. Openness, Fairness, Quality
D. Knowledge-based, Valuable, Simplicity
E. All of these

Q4: Which of the following topic areas is *not* included in the TOGAF 9 Foundation Syllabus?

A. Architecture Governance
B. Basic Concepts
C. Building Blocks
D. Guidelines for adapting the ADM: Iteration and Levels
E. Introduction to the ADM

1.5 Recommended Reading

The following are recommended sources of further information for this chapter:

- The Open Group Certification for People: Program Summary Datasheet
- TOGAF 9 Foundation Datasheet
- The Open Group Certification for People: Certification Policy for Examination-Based Programs
- The Open Group Certification for People: TOGAF Conformance Requirements (Multi-Level)
- The Open Group TOGAF 9 Certification website: www.opengroup.org/certifications/togaf9
- The TOGAF information website: www.togaf.info

Chapter 2

Basic Concepts

2.1 Key Learning Points

This chapter will familiarize you with the fundamentals that you need to know to pass the TOGAF 9 Part 1 Examination. The objectives of this chapter are as follows:

- To provide an introduction to the basic concepts of Enterprise Architecture and the TOGAF framework, including providing a high-level view of the TOGAF standard, Enterprise Architecture, architecture frameworks, and the contents of the TOGAF 9 standard

Key Points Explained

This chapter will help you to answer the following questions:

- What is the TOGAF standard?
- What is an enterprise?
- What is Enterprise Architecture?
- Why do I need Enterprise Architecture? What are the business benefits?
- What is "architecture" in the context of the TOGAF standard?
- What is an architecture framework?
- Why do I need a framework for Enterprise Architecture?
- Why is the TOGAF standard suitable as a framework for Enterprise Architecture?
- What does the TOGAF standard contain?
- What are the different types of architecture that the TOGAF standard deals with?

2.2 Introduction to the TOGAF 9 Standard

2.2.1 What is the TOGAF Standard?

(Syllabus Reference: Unit 1, Learning Outcome 7: You should be able to briefly explain what the TOGAF standard is.)

The TOGAF standard is an architecture framework. It provides the methods and tools for assisting in the acceptance, production, use, and maintenance of

Enterprise Architectures. It is based on an iterative process model supported by best practices and a re-usable set of existing architectural assets.
The TOGAF standard is developed and maintained by The Open Group Architecture Forum. The first version of the TOGAF standard, developed in 1995, was based on the US Department of Defense Technical Architecture Framework for Information Management (TAFIM). Starting from this sound foundation, The Open Group Architecture Forum has developed successive versions of the TOGAF standard at regular intervals and published each one on The Open Group public website.

The TOGAF standard can be used for developing a broad range of different Enterprise Architectures. It complements, and can be used in conjunction with, other frameworks that are more focused on specific deliverables for particular vertical sectors such as Government, Telecommunications, Manufacturing, Defense, and Finance. A key part of the TOGAF standard is the method – the TOGAF Architecture Development Method (ADM) – for developing an Enterprise Architecture that addresses business needs.

Study Guide References

When appropriate, this Study Guide contains references to sections within the TOGAF Standard, Version 9.2 and relevant documents from the TOGAF Library. The references are intended to be functional for the web version and printed version of the document. Therefore, the format of the reference number contains both the Part and the Chapter reference, but not the page references since they exist only in the printed book.

2.2.2 Structure of the TOGAF Documentation

(Syllabus Reference: Unit 1, Learning Outcome 6: You should be able to describe the structure of the TOGAF standard, and briefly explain the contents of each of the parts.)

The TOGAF documentation consists of the TOGAF standard, and a portfolio of guidance material, known as the TOGAF Library, to support the practical application of the standard.

Table 3 summarizes the parts of the TOGAF standard.

Table 3: Structure of the TOGAF Standard

TOGAF Part	Summary
Part I: Introduction	This part provides a high-level introduction to the key concepts of Enterprise Architecture and, in particular, to the TOGAF approach. It contains the definitions of terms used throughout the standard.
Part II: Architecture Development Method (ADM)	This part is the core of the TOGAF framework. It describes the TOGAF Architecture Development Method (ADM) – a step-by-step approach to developing an Enterprise Architecture.
Part III: ADM Guidelines and Techniques	This part contains a collection of guidelines and techniques available for use in applying the TOGAF approach and the TOGAF ADM. (Additional guidelines and techniques are also in the TOGAF Library.)
Part IV: Architecture Content Framework	This part describes the TOGAF content framework, including a structured metamodel for architectural artifacts, the use of re-usable Architecture Building Blocks (ABBs), and an overview of typical architecture deliverables.
Part V: Enterprise Continuum and Tools	This part discusses appropriate taxonomies and tools to categorize and store the outputs of architecture activity within an enterprise.
Part VI: Architecture Capability Framework	This part discusses the organization, processes, skills, roles, and responsibilities required to establish and operate an architecture practice within an enterprise.

