



**TOGAF® 9.1 Certified
Combined Level 1 & Level 2 release 2.0.0**

INSTRUCTOR GUIDE

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TOGAF® 9.1, Classroom Course, release 2.0.0

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The content of this course has been adapted from The Open Group website www.opengroup.org and also from the following books:

- Buschmann, Frank, Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal. *Pattern-Oriented Software Architecture – A System Of Patterns*. John Wiley & Sons, 1996
- Wiegers, Karl E. *Software Requirements* (Second Edition). Microsoft Press, 2003

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The language used in this course is US English. Our sources of reference for grammar, syntax, and mechanics are from The Chicago Manual of Style, The American Heritage Dictionary, and the Microsoft Manual of Style for Technical Publications.



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LIST OF ICONS

| | |
|--|--|
|  Notes for the Instructor | Reference content for the instructor |
|  Announcement for the Participant | Reference content for the participants to read in the class or at home |
|  Zoomed Graphic | The zoomed graphics are available at the end of the presentation slides and in Appendix F. Click the icon in the presentation slide to view the zoomed graphic. |

Sample Material - Not for Reprint

Sample Material
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Before you start the course, please take a moment to:



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<http://gplus.to/ITpreneurs>



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"Watch us" on YouTube

<http://www.youtube.com/user/ITpreneurs>



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Acknowledgements

We would like to sincerely thank the experts who have contributed to the development of the ITpreneurs products:

TOGAF® 9.1 Certified (Combined Level 1 & Level 2) Course

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Alpha Tester

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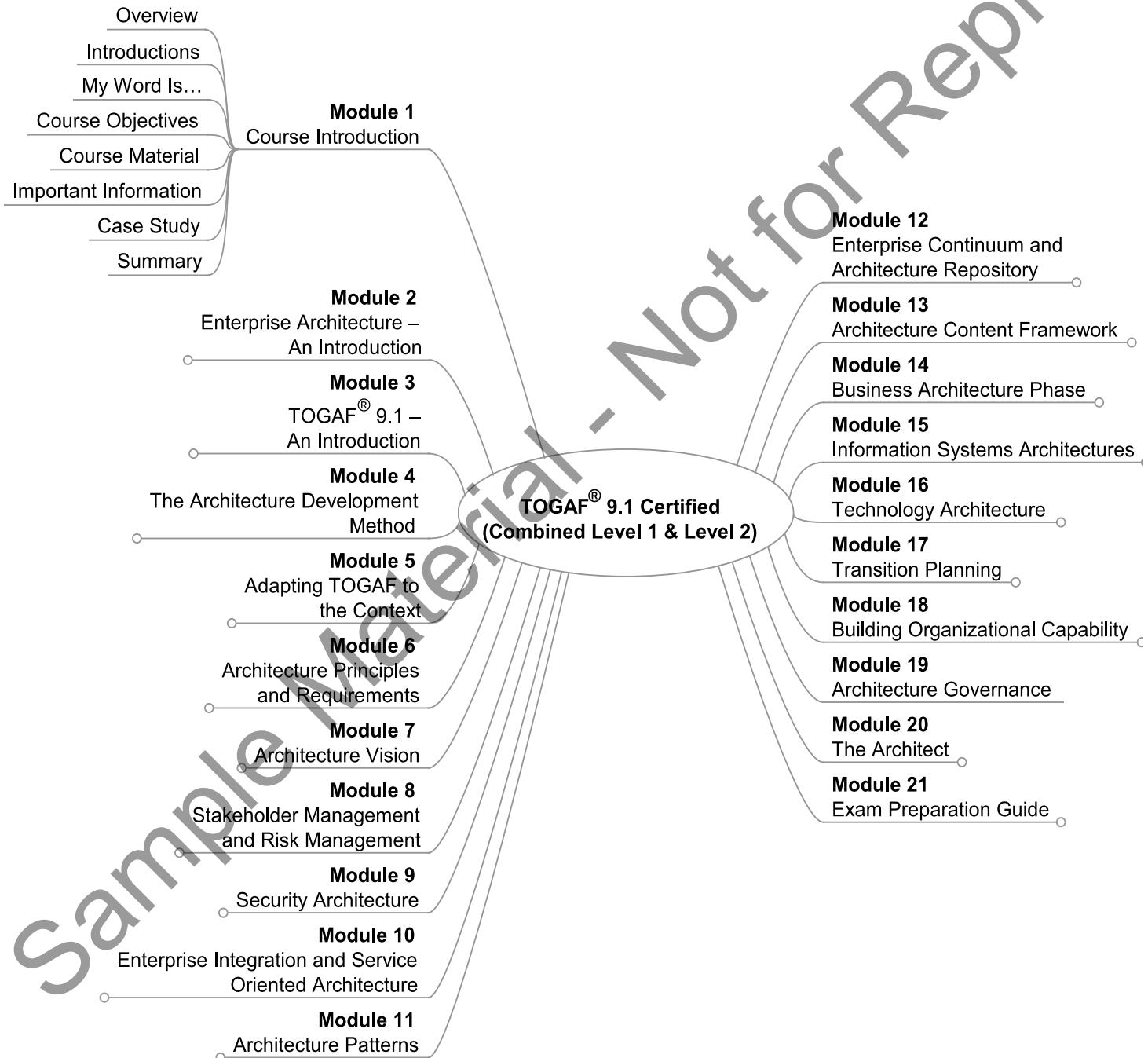
Carlos Sanchez-Sicilia

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Module 1

Course Introduction



OVERVIEW

The Open Group Architecture Framework (TOGAF) is an industry-recognized Enterprise Architecture framework used widely across the world. This framework is envisioned for Enterprise Architects, Business Architects, IT Architects, Data Architects, Systems Architects, Solutions Architects, and others responsible for or associated with the Architecture function in an organization.

The ITpreneurs TOGAF® 9.1 Combined course assists participants in acquiring Level 1 and Level 2 certifications in one go. This course is aimed at participants who require basic to advanced knowledge of TOGAF® 9.1 and is also aimed at professionals who participate in Architecture projects and initiatives as well as those who are into development of Architecture artifacts.

INTRODUCTIONS

Instructor

The slide is titled "Course Introduction" and "Introductions: Instructor". It features the "THE Open GROUP TOGAF® 9 Accredited Training Course" logo. The main content area contains the text "Welcome to TOGAF® 9.1 Combined course!" and a small number "1" in the bottom right corner.



The instructor should welcome the participants to the TOGAF® 9.1 Combined course. Thereafter, the instructor should provide background information that establishes him or her as a credible expert for teaching the course. The instructor should also share, in brief, his or her experience in Enterprise Architecture domain in general and TOGAF domain in particular.

Participants



Course Introduction
Introductions: Participants

We want to know you. Tell us about:

- Yourself
- Your organization
- Your role
- Your Enterprise Architecture or TOGAF experience
- Your expectations from the course

2



After introducing oneself, the instructor should ask the participants to introduce themselves. The participants should start by informing the group about their organization, role, and Enterprise Architecture or TOGAF experience.

These expectations can be used either to scope the training or to review some key concepts later in the course.

MY WORD IS...

 Course Introduction
My Word Is...

What is Your Word?

Your Word is any Enterprise Architecture or TOGAF-related term that starts with the initial letter of Your Name.



A cartoon illustration shows two people from the side, facing each other. The person on the left has dark hair and is wearing a white t-shirt over a dark undershirt. A speech bubble above them says, "Hi, I'm Zoya and 'My Word' is Zachman." The person on the right has dark hair and is wearing a light-colored t-shirt over dark pants. A speech bubble above them says, "I'm Andy and 'My Word' is Architecture Development Method." In the bottom right corner of the slide, there is a small grey box containing the number "3".

 Notes for the Instructor

As a possible ice-breaker exercise, the participants can be asked their “My Word”.

Task: Participants has to state a word or term related either to Enterprise Architecture or to TOGAF. The catch is the word or term must start with the initial letter of the participant's name.

Participant Instructions: The instructor should ask the participants to identify a “My Word” which they find specially interesting or difficult.

Instructor Hints: If the participants are new to both Enterprise Architecture and TOGAF, the instructor can ask the participants to refer to the TOGAF glossary in the Reference Book. If the participants are adequately equipped, the instructor can ask them to state the reason for their choice.

Also, the instructor might record the words or terms either on a flipchart or on a slide for later reference.

COURSE OBJECTIVES

The slide is titled "Course Introduction" and has a subtitle "Course Objectives". In the top left corner, there is a logo for "THE Open GROUP" with the text "TOGAF® 9 Accredited Training Course". The main content area contains the following text:
At the end of this course, you will be able to:

- Comprehend the basic concepts of Enterprise Architecture and TOGAF® 9.1.
- Explain the features of TOGAF® 9.1 and its methodology.
- Apply Architecture Development Method (ADM), guidelines, and deliverables related to TOGAF® 9.1.
- Interpret the reference models and architecture function in TOGAF® 9.1.
- Prepare for TOGAF combined certification examination.

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Sample Material - Not for Reprint

COURSE MATERIAL



Notes for the Instructor

The instructor should inform the participants about the course material. The course material is divided into Participant Handbook and Reference Book. The Participant Handbook consists of module slides, associated information, exercises, case study, and sample examination. The Reference Book consists of additional reading material useful for classroom exercises, the TOGAF syllabus, and the TOGAF glossary.

The case study, Appendix A, should be used throughout the classroom session to explain or reinforce the learning points. The participants should be advised to read this material thoroughly.

The instructor should emphasize the importance of studying the Reference Book prior to attending the classroom session. Inform the participants that the material covered in the Reference Book is important and would be covered via various exercises in the classroom session. In order to draw maximum benefit, the participants must understand the reference material and clarify doubts, if any, in the classroom session.

Announcement for the Participant

The course material for the TOGAF® 9.1 Combined course is divided into Participant Handbook and Reference Book. The Participant Handbook consists of module slides, associated information, exercises, case study, and sample examination. The Reference Book consists of additional reading material useful for classroom exercises, the TOGAF syllabus, and the TOGAF glossary.

The case study, Appendix A, is used throughout the classroom session to explain or reinforce the learning points. The participants are requested to read this material thoroughly.

The course assumes that the participants have read the Reference Book prior to attending the classroom session. The material covered in the Reference Book is important and would be covered via various exercises in the classroom session. In order to draw maximum benefit, the participants must understand the reference material and clarify doubts, if any, in the classroom session.

IMPORTANT INFORMATION

The slide is titled "Course Introduction" under "Important Information". It features six icons in boxes:

- Class Hours:** An icon of a red and silver analog clock.
- Meals/Breaks:** An icon of a steaming cup of coffee.
- Phone Etiquette:** An icon of a silver mobile phone.
- Laptops:** An icon of an open laptop computer.
- Restrooms:** An icon of two black silhouettes, one female and one male, standing near a vertical bar representing a restroom door.
- Safety:** An icon of a wooden door with a green exit sign and arrow pointing left.

A small number "6" is in the bottom right corner of the slide area.



The instructor should inform the participants about the various details, such as class hours, breaks, mobile and laptop usage, restrooms, and safety information.

CASE STUDY

 **Course Introduction**
Case Study

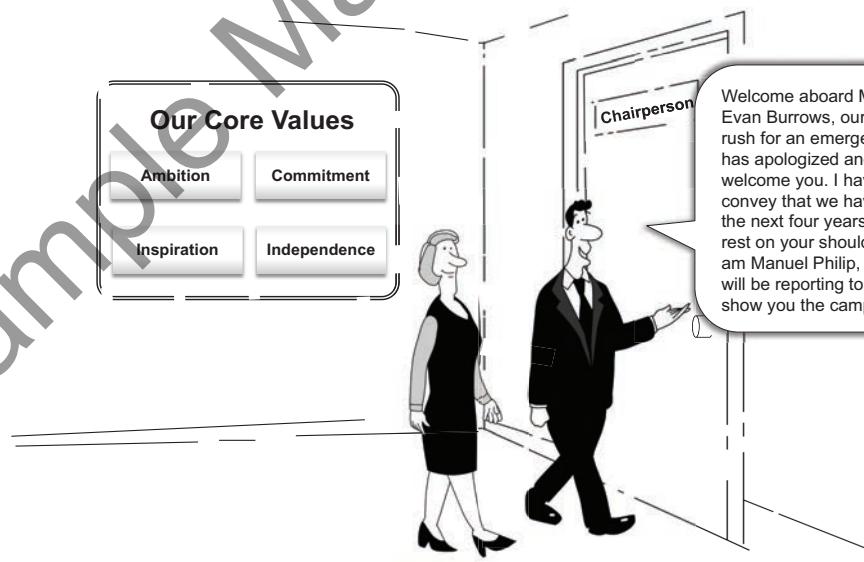


1912...did the founding fathers of this university ever think that this will grow into such prestigious institution? Well, my welcome kit says, the university has over 30,000 students and 5,000 staff members!

The University of Centralville, Centralville, USA
Established: 1912

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 **Course Introduction**
Case Study



Our Core Values

- Ambition
- Commitment
- Inspiration
- Independence

Welcome aboard Ms. Rose Rhineberg! Evan Burrows, our Chairperson had to rush for an emergency meeting. He has apologized and asked me to welcome you. I have been asked to convey that we have massive plans for the next four years and lots of it will rest on your shoulders. By the way, I am Manuel Philip, the IT Director. You will be reporting to me. Allow me to show you the campus.

Chairperson

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Course Introduction

Case Study

Evan has pinned his hopes on our Strategic Plan and man he has planned it big.

Between the two of us – he wants to run for Congress and feels his work here should be enough to garner support.

That's interesting. Does it run in his family or is he a first timer? Anyways, Evan is the Chairperson of the Executive Board.

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Course Introduction

Case Study

Hey, some googling will be handy there.

Our Executive Board governs the six faculties and seven support services of the university. This is our highest administrative body.

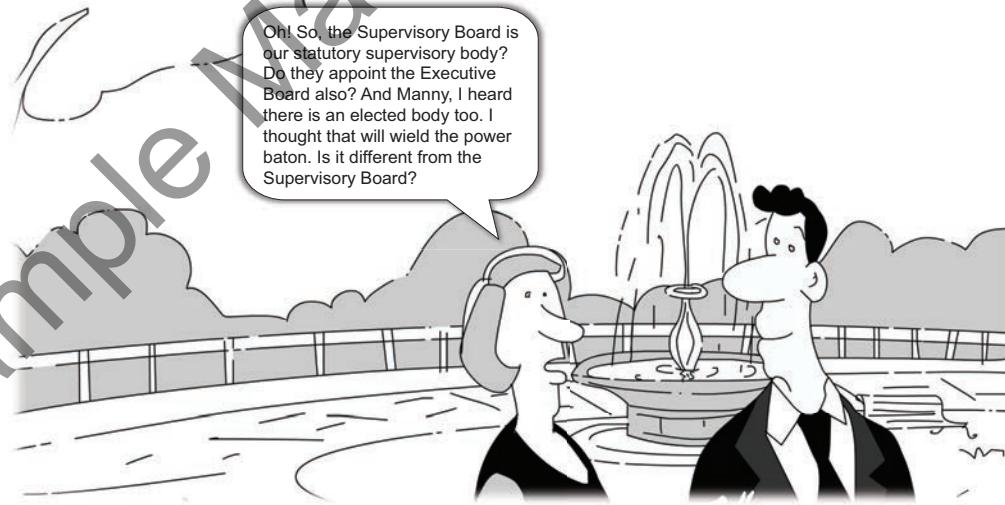
Hmmmm....

10



**Course Introduction****Case Study**

11

**Course Introduction****Case Study**

12





Course Introduction

Case Study

Let me show you the university. Rose, our campus has six buildings.

Six buildings...one for every faculty I guess! Our range of undergraduate, graduate, and research programs are run in these buildings. Quite a view, I must say.

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Course Introduction

Case Study

First to your right is the Humanities faculty and two support services - HR and Finance. The one next to it is our faculty for Law, Governance, and Economics. Our Executive Affairs and Communication & Marketing support services work from that building too.

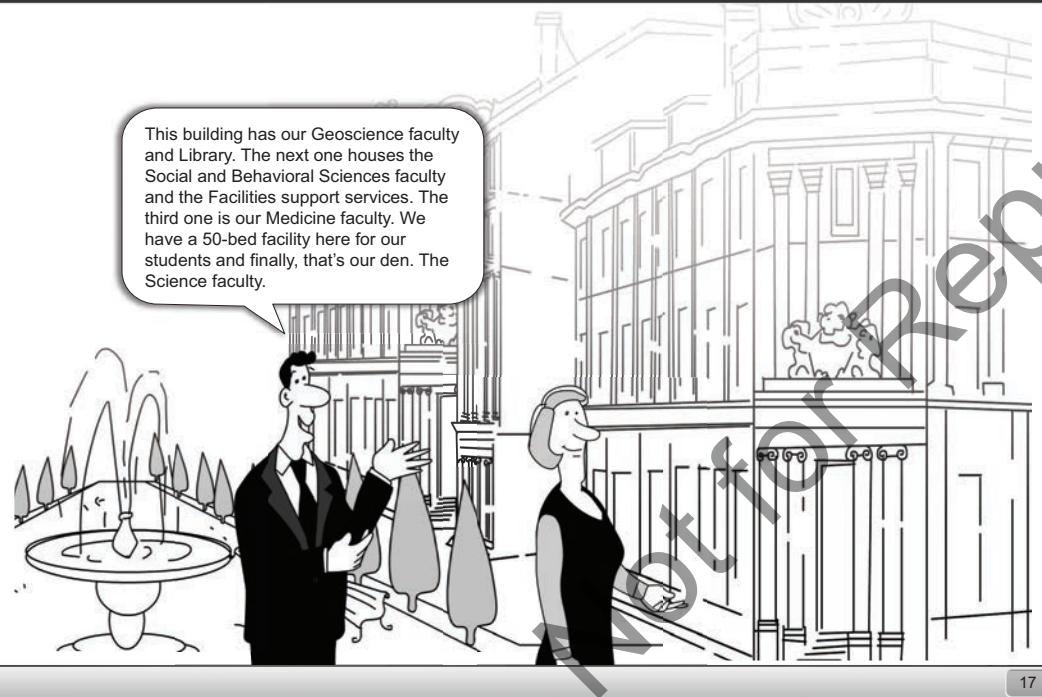
Hmmmm....

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Course Introduction

Case Study



This building has our Geoscience faculty and Library. The next one houses the Social and Behavioral Sciences faculty and the Facilities support services. The third one is our Medicine faculty. We have a 50-bed facility here for our students and finally, that's our den. The Science faculty.

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Course Introduction

Case Study



This is where we work and have fun – our IT support service.

Hey! A bubbly place indeed...with huge posters.

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Course Introduction

Case Study

The Mission of the University of Centralville is stated in the poster.

Our Mission:

- Educate young people
- Prepare coming generations for research
- Provide specialized training for professional life
- Conduct groundbreaking research
- Address and work towards social issues

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Course Introduction

Case Study

Rose, we are a university that lives by its core values and mission. Seriously...everything that stands by these gets the Supervisory Board support hands down.

There, let us look at Evan's dream – Strategic Plan. Evan and his team have defined some performance agreements based on it. Here it is...

Our Mission:

- Educate young people
- Prepare coming generations for research
- Provide specialized trainings for professional life
- Conduct groundbreaking research
- Address and work towards social issues

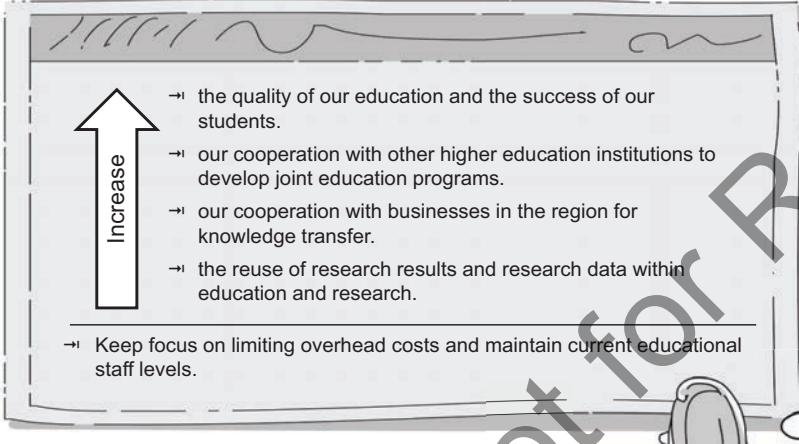
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Course Introduction

Case Study

The Goals of the University of Centralville are stated in the poster.



- the quality of our education and the success of our students.
- our cooperation with other higher education institutions to develop joint education programs.
- our cooperation with businesses in the region for knowledge transfer.
- the reuse of research results and research data within education and research.

→ Keep focus on limiting overhead costs and maintain current educational staff levels.

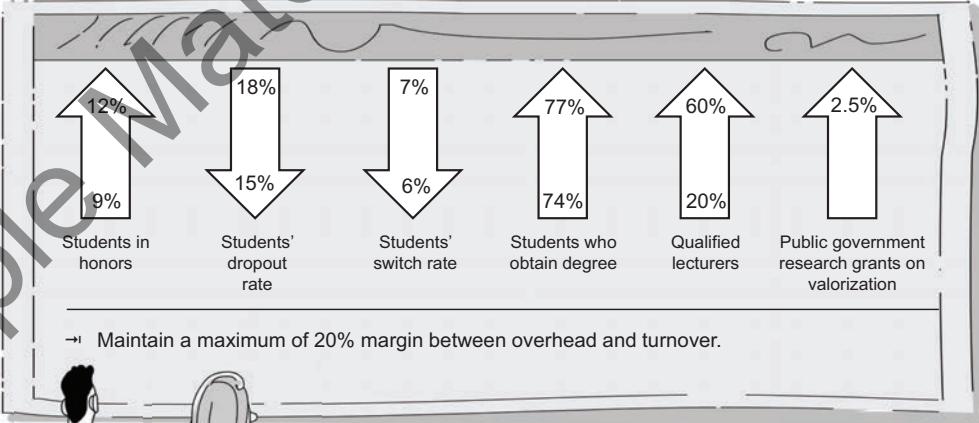
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Course Introduction

Case Study

The performance agreements for Strategic Plan are mentioned in the poster.



| Metric | Current Status (%) | Target (%) |
|---|--------------------|------------|
| Students in honors | 9% | 12% |
| Students' dropout rate | 15% | 18% |
| Students' switch rate | 6% | 7% |
| Students who obtain degree | 74% | 77% |
| Qualified lecturers | 20% | 60% |
| Public government research grants on valorization | 2.5% | |

→ Maintain a maximum of 20% margin between overhead and turnover.

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Course Introduction

Case Study

Let me introduce you to the team! We are a 100-people team...actually, you are our century scoring member!

Our main activity is to manage the daily operations of the university's IT systems.

That's interesting.

23

Course Introduction

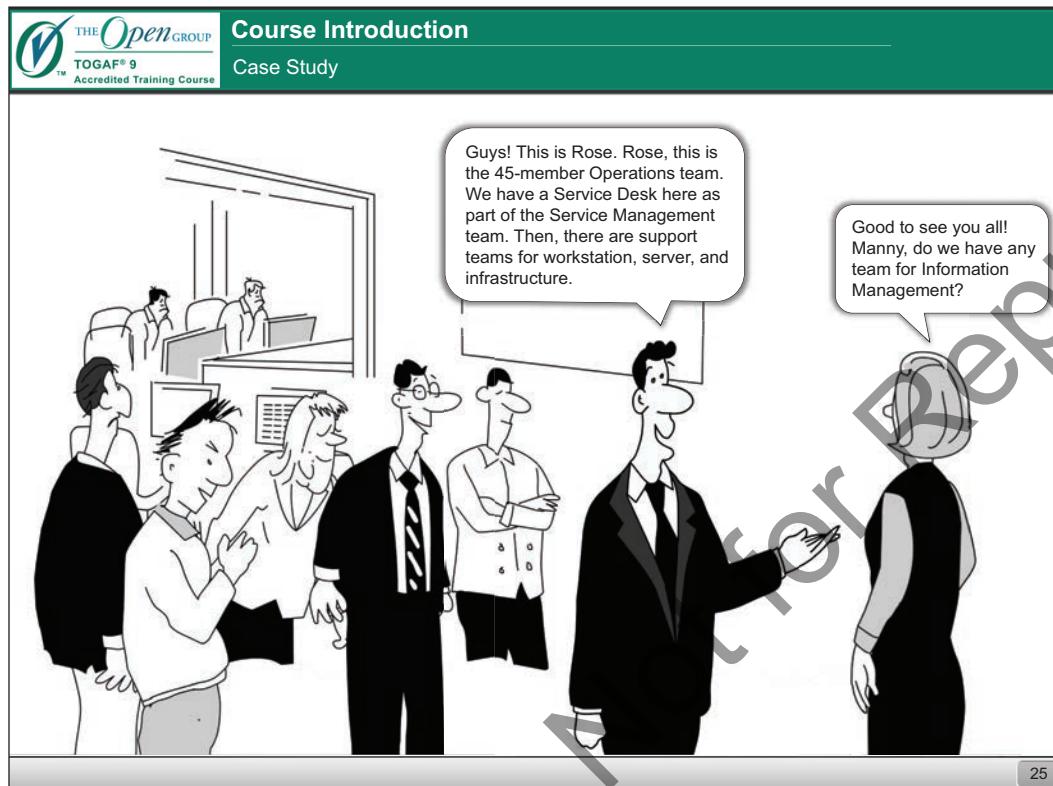
Case Study

This is Rose. She has joined us as Chief Enterprise Architect. Rose, that is our 35-member Application Management team. To your left is the Portal team. Then the Enterprise Integration team and the third one is...

Let me guess...are they Java Developers? Do you handle custom development work as well?

Yeah.

24



 **Course Introduction**
Case Study



Rose will report directly to me and Enterprise Architects will report to her. Walter, I have a meeting. Can you introduce the team? Catch you later Rose!

27

 **Course Introduction**
Case Study



Rose, with you the Information Management team will be 20-people strong. Anyways...our functional management team has 12 members who are responsible for the functional management of our core IT systems.