(Syllabus Reference: Unit 1, Learning Outcome 10: You should be able to briefly explain the TOGAF Library.)

Accompanying the standard is the TOGAF Library. The TOGAF Library is a reference library containing guidelines, templates, patterns, and other forms of reference material to accelerate the creation of new architectures for the enterprise. It is structured as summarized in Table 4:

Table 4: Structure of the TOGAF Library

Section 1: Foundation Documents	Broadly applicable information relating to the subject of the TOGAF framework or Enterprise Architecture.
Section 2: Generic Guidance and Techniques	Information describing architecture styles and how the TOGAF framework and Enterprise Architecture can be adapted to exploit the characteristics of a more specific context.
Section 3: Industry-Specific Guidance and Techniques	Information describing how the TOGAF framework and Enterprise Architecture can be applied to meet the specific needs of a vertical industry segment.
Section 4: Organization-Specific Guidance and Techniques	Information describing how the TOGAF framework and Enterprise Architecture have been applied to meet the needs of specific enterprises.

2.3 What is an Enterprise?

(Syllabus Reference: Unit 1, Learning Outcome 1: You should be able describe what an enterprise is.)

The TOGAF standard considers an "enterprise" to be any collection of organizations that has common goals. For example, an enterprise could be a whole corporation, or a division of a corporation; a government agency or a single government department; a chain of geographically distant organizations linked together by common ownership; groups of countries or governments working together to create common or shareable deliverables or infrastructures; partnerships and alliances of businesses working together, such as a consortium or supply chain.

The term "enterprise" in the context of "Enterprise Architecture" can be used to denote both an entire enterprise, encompassing all of its information systems, and a specific domain within the enterprise. In both cases, the architecture crosses multiple systems and multiple functional groups within the enterprise.

Confusion often arises from the evolving nature of the term "enterprise". An extended enterprise frequently includes partners, suppliers, and customers. If the goal is to integrate an extended enterprise, then the enterprise comprises the partners, suppliers, and customers, as well as internal business units.
For example, an organization with an online store that uses an external fulfillment house for dispatching orders would extend its definition of the enterprise in that system to include the fulfillment house.

2.4 What is Architecture in the Context of the TOGAF Standard?

(Syllabus Reference: Unit 1, Learning Outcome 8: You should be able to explain what architecture is in the context of the TOGAF standard.)

ISO/IEC/IEEE 42010:2011[8] defines "architecture" as:

"The fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution."

The TOGAF standard embraces but does not strictly adhere to ISO/IEC/IEEE 42010:2011 terminology. In addition to the ISO/IEC/IEEE 42010:2011 definition, the TOGAF standard adds a second definition depending on the context:

"*The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time.*"

8 ISO/IEC/IEEE 42010: 2011, Systems and Software Engineering — Architecture Description.

What is Enterprise Architecture?

There are many definitions of Enterprise Architecture. Most focus on structure and organization. Two definitions are given below:

Enterprise Architecture is:

1. The organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the firm's operating model. [Source: MIT Center for Information Systems Research]
2. A conceptual blueprint that defines the structure and operation of an organization. The intent of an Enterprise Architecture is to determine how an organization can most effectively achieve its current and future objectives. [Source: SearchCIO.com]

2.5 Why do I Need Enterprise Architecture?

(Syllabus Reference: Unit 1, Learning Outcome 2: You should be able to explain the purpose of an Enterprise Architecture.)

The purpose of Enterprise Architecture is to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy. Effective management and exploitation of information and Digital Transformation are key factors to business success, and an indispensable means to achieving competitive advantage. An Enterprise Architecture addresses this need, by providing a strategic context for the evolution and reach of digital capability in response to the constantly changing needs of the business environment.

For example, the rapid development of social media, Internet of Things, and cloud computing has radically extended the capacity of the enterprise to create new market opportunities.