Are these people responsible for gathering requirements and functional specifications of new systems as well?

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Course Introduction

Case Study



A cartoon illustration showing a group of people in a meeting room. In the center, a man in a dark suit and tie is speaking. A woman with short grey hair stands to his right, smiling. Other people are seated in the background. A speech bubble from the central figure says: "Well, we have a team of another 10 who work on conducting the requirements analysis and developing the functional specifications." Another speech bubble from the woman says: "Here, these are the members of our project management team." A third speech bubble from the woman says: "Hey! I am Rose."

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Course Introduction

Case Study



A cartoon illustration showing three men in an office break room. One man in a dark suit is handing a coffee cup to another man. A third man in a patterned shirt stands behind them. A speech bubble from the man in the suit says: "Was wondering where Hank and Donny are! Here Rose, meet your team – the coffee buffs! In fact, we are planning to move the coffee machine next to their work stations. Boys, this is your chief...Rose." A speech bubble from the man in the suit says: "Leaving Rose in your hands now!"

30





Course Introduction

Case Study



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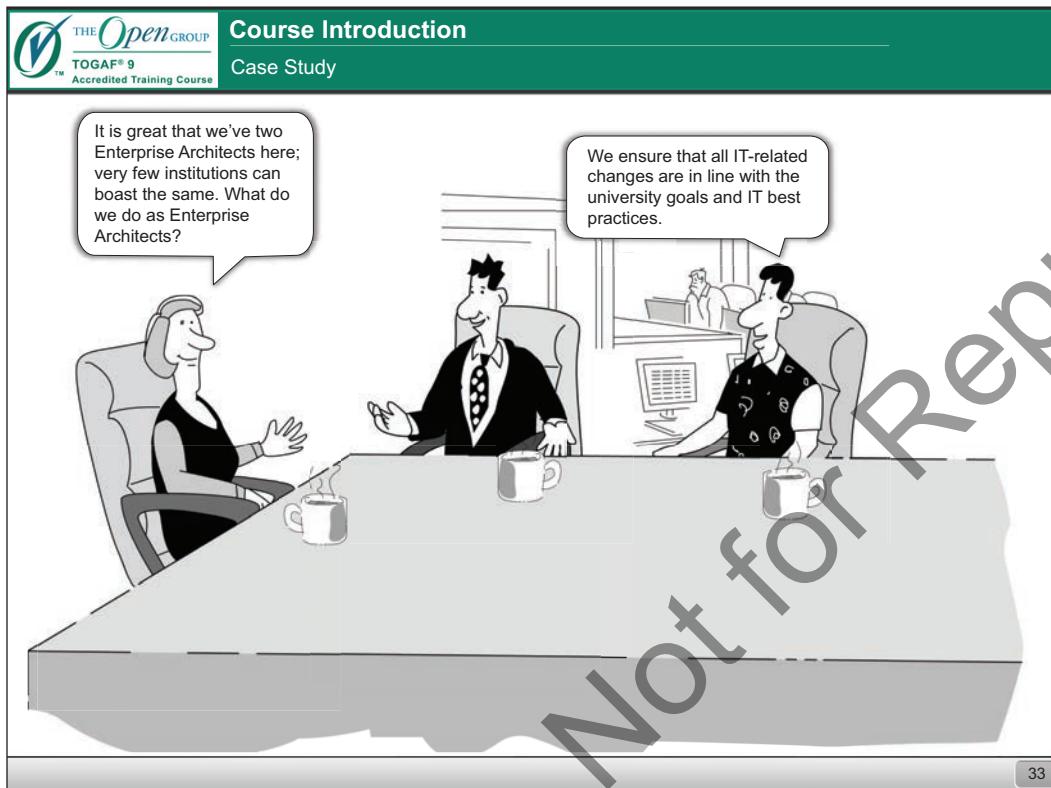


Course Introduction

Case Study



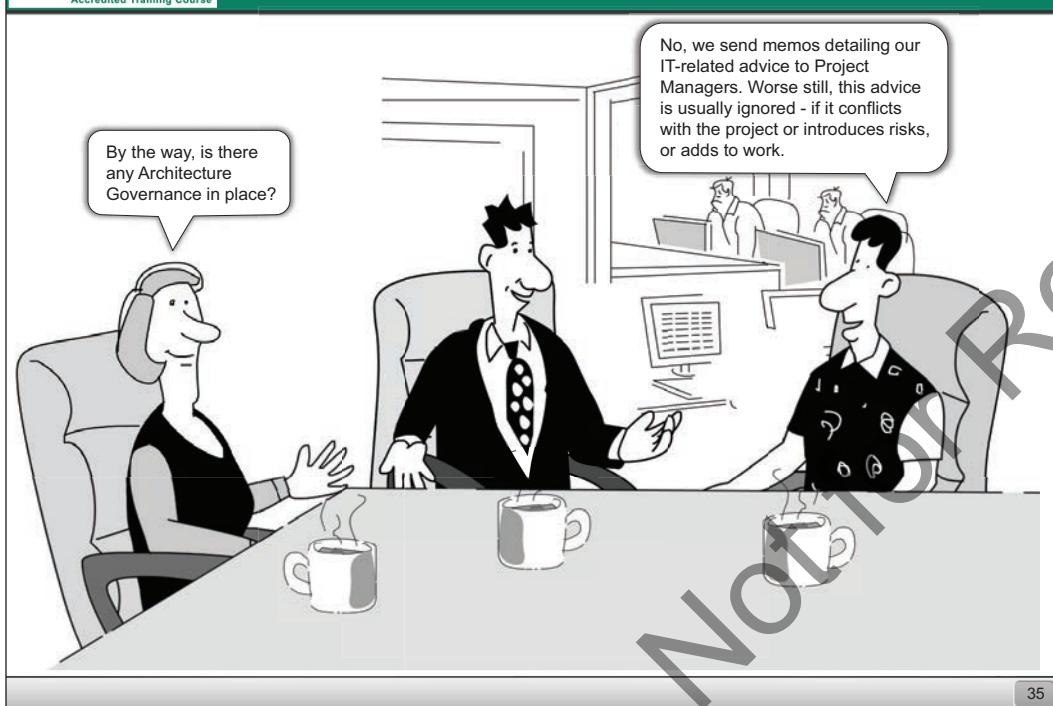
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Course Introduction

Case Study



Course Introduction

Case Study



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Course Introduction

Case Study



Ah! Just the usual ones. There are three systems directly associated with the students. First, a Learning Management System for sharing material between the students and lecturers, collaboration, exercises, assignments, tests, and stuff.

Then there is the Student Information System used for student-related info, courses, classes, and grades. The Research Administration System is used for sharing the research results. It can be accessed by researchers, lecturers, and students.

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Course Introduction

Case Study



Do we have any system for scheduling the courses and resources?

Yes, our Scheduling System takes care of that. Then the general ledger is handled by the Financial System and procurement is handled by the Procurement System.

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Course Introduction

Case Study

Then there is the Portal, maintained by the Portal team over there...

We also have an HR System for administering employee information. The best part of our HR System is the self-service feature. We can do most of the things ourselves, such as apply for leaves.

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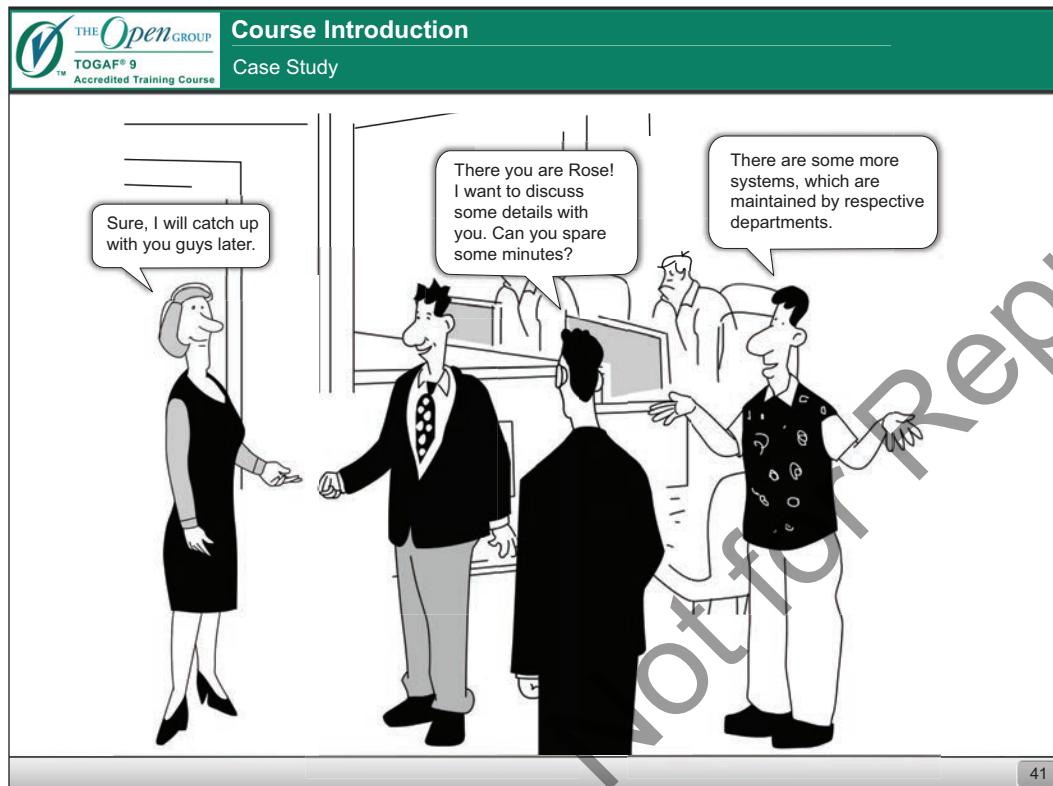
Course Introduction

Case Study

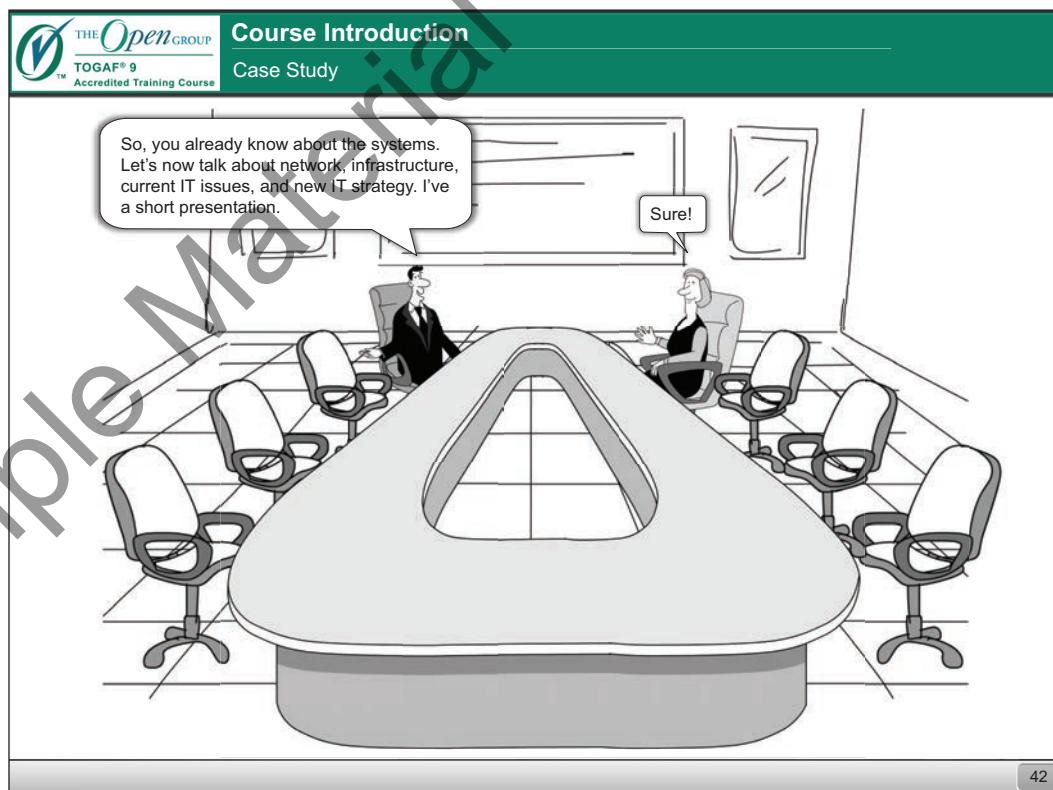
They also take care of the university website.

Soon our Financial and HR systems will be connected to the Portal. These will be replaced by SAP. So, that will be the end of some custom-built systems.

40



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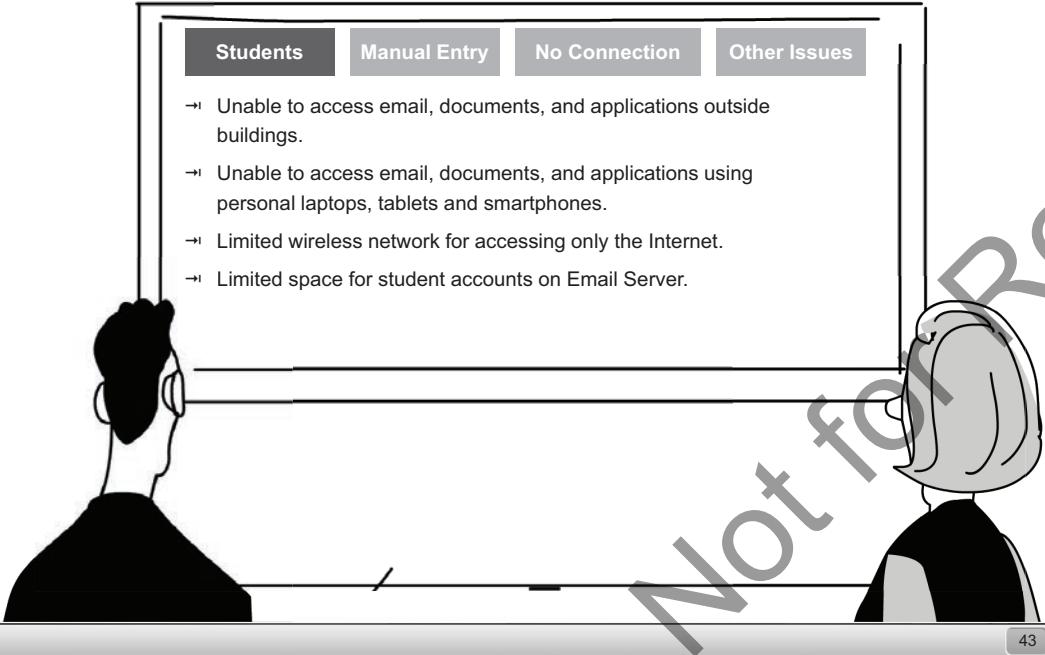


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 **Course Introduction**
Case Study

Students **Manual Entry** **No Connection** **Other Issues**

- Unable to access email, documents, and applications outside buildings.
- Unable to access email, documents, and applications using personal laptops, tablets and smartphones.
- Limited wireless network for accessing only the Internet.
- Limited space for student accounts on Email Server.

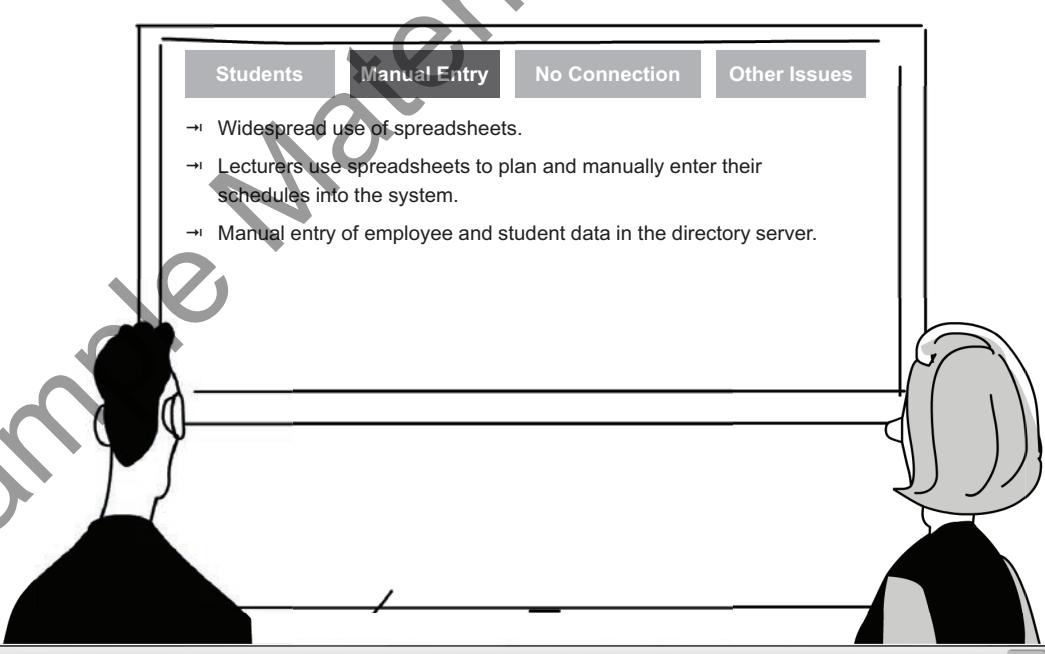


43

 **Course Introduction**
Case Study

Students **Manual Entry** **No Connection** **Other Issues**

- Widespread use of spreadsheets.
- Lecturers use spreadsheets to plan and manually enter their schedules into the system.
- Manual entry of employee and student data in the directory server.

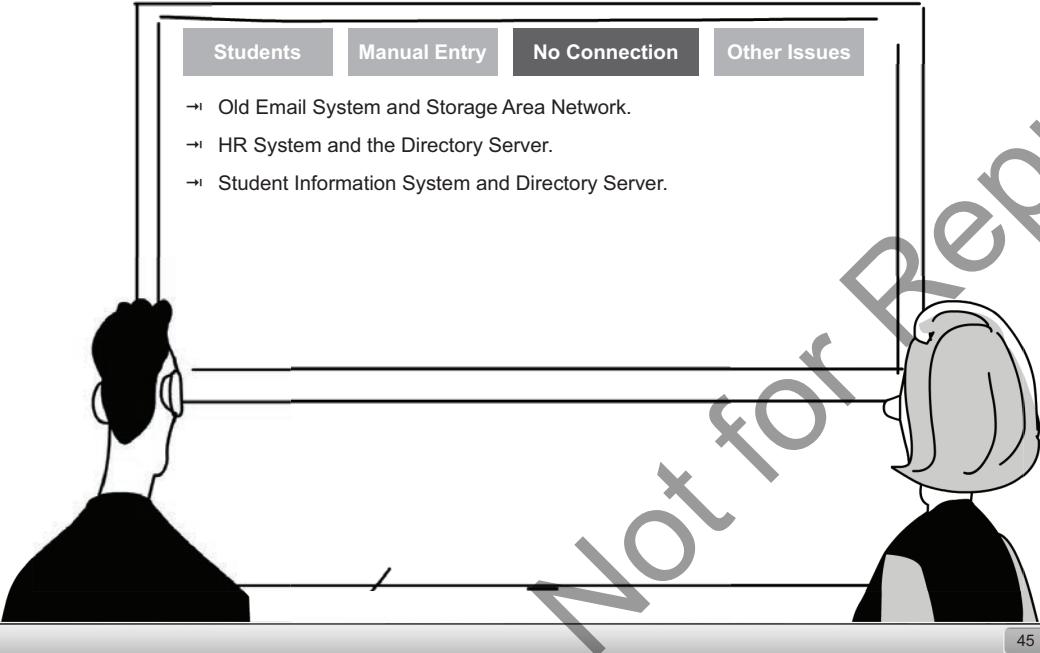


44

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Course Introduction

Case Study



Students Manual Entry No Connection Other Issues

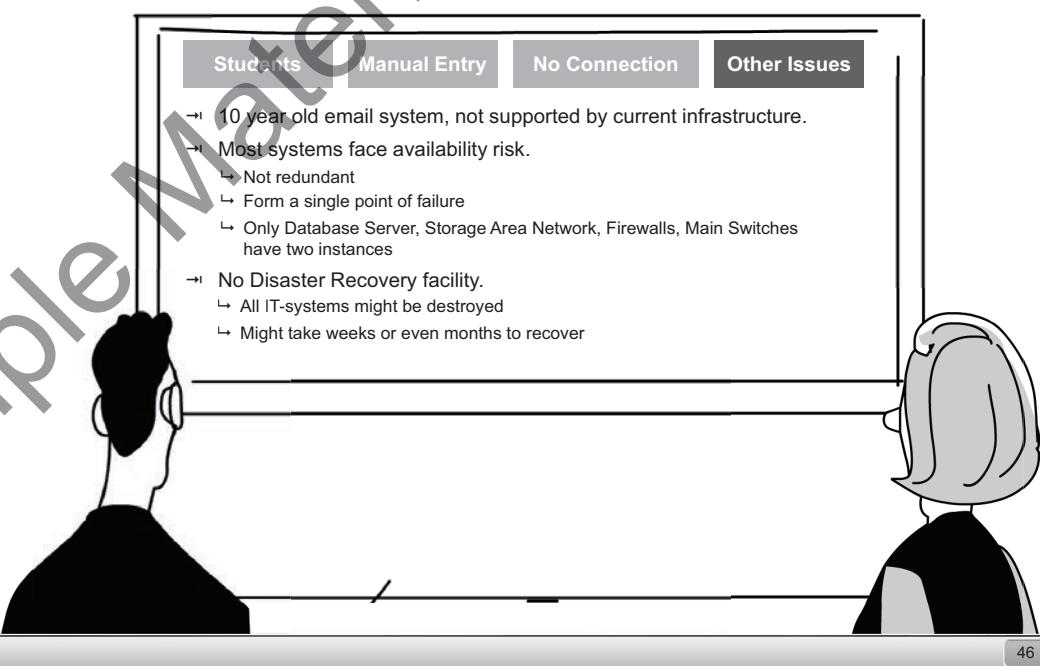
- Old Email System and Storage Area Network.
- HR System and the Directory Server.
- Student Information System and Directory Server.

45

 THE Open GROUP
TOGAF® 9
Accredited Training Course

Course Introduction

Case Study



Students Manual Entry No Connection Other Issues

- 10 year old email system, not supported by current infrastructure.
- Most systems face availability risk.
 - ↳ Not redundant
 - ↳ Form a single point of failure
 - ↳ Only Database Server, Storage Area Network, Firewalls, Main Switches have two instances
- No Disaster Recovery facility.
 - ↳ All IT-systems might be destroyed
 - ↳ Might take weeks or even months to recover

46



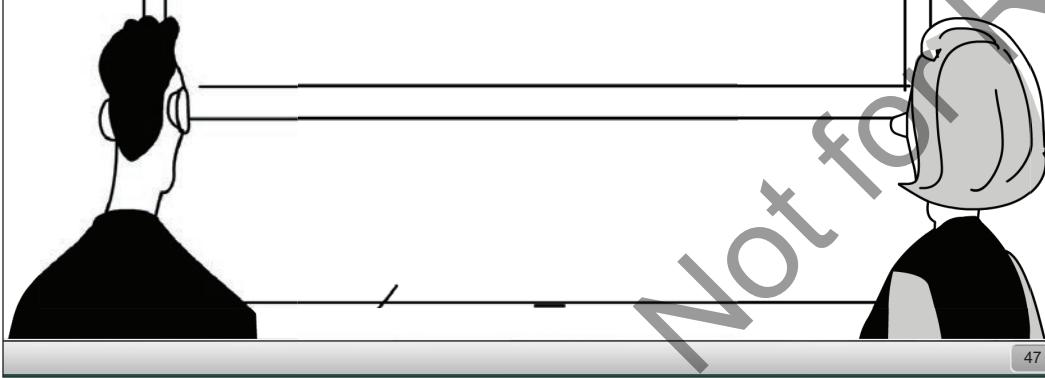


Course Introduction

Case Study

Three-point IT Strategy

- Provide students secure access to their email, documents, and applications from mobile devices and home computers.
- Increase IT system availability by solving all single points of failure in the technical infrastructure.
- Improve administration processes efficiency by preventing multiple entry of the same information across systems.



47



Course Introduction

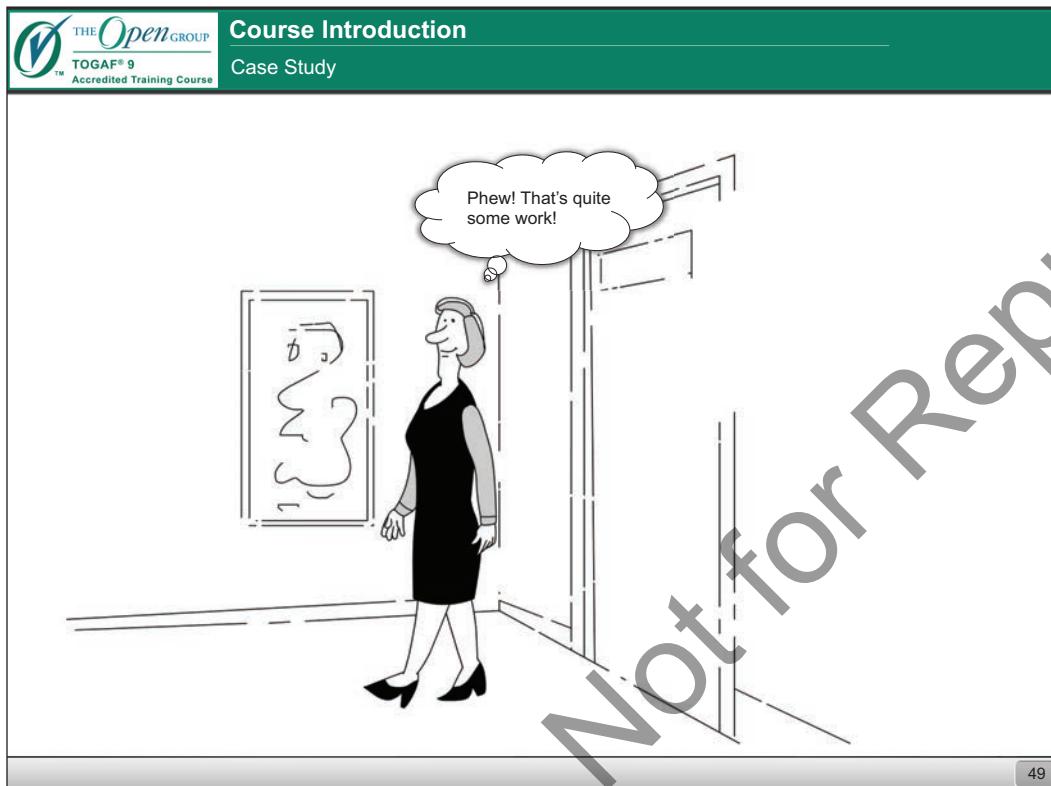
Case Study

You see it is vital we succeed. It is our dream and Evan has much at stake. I think he should get a fair chance for his Congress run.