(Syllabus Reference: Unit 1, Learning Outcome 3: You should be able to list the business benefits of having an Enterprise Architecture.)

The advantages that result from a good Enterprise Architecture can bring important business benefits, including:

- More effective and efficient business operations:
  - Lower business operation costs

  - More agile organization
  - Business capabilities shared across the organization
  - Lower change management costs
  - More flexible workforce
  - Improved business productivity
- More effective and efficient Digital Transformation and IT operations:
  - Extending the effective reach of the enterprise through digital capability
  - Bringing all components of the enterprise into a harmonized environment
  - Lower software development, support, and maintenance costs
  - Increased portability of applications
  - Improved interoperability and easier system and network management
  - Improved ability to address critical enterprise-wide issues, such as security
  - Easier upgrade and exchange of system components
- Better return on existing investment, reduced risk for future investment:
  - Reduced complexity in the business and IT
  - Maximum return on investment in existing business and IT infrastructure
  - The flexibility to make, buy, or out-source business and IT solutions
  - Reduced risk overall in new investments and their costs of ownership
- Faster, simpler, and cheaper procurement:
  - Simpler buying decisions, because the information governing procurement is readily available in a coherent plan
  - Faster procurement process, maximizing procurement speed and flexibility without sacrificing architectural coherence
  - The ability to procure heterogeneous, multi-vendor open systems
  - The ability to secure more economic capabilities

Ultimately, the benefits of Enterprise Architecture derive from the better planning, earlier visibility, and more informed designs that result when it is introduced. [Source: Simon Townson, Why Does Enterprise Architecture Matter?]

2.6 What is an Architecture Framework?

(Syllabus Reference: Unit 1, Learning Outcome 4: You should be able to define what an architecture framework is.)

An architecture framework is a foundational structure, or set of structures, that can be used for developing a broad range of different architectures. It should describe a method for designing a target state of the enterprise in terms of a set of building blocks, and for showing how the building blocks fit together. It should contain a set of tools and provide a common vocabulary. It should also include a list of recommended standards and compliant products that can be used to implement the building blocks.

2.7 Why do I Need a Framework for Enterprise Architecture?

Using an architecture framework will speed up and simplify architecture development, ensure more complete coverage of the designed solution, and make certain that the architecture selected allows for future growth in response to the needs of the business.

Regulatory Drivers for Adoption of Enterprise Architecture

There are a number of laws and regulations that have been drivers for the adoption and use of Enterprise Architecture in business:

- The Clinger-Cohen Act
  (US Information Technology Management Reform Act 1996)
  The US Information Technology Management Reform Act (Clinger-Cohen Act) is designed to improve the way the US Federal Government acquires and manages IT.
- The Sarbanes-Oxley Act
  (US Public Company Accounting Reform and Investor Protection Act 2002)
  The Sarbanes-Oxley Act was passed in response to a number of major corporate and accounting scandals involving prominent companies in the US (for example, Enron and Worldcom). Under the Act, companies must provide attestation of internal control assessment, including documentation of control procedures related to IT.
- EU Directives on the Award of Public Contracts
  Similarly within the European Union, there are EU Directives that require

vendors involved in Public Contracts to show that they are using formal Enterprise Architecture processes within their businesses when supplying products and services.

2.8 Why is the TOGAF Standard Suitable as a Framework for Enterprise Architecture?

(Syllabus Reference: Unit 1, Learning Outcome 5: You should be able explain why the TOGAF standard is suitable as a framework for Enterprise Architecture.)

The TOGAF standard has been developed through the collaborative efforts of the whole community. Using the TOGAF standard results in Enterprise Architecture that is consistent, reflects the needs of stakeholders, employs best practice, and gives due consideration both to current requirements and to the perceived future needs of the business.

Developing and sustaining an Enterprise Architecture is a technically complex process which involves many stakeholders and decision processes in the organization. The TOGAF standard plays an important role in standardizing and risk reduction of the architecture development process. The TOGAF standard provides a best practice framework for adding value, and enables the organization to build workable and economic solutions which address their business issues and needs.

2.9 What are the Different Architecture Domains that the TOGAF Standard deals with?

(Syllabus Reference: Unit 1, Learning Outcome 9: You should be able to list the different types of architecture that the TOGAF standard deals with.)