In whatever way you look at it, the stakes are high and you are our Chief Enterprise Architect. You have to crack it for us. Good Luck!



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Notes for the Instructor

The instructor should inform the participants that the case study will be used throughout the course to explain or reinforce the learning points. The comic strip will be played once. The participants should read the case study, provided as Appendix A.

If the instructor thinks that the given case study is complex, the participants can be instructed to use their own organization's case study or any other relevant case study.

Announcement for the Participant

The participants are requested to carefully read the case study provided as Appendix A. This case study will be used to explain or reinforce the learning points throughout the course.

SUMMARY

The slide is titled "Course Introduction" and "Summary". It features the logo of The Open Group and the text "TOGAF® 9 Accredited Training Course". The main content area contains the following text:

In this module, you learned about:

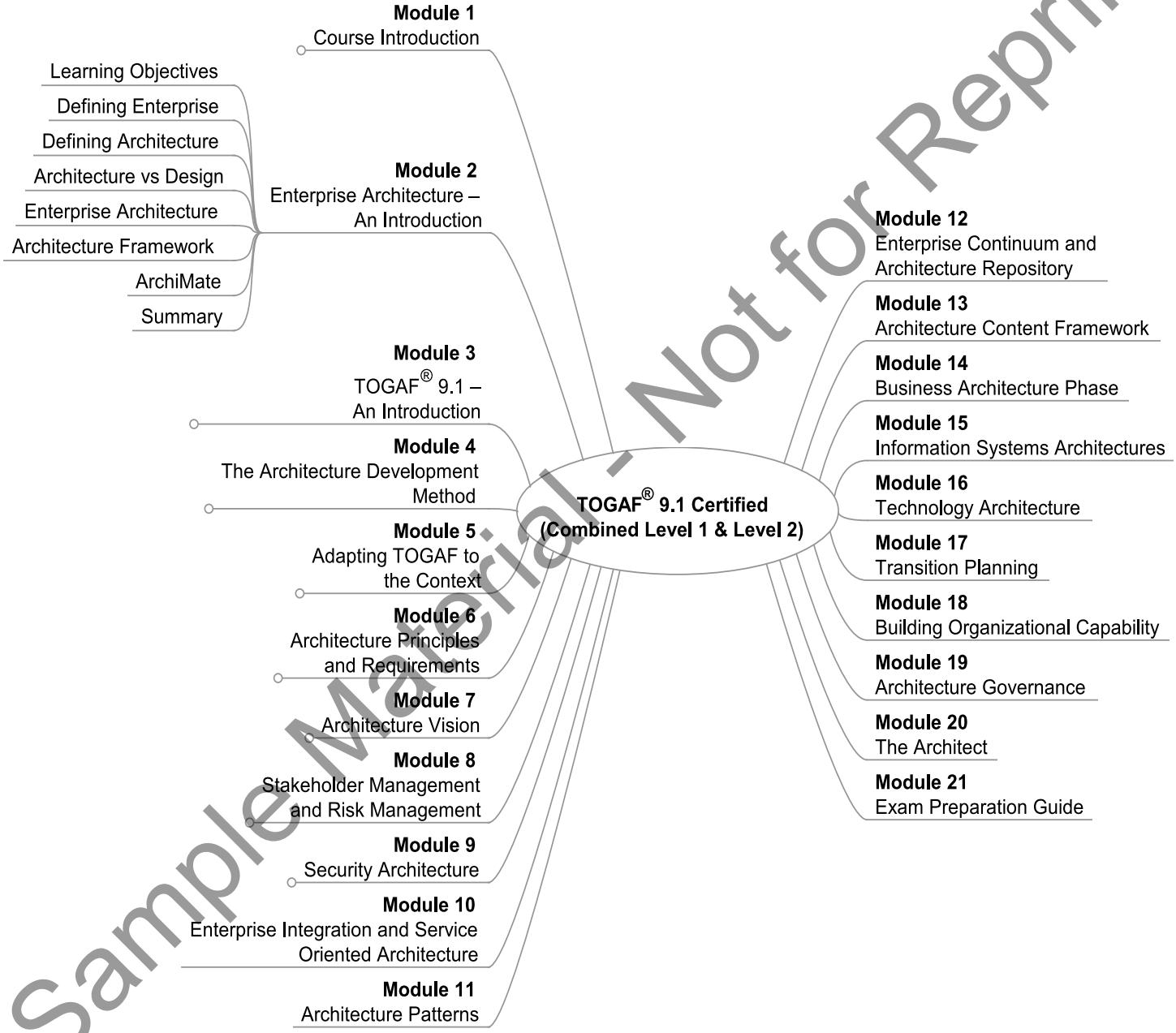
- Your instructor and fellow participants.
- The objectives of the course.
- The organization of the course.
- The University of Centralville case study, which will be used throughout the course.

A small number "50" is visible in the bottom right corner of the slide area.

Sample Material - Not for Reprint

Module 2

Enterprise Architecture – An Introduction



LEARNING OBJECTIVES

The slide is titled "Enterprise Architecture – An Introduction" and is part of the "Learning Objectives" section. It features the logo of THE Open GROUP TOGAF® 9 Accredited Training Course. The main content area contains the following text and bullet points:

At the end of this module, you will be able to:

- Explain enterprise and architecture.
- Define Enterprise Architecture.
- Describe the different architecture frameworks.
- Distinguish between the various architecture frameworks.

A small number "1" is located in the bottom right corner of the slide area.

Sample Material - Not for Reprint

DEFINING ENTERPRISE

The Concept

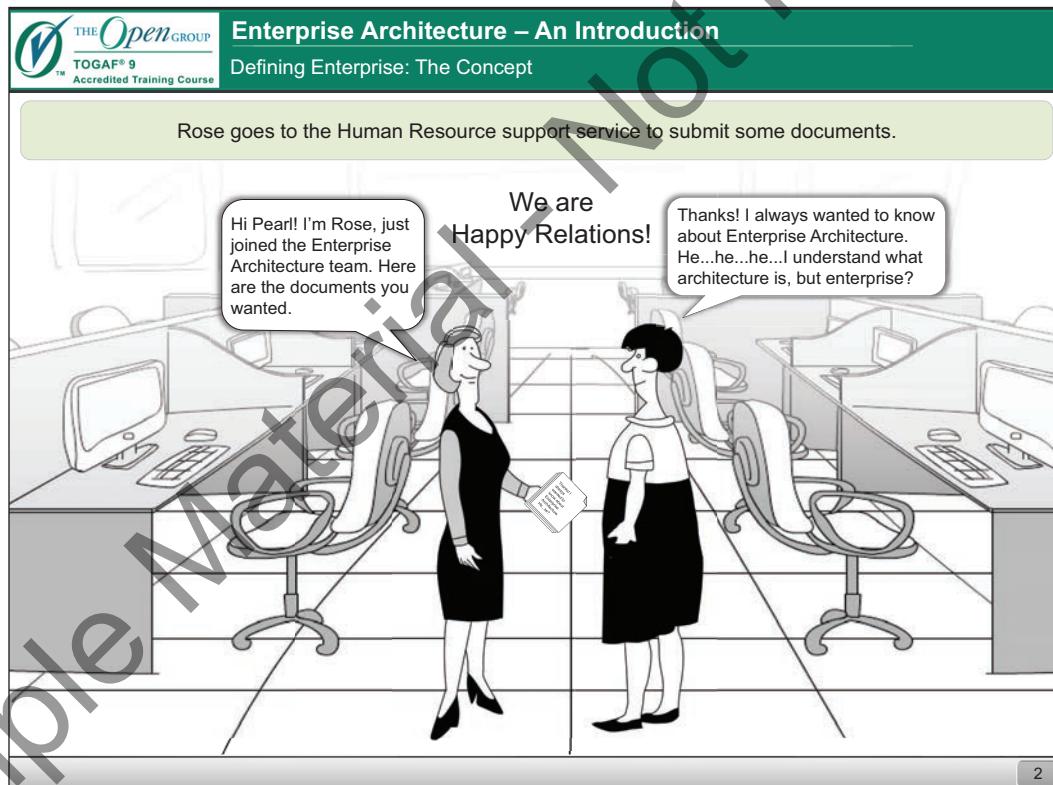


Notes for the Instructor

The concept of enterprise has been explained using a comic strip.

The instructor is advised to:

- Present this comic strip in continuation with the case study comic strip in Module 1: Course Introduction. The instructor might use the following pointers:
 - Rose is the Chief Enterprise Architect, who has just joined the university.
 - Pearl is an entry-level Human Resource Executive, who is collecting relevant documents from Rose.
- Show the comic strip, allowing participants enough time to go through the storyline.



2

Enterprise Architecture – An Introduction

Defining Enterprise: The Concept



Now Pearl, that's a tough one because the word enterprise carries many meanings. From the perspective of Enterprise Architecture, the term "enterprise" represents a group of people that have a common goal.

OK, take our university as an example. We've got the teaching departments and support services like Finance, Executive Affairs, Marketing, Library, and IT. Then we've got you – the HR support service.

We are Happy Relations!

Oh!

3

Enterprise Architecture – An Introduction

Defining Enterprise: The Concept



Thanks!
All of these groups work towards the common goals of the university. Every group can function in a silo – unaware or unconcerned about what the other group is doing.

We are Happy Relations!

Why don't you take a seat?

4

 **Enterprise Architecture – An Introduction**
Defining Enterprise: The Concept



On the other hand, these different groups can be united by mission, vision, and goals. They can strive as one to transform vision into reality. That's when they become an enterprise.

We are Happy Relations!

Quite interesting!

5

 **Enterprise Architecture – An Introduction**
Defining Enterprise: The Concept



People bonding, mutual knowledge sharing, and information transparency characterize a good enterprise. All this has a lot to do with our university. Right?

We are Happy Relations!

Well, that's right, and simple. I'll make sure we keep bumping...he...he...he...

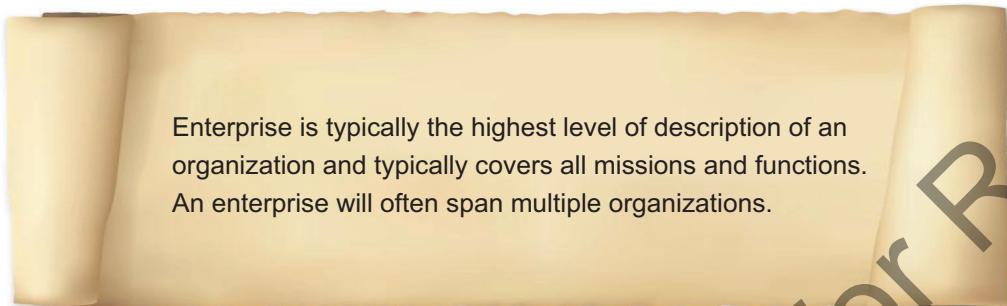
6





Enterprise Architecture – An Introduction

Defining Enterprise



Source: TOGAF® Version 9.1, The Open Group, 2011

7



After running the comic strip, the instructor is advised to:

- Spend a minute in reinforcing the message from the comic strip. Alternately, the participants can be asked to summarize.
- Arrive at the definition given in this slide using pointers from the comic strip. For example:
 - Different functions, such as teaching departments, various support services
 - United by mission, vision, and goals
 - Strive as ‘one’
- Take the participants through this slide.



According to TOGAF, an enterprise can be defined as any collection of organizations that has a common set of goals. An enterprise can be publically or privately owned, can be located at one place or at different places, and can be a complete corporation or a business unit thereof.

These days, the term enterprise is extended to include partners, suppliers, customers, and business units.



DEFINING ARCHITECTURE

The Concept



Notes for the Instructor

The concept of architecture has been explained using a comic strip.

Before presenting the comic strip, the instructor is advised to:

- Present this comic strip in continuation with the ones in Module 1: Course Introduction and the enterprise topic of this module. The instructor might use the following pointers:
 - Rose is the Chief Enterprise Architect.
 - Hank is an Enterprise Architect who reports to Rose. He is a happy-go-lucky guy, who is particularly fond of Café Coffee Day. The other members of the team prefer Starbucks.
 - A contest has just been announced and Hank not only wants to participate, but wants to win it as well. When the comic strip opens, Hank is reading the contest announcement email.
- Show the comic strip, allowing participants enough time to go through the storyline.