The TOGAF standard covers the development of four architecture domains. These are commonly accepted as subsets of an overall Enterprise Architecture. They are as follows:

Table 5: Architecture Domains Supported by the TOGAF Standard

Architecture Type	Description
Business Architecture	The business strategy, governance, organization, and key business processes.
Data Architecture	The structure of an organization's logical and physical data assets and data management resources.
Application Architecture	A blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organization.
Technology Architecture	The software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT infrastructure, middleware, networks, communications, processing, and standards.

2.10 What does the TOGAF Standard Contain?

(Syllabus Reference: Unit 1, Learning Outcome 6: You should be able to describe the structure of the TOGAF standard, and briefly explain the contents of each of the parts.)

The contents of the TOGAF standard reflect the structure and content of an Architecture Capability within an enterprise, as shown in Figure 3.

Definition of "Capability"

An ability that an organization, person, or system possesses.

[Source: The TOGAF Standard, Version 9.2 Part I: Introduction, Chapter 3 (Definitions)]

Capabilities are typically expressed in general and high-level terms and typically require a combination of organization, people, processes, and technology to achieve. For example, marketing, customer contact, or outbound telemarketing.

An **Enterprise Architecture Capability** (or Architecture Capability), in the context of the TOGAF standard, is the ability for an organization to effectively undertake the activities of an Enterprise Architecture practice.

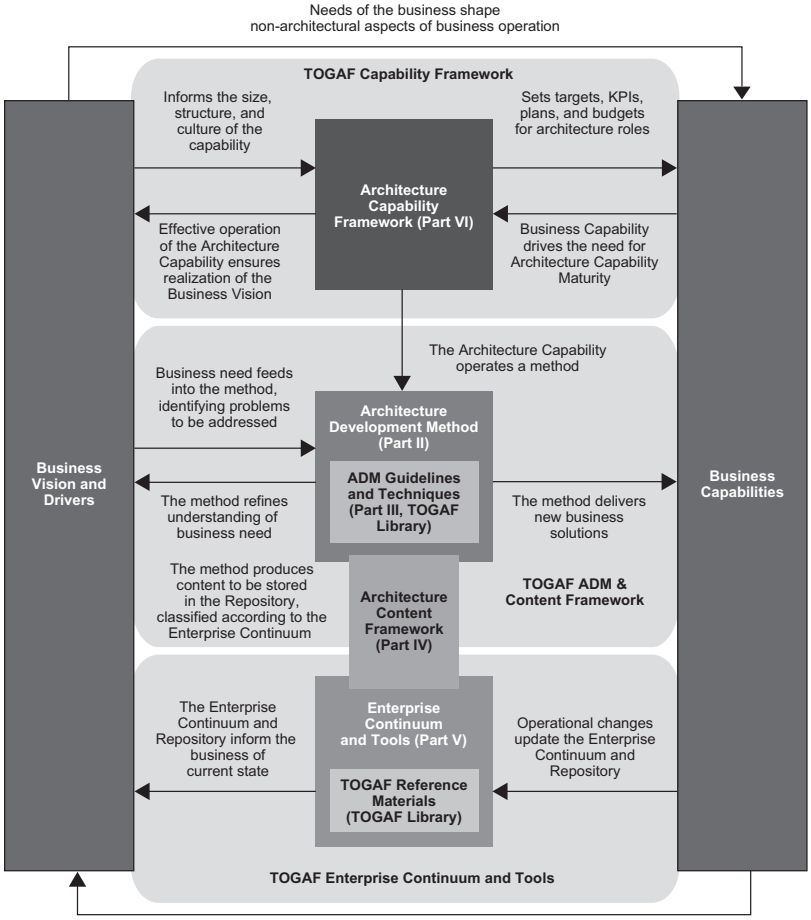


Figure 3: TOGAF Content Overview

Central to the TOGAF framework is the Architecture Development Method (documented in Part II: ADM). The Architecture Capability (documented in Part VI: Architecture Capability Framework) operates the method. The method is supported by a number of guidelines and techniques (documented in Part III: ADM Guidelines and Techniques, and also in the TOGAF Library). This produces content (documented in Part IV: Architecture Content Framework) to be stored in the repository, which is classified according to the Enterprise Continuum (documented in Part V: Enterprise Continuum and Tools). The repository can be initially populated with the TOGAF Reference Models and other reference materials (documented in the TOGAF Library).

These are described in the following sections.