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Enterprise Architecture – An Introduction

Defining Architecture: The Concept

A contest, open for all employees of the University of Centralville, is held every quarter. Donny won the last contest. Hank is eagerly waiting to beat him this time. Hank is reading the email announcing the new contest.

Finally, the new contest! I've to win it this time. Rose, do you know when Donny won the last contest he forced a Starbucks down my throat.

Hank! Didn't your Mom tell you "Impossible spells I-M-Possible", whatever the problem?

Oops! This seems so I.M.P.O.S.S.I.B.L.E.

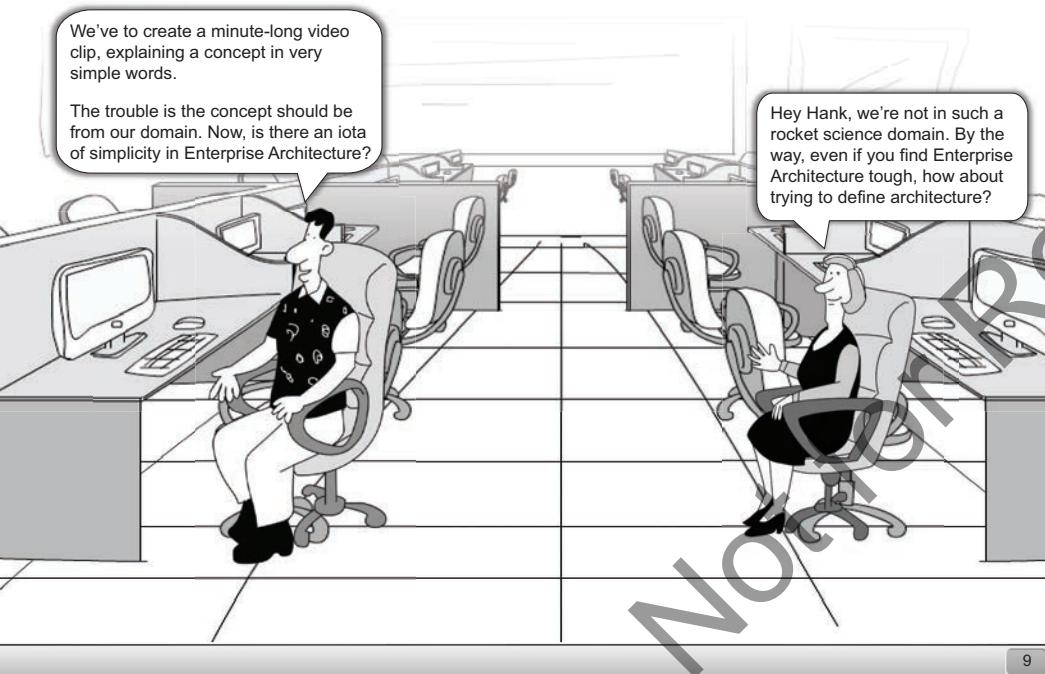
8

 **Enterprise Architecture – An Introduction**
Defining Architecture: The Concept

We've got to create a minute-long video clip, explaining a concept in very simple words.

The trouble is the concept should be from our domain. Now, is there an iota of simplicity in Enterprise Architecture?

Hey Hank, we're not in such a rocket science domain. By the way, even if you find Enterprise Architecture tough, how about trying to define architecture?



9

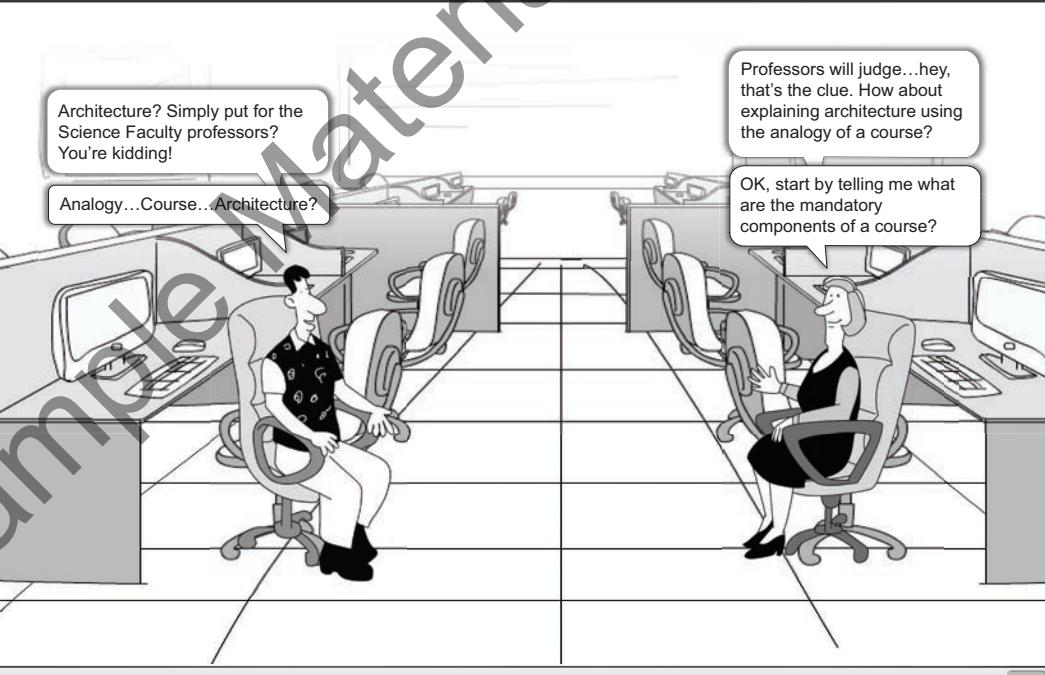
 **Enterprise Architecture – An Introduction**
Defining Architecture: The Concept

Architecture? Simply put for the Science Faculty professors?
You're kidding!

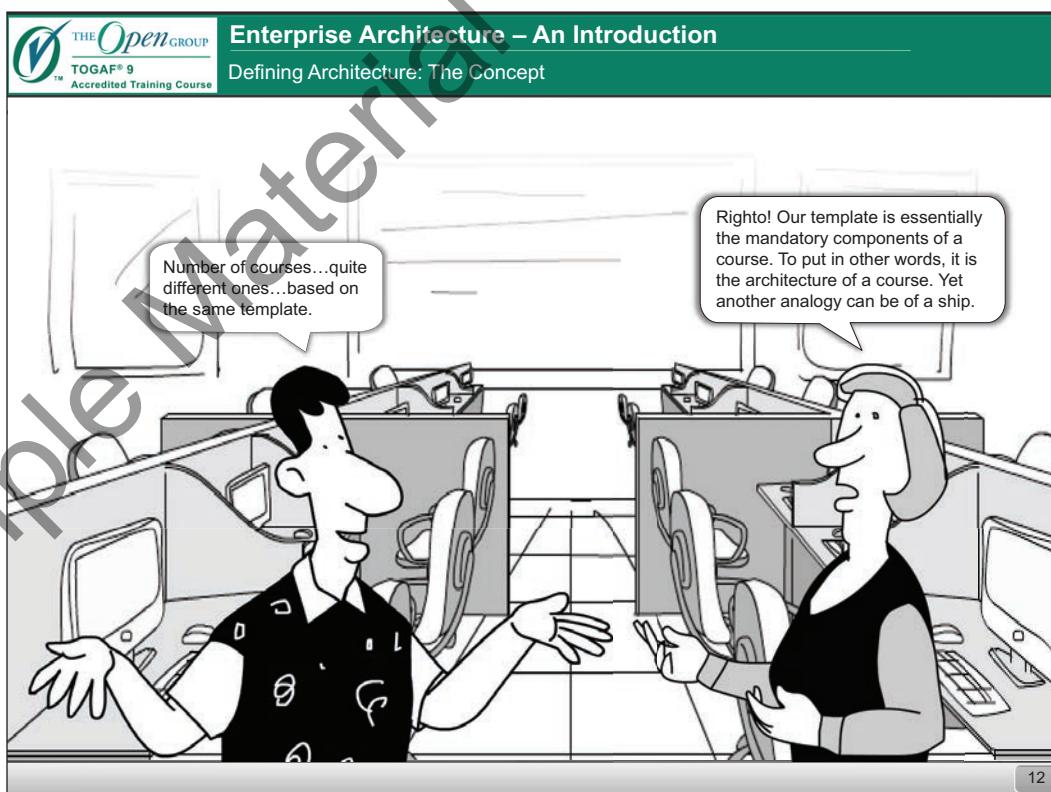
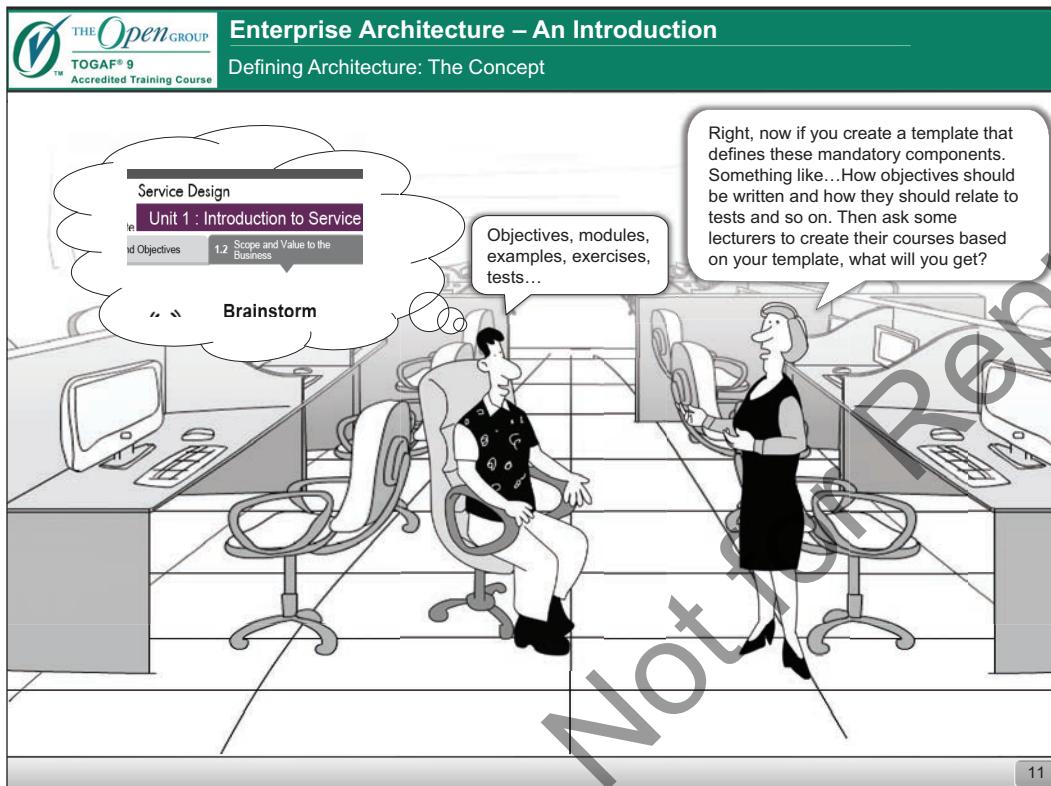
Analogy...Course...Architecture?

Professors will judge...hey, that's the clue. How about explaining architecture using the analogy of a course?

OK, start by telling me what are the mandatory components of a course?