2.10.1 The Architecture Development Method (ADM)

The ADM describes a process for deriving an organization-specific Enterprise Architecture that addresses business requirements.

The ADM is the major component of the TOGAF framework and provides guidance for architects on a number of levels:

- It provides a number of **architecture development phases** (Business Architecture, Information Systems Architectures, Technology Architecture) in a cycle, as an overall process template for architecture development activity
- It provides a **narrative of each architecture phase**, describing the phase in terms of objectives, approach, inputs, steps, and outputs
  The inputs and outputs sections provide a definition of the architecture content structure and deliverables (a detailed description of the phase inputs and phase outputs is given in the Architecture Content Framework).
- It provides cross-phase summaries that cover requirements management

See also Chapter 5 and Chapter 7.

2.10.2 ADM Guidelines and Techniques

ADM Guidelines and Techniques provides a number of guidelines and techniques to support the application of the ADM. The guidelines include adapting the ADM to deal with a number of usage scenarios, including different process styles (e.g., the use of iteration) and applying the ADM across the Architecture Landscape. There is a high-level description of how to use the framework with different architectural styles, using SOA as an example. The techniques support specific tasks within the ADM (such as Capability-Based Planning, defining principles, gap analysis, migration planning, risk management, stakeholder management, etc.). Additional guidelines and techniques are also available in the TOGAF Library (e.g., guidance on the business scenarios technique). See also Chapter 8.

2.10.3 Architecture Content Framework

The **Architecture Content Framework** provides a detailed model of architectural work products, including deliverables, artifacts within deliverables, and the Architecture Building Blocks (ABBs) that deliverables represent.

The details of the Architecture Content Framework are out of scope for TOGAF 9 Foundation, and are covered instead in the Level 2 syllabus.

2.10.4 The Enterprise Continuum

The **Enterprise Continuum** provides a model for structuring a virtual repository and provides methods for classifying architecture and solution artifacts, showing how the different types of artifacts evolve, and how they can be leveraged and re-used. This is based on architectures and solutions (models, patterns, architecture descriptions, etc.) that exist within the enterprise and in the industry at large, and which the enterprise has collected for use in the development of its architectures.
See also Section 3.4 and Chapter 6.

2.10.5 TOGAF Reference Models

The TOGAF Library includes two example reference models (as well as other reference materials) for possible inclusion in an enterprise's own Enterprise Continuum.

Table 6: Reference Models Included in the Enterprise Continuum

Reference Model	Description
TOGAF Foundation Architecture Technical Reference Model	The TOGAF Technical Reference Model is an architecture of generic services and functions that provides a foundation on which specific architectures and Architecture Building Blocks (ABBs) can be built.
Integrated Information Infrastructure Reference Model (III-RM)	The Integrated Information Infrastructure Reference Model (III-RM) is based on the TOGAF Foundation Architecture, and is specifically aimed at helping the design of architectures that enable and support the vision of Boundaryless Information Flow.

See also Chapter 13.

2.10.6 The Architecture Capability Framework

The **Architecture Capability Framework** is a set of resources, guidelines, templates, background information, etc. provided to help the architect establish an architecture practice within an organization.

See also Section 3.6, Section 3.7, and Chapter 9.

2.11 Summary

This chapter has introduced the basic concepts of Enterprise Architecture and the TOGAF standard. This has included answering questions, such as:

- "What is an enterprise?"
  - A collection of organizations that share common goals, such as a government agency, part of a corporation, or a corporation in its entirety
  - Large corporations may comprise multiple enterprises
  - An "extended enterprise" can include partners, suppliers, and customers
- "What is an architecture?"
  - An architecture is defined as "the fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution"

The TOGAF standard is an architecture framework. It enables you to design, evaluate, and build the right architecture for your organization. An architecture framework is a "toolkit" that can be used for developing a broad range of different architectures.

- It should describe a method to design an information system in terms of a set of building blocks, and show how the building blocks fit together
- It should contain a set of tools and provide a common vocabulary
- It should also include a list of recommended standards and compliant products that can be used to implement the building blocks

The value of a framework is that it provides a practical starting point for an architecture project.

The components of the TOGAF Standard, Version 9.2 are as follows:

- Architecture Development Method (ADM)
- ADM Guidelines and Techniques
- The Architecture Content Framework
- The Enterprise Continuum and Tools
- The Architecture Capability Framework

The TOGAF Library is a reference library containing guidelines, templates, patterns, and other forms of reference material to accelerate the creation of new architectures for the enterprise.