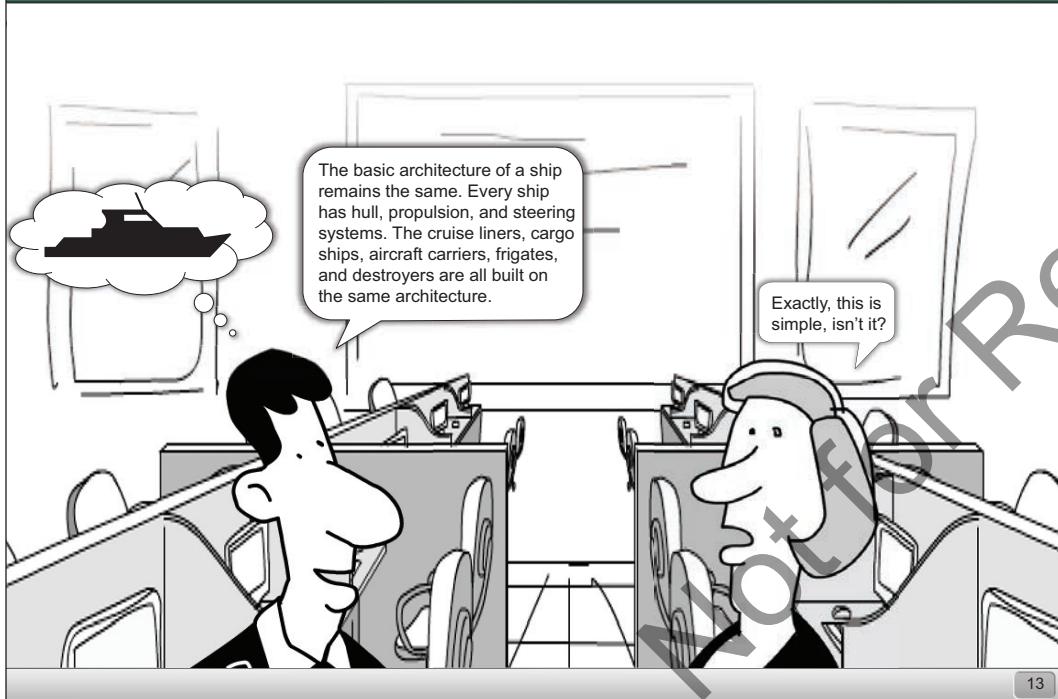


10



Enterprise Architecture – An Introduction

Defining Architecture: The Concept



Enterprise Architecture – An introduction

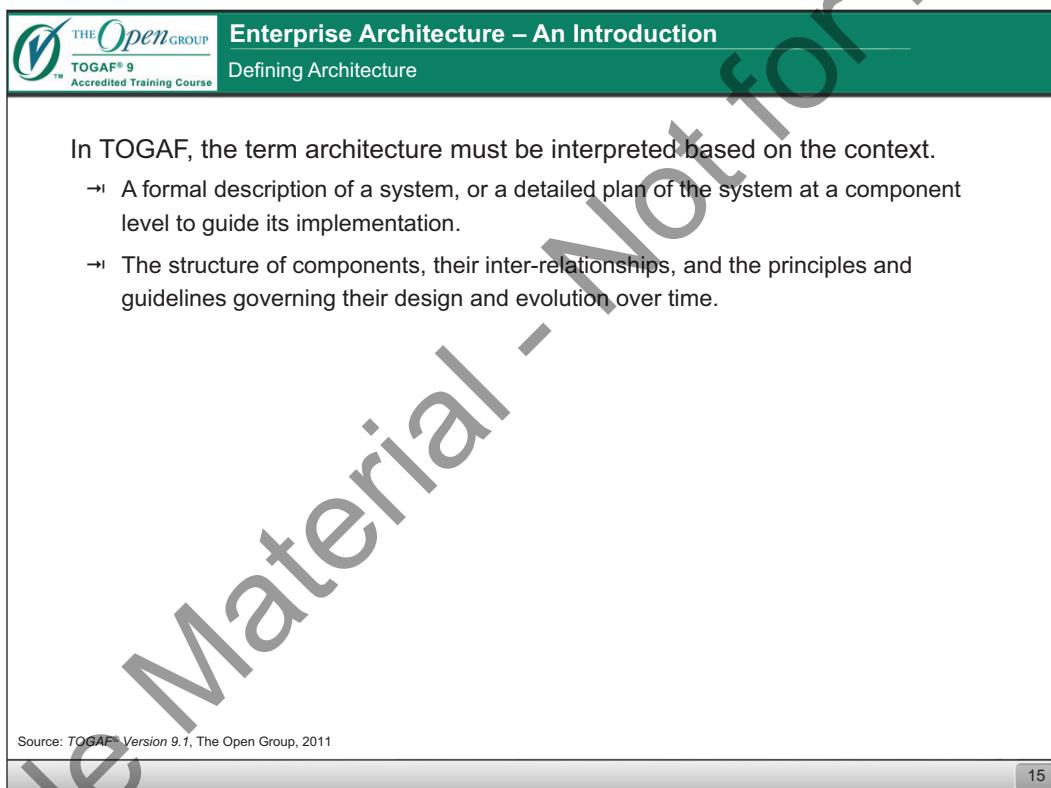
Defining Architecture: The Concept





After running the comic strip, the instructor is advised to:

- Spend a minute in reinforcing the message from the comic strip. Alternately, the participants can be asked to summarize.
- Arrive at the definition given in this slide using pointers from the comic strip. For example:
 - Template as a component level plan to create a course.
 - Structure of components, such as objectives, modules, examples, exercises, tests.
 - Inter-relationships of components, such as how objectives relate to tests.
- Prepare the participants for the upcoming discussion.



The slide is titled "Enterprise Architecture – An Introduction" and subtitle "Defining Architecture". It features the Open Group logo and the text "TOGAF® 9 Accredited Training Course". The main content discusses the interpretation of architecture based on context, mentioning formal descriptions, system plans, component-level guidance, and the structure of components over time. A source note at the bottom left indicates it's from TOGAF Version 9.1, The Open Group, 2011. The slide number 15 is in the bottom right corner.

In TOGAF, the term architecture must be interpreted based on the context.

- A formal description of a system, or a detailed plan of the system at a component level to guide its implementation.
- The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time.

Source: TOGAF® Version 9.1, The Open Group, 2011

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Initially, the instructor is advised to conduct a discussion on various analogies related to architecture, in the following manner:

- Use building architecture as an analogy to explain Enterprise Architecture. However, do not take the analogy too far. After all, the traditional architects mostly work on well-specified requirements and begin work on clean slates. These luxuries are not available to an Enterprise Architect.
- Initiate a controlled discussion on various analogies relating to Enterprise Architecture. For example, City Planning and Enterprise Architecture. Like complex cities, enterprise-wide large information



systems take multiple stakeholders' perspectives and requirements into consideration. If we take the zones of a city as organization structure, buildings are applications and systems, and the building materials are infrastructure and design specifications.

- Facilitate the discussion between the participants and encourage sharing of ideas.
- Note the valid analogies and their key points on the whiteboard or flipchart.
- Provide guidance if the participants are digressing.

Announcement for the Participant

Architecture has many definitions. Danny Greeffhorst, Henk Koning, and Hans van Vliet in *The Many Faces of Architectural Descriptions* (Springer, 2006) state:

Architecture describes the fundamental aspects of a system.

One of the classic analogies often used to explain Enterprise Architecture is traditional architecture. In both cases, it is important to keep the big picture in mind – the functionality and the requirements. Thereafter, a building architect creates various representations, ranging from rough sketches to final blueprints, before the construction begins. Various stakeholders require various representations – each covering a perspective of the building. For example, the representation shared with the owner is very different from the representation shared with the builder. Therefore, the architect provides an aesthetic representation to the owner and construction details representation to the builder. Similarly, an Enterprise Architect prepares various representations for addressing the several perspectives of organizations. Just like the case of buildings, every stakeholder requires a complete representation, and the representation differs according to the perspectives. Also, both buildings and Enterprise Architectures can be remodeled, repurposed, and rebuilt.

According to *IEEE in IEEE 1471, ISO/IEC 42010:2007*, the definition of architecture is as follows:

The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.

However, TOGAF does not strictly adhere to this definition. Another important definition is that of Len Fehskens, a renowned Enterprise Architecture expert. Len Fehskens in *Re-Thinking Architecture* (The Open Group, 2008) defines architecture as:

Those properties of a thing and its environment that are necessary and sufficient for it to be fit for purpose for its mission.

According to J.G.L. Dietz in *Architecture – Building Strategy into Design*:

Theoretically, architecture is the normative restriction of design freedom. Practically, architecture is a consistent and coherent set of design principles.

Activity Time

The slide is titled "Enterprise Architecture – An Introduction" and subtitle "Defining Architecture: Activity Time". It features a logo for "THE Open GROUP TOGAF® 9 Accredited Training Course". A large watermark "Sample Material - Not for Reprint" is diagonally across the slide. The main content is a 2x2 grid divided by a horizontal and vertical line. The top-left quadrant is labeled "Architecture" and the top-right quadrant is labeled "Design". A small number "16" is in the bottom right corner.



This activity is aimed at understanding the difference between the terms architecture and design.

Activity: List the maximum number of differences between the very similar and often confused terms, architecture and design.

Instructor Hints: The instructor should ask the participants to distinguish between architecture and design. Depending on the size of the class, the instructor can divide the participants into two or more groups. After that, the instructor is advised to:

- Provide Post It or Stickies to the participants.
- Ask the participants to list differences between architecture and design on different Post Its or Stickies.
- Give each group an area (on the whiteboard) defined as architecture and design and get the responses posted there.
- Declare the group with maximum number of valid differences as the winner.

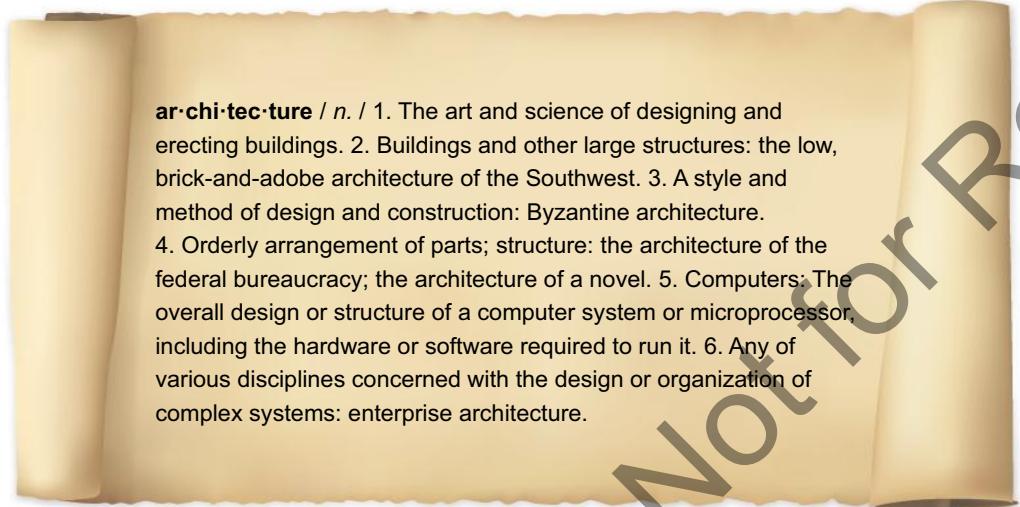
Time Allotted: 15 minutes (5 minutes to list the differences and 10 minutes to discuss the same).

ARCHITECTURE VS DESIGN

Architecture

 **Enterprise Architecture – An Introduction**

Architecture vs Design: Architecture



ar·chi·tec·ture / n. / 1. The art and science of designing and erecting buildings. 2. Buildings and other large structures: the low, brick-and-adobe architecture of the Southwest. 3. A style and method of design and construction: Byzantine architecture. 4. Orderly arrangement of parts; structure: the architecture of the federal bureaucracy; the architecture of a novel. 5. Computers: The overall design or structure of a computer system or microprocessor, including the hardware or software required to run it. 6. Any of various disciplines concerned with the design or organization of complex systems: enterprise architecture.

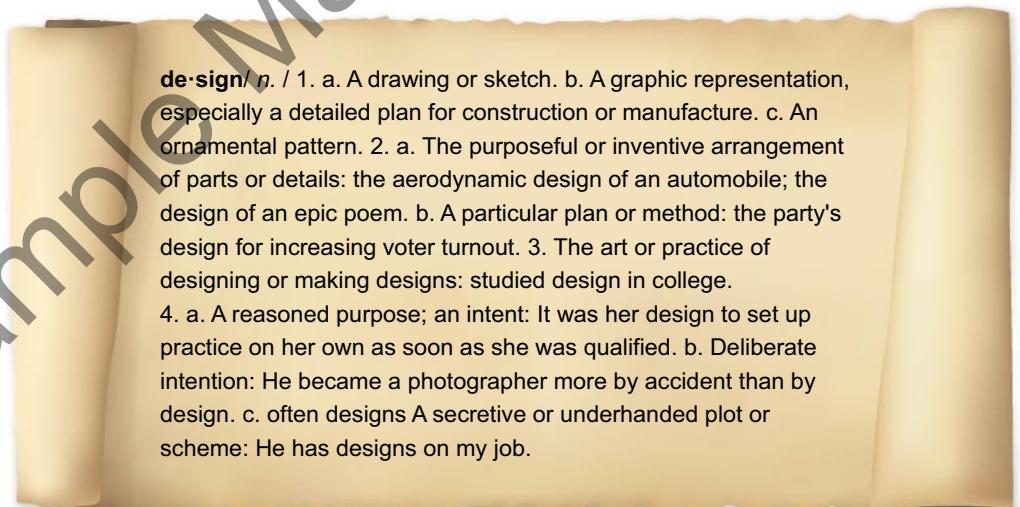
Source: www.ahdictionary.com

17

Design

 **Enterprise Architecture – An Introduction**

Architecture vs Design: Design



de·sign / n. / 1. a. A drawing or sketch. b. A graphic representation, especially a detailed plan for construction or manufacture. c. An ornamental pattern. 2. a. The purposeful or inventive arrangement of parts or details: the aerodynamic design of an automobile; the design of an epic poem. b. A particular plan or method: the party's design for increasing voter turnout. 3. The art or practice of designing or making designs: studied design in college. 4. a. A reasoned purpose; an intent: It was her design to set up practice on her own as soon as she was qualified. b. Deliberate intention: He became a photographer more by accident than by design. c. often designs A secretive or underhanded plot or scheme: He has designs on my job.

Source: www.ahdictionary.com

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Architecture provides the bigger picture, the overview, and covers a wider scope of development. It defines the linkages between domains and systems. Architecture focuses on operationalizing the strategy, structure, and purpose using frameworks, goals, principles, and methodologies.

Design, on the other hand, has a relatively smaller scope of development. It defines the linkages between various parts of a system. Design focuses on implementation and practice of a particular task at hand, given the immediate goals and constraints.