2.12 Test Yourself Questions

Q1: Which one of the following statements best describes the TOGAF standard?

A. The TOGAF standard is a tool for developing Technology Architectures only.
B. The TOGAF standard is a framework and method for architecture development.
C. The TOGAF standard is an architecture pattern.
D. The TOGAF standard is a method for IT Governance.

Q2: Which one of the following best describes why you need a framework for Enterprise Architecture?

A. Architecture design is complex.
B. Using a framework can speed up the process.
C. Using a framework ensures more complete coverage.
D. A framework provides a set of tools and a common vocabulary.
E. All of these.

Q3: Which of the following is *not* one of the main constituent parts of the TOGAF standard?

A. The Architecture Development Method
B. The Enterprise Continuum & Tools
C. The TOGAF Technical Reference Model
D. The TOGAF Architecture Capability Framework

Q4: Which one of the types of architecture below is *not* commonly accepted as part of the Enterprise Architecture addressed by the TOGAF standard?

A. Business Architecture
B. Data Architecture
C. Application Architecture
D. Technology Architecture
E. Pattern Architecture

Q5: Which part of the TOGAF document provides a number of architecture development phases, together with narratives for each phase?

A. Part I: Introduction
B. Part II: Architecture Development Method (ADM)
C. Part III: ADM Guidelines and Techniques
D. Part IV: Architecture Content Framework
E. Part V: Enterprise Continuum and Tools

2.13 Recommended Reading

The following are recommended sources of further information for this chapter:

- The TOGAF Standard, Version 9.2 Part I: Introduction, Introduction and Core Concepts
- Why Does Enterprise Architecture Matter?, White Paper by Simon Townson

Chapter 3

Core Concepts

3.1 Key Learning Points

This chapter will help you understand and be able to explain the core concepts of the TOGAF standard.

Key Points Explained

This chapter will help you to answer the following questions:

- What are the ADM phase names and the purpose of each phase?
- What are deliverables, artifacts, and building blocks?
- What is the Enterprise Continuum?
- What is the Architecture Repository?
- How to establish and operate an Enterprise Architecture Capability?
- How to use the TOGAF framework with other frameworks?

3.2 What are the Phases of the ADM?

(Syllabus Reference: Unit 2, Learning Outcome 1: You should be able to explain the core concept of the ADM and the purpose of each phase at a high level.)

The Architecture Development Method (ADM) forms the core of the TOGAF standard and is a method for deriving organization-specific Enterprise Architecture. It is the result of contributions from many architecture practitioners.

The ADM provides a tested and repeatable process for developing architectures. The ADM includes establishing an architecture framework, developing architecture content, transitioning, and governing the realization of architectures. All of these activities are carried out within an iterative cycle of continuous architecture definition and realization that allows organizations to transform their enterprises in a controlled manner in response to business goals and opportunities.

The ADM is described as a number of phases within a process of change illustrated by an ADM cycle graphic (see following). Phases within the ADM are as follows:

The **Preliminary Phase** describes the preparation and initiation activities required to create an Architecture Capability, including the customization of the TOGAF framework, and the definition of Architecture Principles.

Phase A: Architecture Vision describes the initial phase of an Architecture Development Cycle. It includes information about defining the scope, identifying the stakeholders, creating the Architecture Vision, and obtaining approvals.

Phase B: Business Architecture describes the development of a Business Architecture to support an agreed Architecture Vision.

Phase C: Information Systems Architectures describes the development of Information Systems Architectures for an architecture project, including the development of Data and Application Architectures.

Phase D: Technology Architecture describes the development of the Technology Architecture for an architecture project.

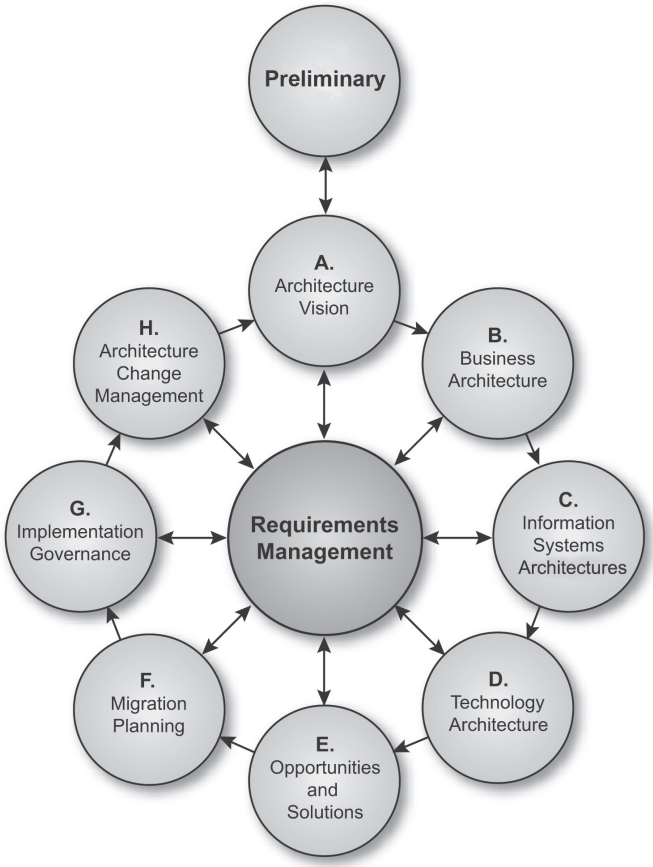
Phase E: Opportunities and Solutions describes the process of identifying major implementation projects and grouping them into work packages that deliver the Target Architecture defined in the previous phases.

Phase F: Migration Planning describes the development of a detailed Implementation and Migration Plan that addresses how to move from the Baseline to the Target Architecture.

Phase G: Implementation Governance provides an architectural oversight of the implementation.

Phase H: Architecture Change Management establishes procedures for managing change to the new architecture.

Requirements Management examines the process of managing architecture requirements throughout the ADM.



3.3 Deliverables, Artifacts, and Building Blocks

(Syllabus Reference: Unit 2, Learning Outcome 2: You should be able to explain the core concepts of deliverables, artifacts, and building blocks in the context of the Architecture Content Framework.)

During application of the ADM process, a number of outputs are produced; for example, process flows, architectural requirements, project plans, project compliance assessments, etc. In order to collate and present these major work products in a consistent and structured manner, the TOGAF standard defines

a structural model – the TOGAF Architecture Content Framework – in which to place them.

The Architecture Content Framework uses the following three categories to describe the type of architectural work product within the context of use:

- A **deliverable** is a work product that is contractually specified and in turn formally reviewed, agreed, and signed off by the stakeholders
  Deliverables represent the output of projects and those deliverables that are in documentation form will typically be archived at completion of a project, or transitioned into an Architecture Repository as a reference model, standard, or snapshot of the Architecture Landscape at a point in time.
- An **artifact** is an architectural work product that describes an aspect of the architecture
  Artifacts are generally classified as catalogs (lists of things), matrices (showing relationships between things), and diagrams (pictures of things). Examples include a requirements catalog, business interaction matrix, and a use-case diagram. An architectural deliverable may contain many artifacts and artifacts will form the content of the Architecture Repository.
- A **building block** represents a (potentially re-usable) component of business, IT, or architectural capability that can be combined with other building blocks to deliver architectures and solutions
  Building blocks can be defined at various levels of detail and can relate to both architectures and solutions, with Architecture Building Blocks (ABBs) typically describing the required capability in order to shape the Solution Building Blocks (SBBs) which would represent the components to be used to implement the required capability.

The relationships between deliverables, artifacts, and building blocks are shown in Figure 4.

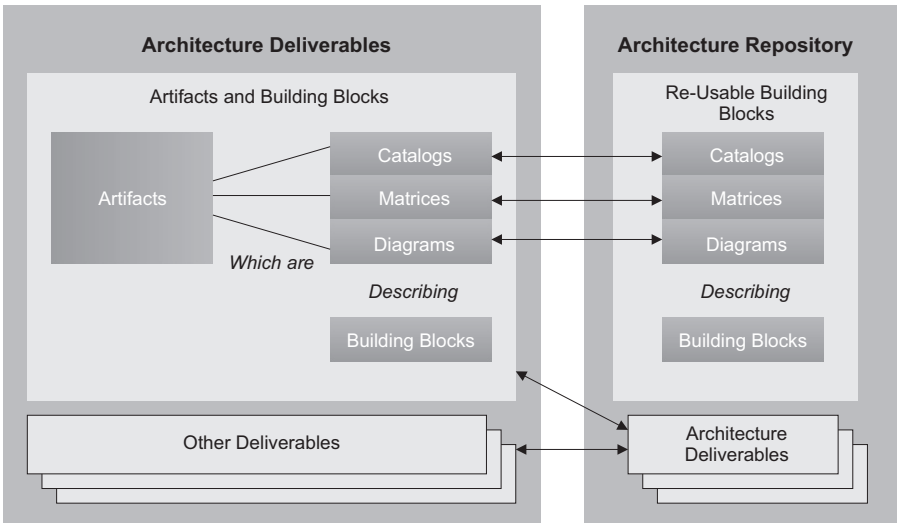


Figure 4: Relationships between Deliverables, Artifacts, and Building Blocks

3.4 The Enterprise Continuum

(Syllabus Reference: Unit 2, Learning Outcome 3: You should be able to explain the core concept of the Enterprise Continuum.)

The TOGAF standard includes the concept of the Enterprise Continuum, shown in Figure 5, which sets the broader context for an architect and explains how generic solutions can be leveraged and specialized in order to support the requirements of an individual organization. The Enterprise Continuum is a view of the Architecture Repository that provides methods for classifying architecture and solution artifacts as they evolve from generic Foundation Architectures to Organization-Specific Architectures. The Enterprise Continuum comprises two complementary concepts: the Architecture Continuum and the Solutions Continuum.

The Enterprise Continuum and the Architecture Repository

The Enterprise Continuum provides a view of the Architecture Repository that shows the evolution of these related architectures from generic to specific, from abstract to concrete, and from logical to physical.

[Source: The TOGAF Standard, Version 9.2 Part V: Enterprise Continuum and Tools]

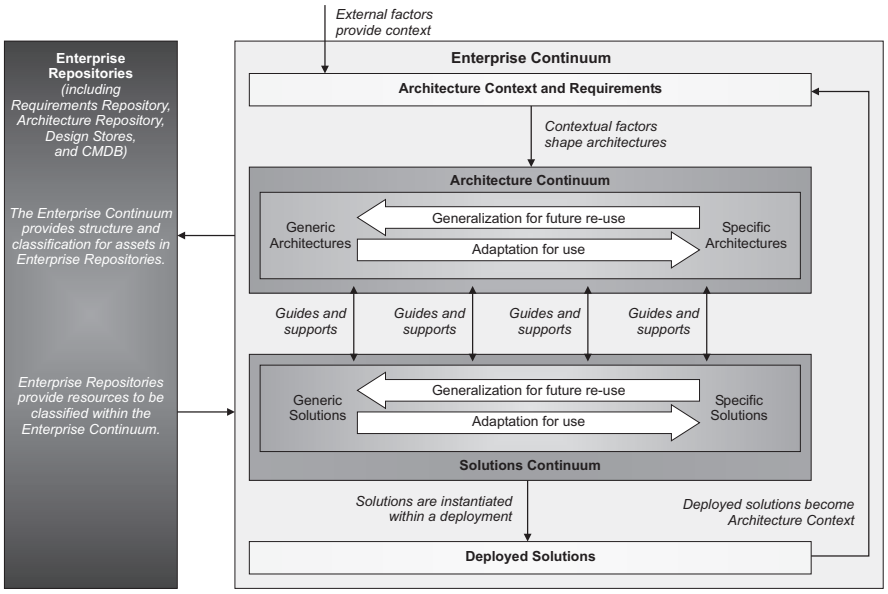


Figure 5: The Enterprise Continuum

3.5 The Architecture Repository

(Syllabus Reference: Unit 2, Learning Outcome 4: You should be able to explain the core concept of the Architecture Repository.)

Supporting the Enterprise Continuum is the concept of an Architecture Repository, which can be used to store different classes of architectural output at different levels of abstraction, created by the ADM. In this way, the TOGAF standard facilitates understanding and co-operation between stakeholders and practitioners at different levels.

The structure of the TOGAF Architecture Repository is shown in Figure 6.

The major components within an Architecture Repository are as follows:

- The **Architecture Metamodel** describes the organizationally tailored application of an architecture framework, including a metamodel for architecture content
- The **Architecture Capability** defines the parameters, structures, and processes that support governance of the Architecture Repository
- The **Architecture Landscape** shows an architectural view of the building blocks that are in use within the organization today (e.g., a list of the