Architecture is about taking decisions on essential elements of the strategy while design focuses on implementation details. Architecture provides the overview while design provides the details.

In short, architecture is about doing the right things and design is about doing things right.

Activity Time

A slide titled "Enterprise Architecture – An Introduction" with the subtitle "Architecture vs Design: Activity Time". The main content asks, "What will happen if there is no Enterprise Architecture in place?" Below the question is a cartoon illustration of four people sitting around a conference table. One man on the left is looking up with a lightbulb above his head, symbolizing an idea. The other three people appear confused or lost. The slide has a green header bar and a grey footer bar with the number 19.



This activity is aimed at highlighting the importance of Enterprise Architecture.

Activity: Brainstorm about the question “What will happen if there is no Enterprise Architecture in place?”.

Instructor Hints: The instructor should initiate a brainstorming activity, explaining the importance of sharing ideas freely. The participants are already aware of the terms enterprise and architecture. They also know the difference between architecture and design. The participants should be instructed to build on these definitions and differences. Depending on the size of the class, the instructor can divide the participants into two or more groups. After that, the instructor is advised to:

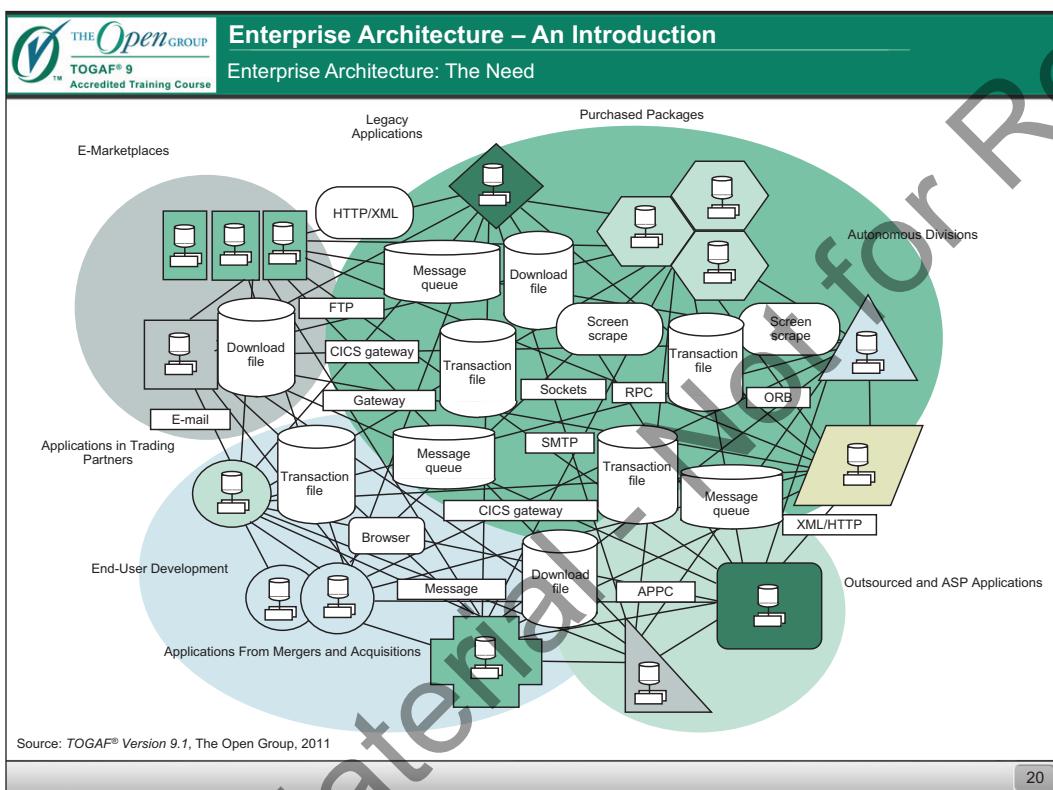


- Ask each group to share an idea in a round-robin fashion.
- Sum up the brainstorming session by showing the content on the following slide.

Time Allotted: 5 minutes

ENTERPRISE ARCHITECTURE

The Need



Notes for the Instructor

The instructor is advised to use this slide for initiating a discussion. The starting question might be “Is the architecture depicted above good or bad?”. The good aspect of the depiction is that it can be documented; the bad aspect is it contains too many technologies and interfaces. However, it is not always possible to make this simple. In addition, the goals and principles of the enterprise must be taken into consideration while deciding the architecture.

Announcement for the Participant

In today's world, most enterprises deal with many applications and technologies. It is almost impossible to carefully think through and document how these are actually used. As a result enterprises usually have limited information about how it actually functions. It is also very difficult to understand how the processes, applications, and technology interact with each other. This makes it difficult to determine the impact of changes at any level.



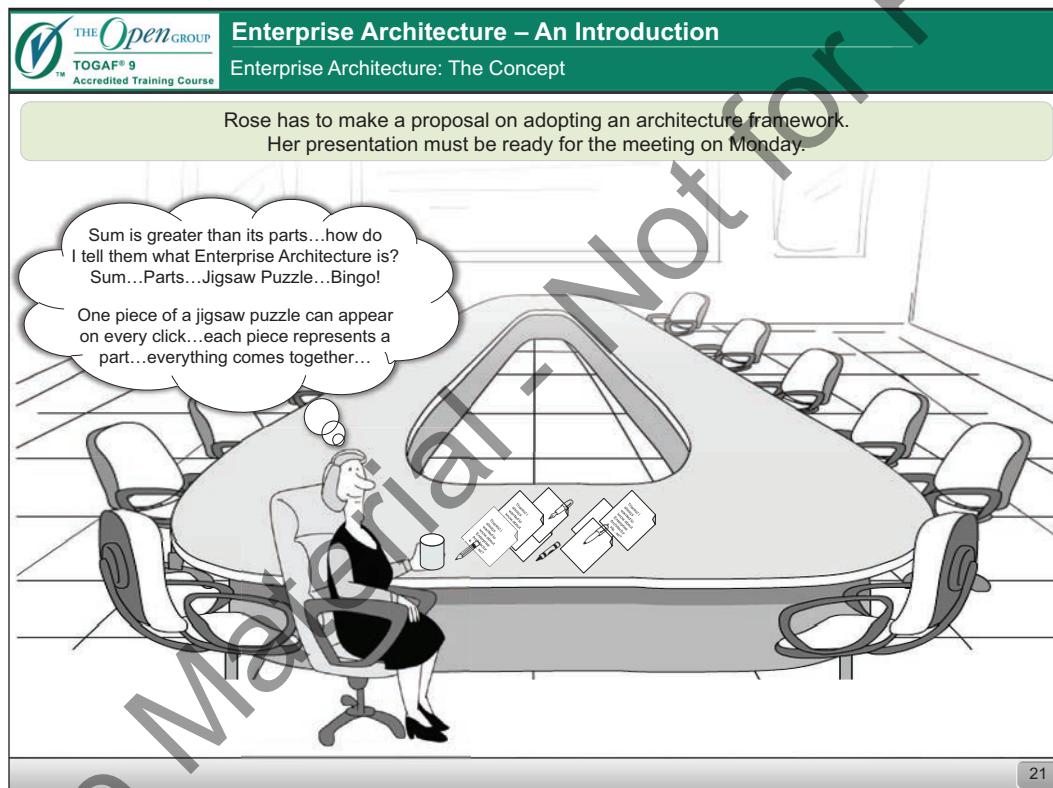
The Concept



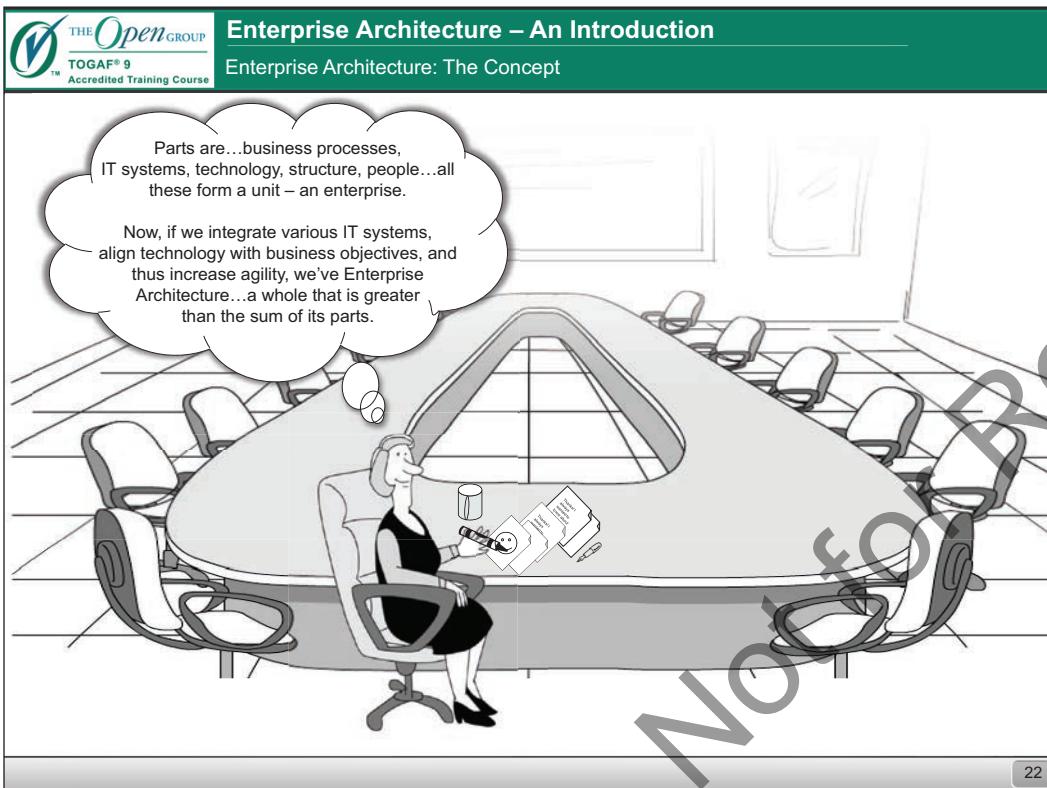
The concept of Enterprise Architecture has been explained using a comic strip.

Before presenting the comic strip, the instructor is advised to:

- Present this comic strip in continuation with the case study comic strip in Module 1: Course Introduction, enterprise, and architecture comic strips. The instructor might inform the participants that Rose is the Chief Enterprise Architect, who has just joined the university.
- Show the comic strip, allowing the participants enough time to go through the storyline.



Sample Material - Not for Reprint



After running the comic strip, the instructor is advised to:

- Spend a minute in reinforcing the message from the comic strip. Alternately, the participants can be asked to summarize.
- Arrive at the definition given in this slide using pointers from the comic strip. For example:
 - Integrate various IT systems
 - Increase agility
 - Align technology with business objectives



According to TOGAF® 9.1, the purpose of Enterprise Architecture is to optimize fragmented manual and automated processes into integrated environment such that the enterprise is responsive to change and supportive of business strategy.

In order to succeed in today's business, it is imperative to effectively manage and exploit the capabilities of various IT systems spread across the enterprise. Various IT systems must integrate with strategic vision, goals, and objectives and adapt to the ever-changing needs of the enterprise.

Enterprise Architecture aligns the IT supply to the demands of the business. In doing so, it optimizes the service portfolio of an enterprise. Also, as the bigger picture gets clear, it is easier to identify the projects that contribute to the business strategy of an enterprise. Finally, architecture improves the quality of individual solutions and simplifies their development and maintenance.

The Benefits

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Enterprise Architecture – An Introduction

Enterprise Architecture: The Benefits

| Business Benefits | IT Benefits |
|--|---|
| <ul style="list-style-type: none"> Helps an enterprise achieve its business strategy. Shortens time to market for new innovations and capabilities. Provides consistent business processes and information across business units. Improves reliability and security, and reduces risk. | <ul style="list-style-type: none"> Increases the efficiency of business and IT operations. Provides better return on existing investment. Reduces risk for future investment. Ensures faster and simpler procurement. |

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Announcement for the Participant

The benefits of Enterprise Architecture can be divided into business benefits and IT benefits. These benefits include, but are not limited to, the following:

- **Helps an Enterprise Achieve its Business Strategy** — In order to comprehend where an enterprise stands, the enterprise must understand its business, information, and technical architectures so that investments can be channeled towards achieving strategic business goals.
- **Shortens Time to Market for New Innovations and Capabilities** — Clear understanding of the enterprise and its functioning helps in quicker introduction and faster adoption of new technologies and functionalities.
- **Provides Consistent Business Processes and Information Across Business Units** — The known information can smoothly move across business units, thereby increasing the opportunities to reuse and integrate applications.
- **Improves Reliability and Security, and Reduces Risk** — Clear traceability between business processes, data, user roles, applications, and infrastructure translates into a reliable architecture model. A reliable architecture model translates into better security policies and risk mitigation plans.

- **Increases the Efficiency of Business and IT Operations** — Lowers software development, support, and maintenance costs; increases portability between applications, simplifies management of systems and networks, improves the ability to address critical enterprise-wide issues, and makes upgrade and exchange of system components easier.
- **Provides Better Return on Existing Investment** — The return on investment is maximized when there is a decrease in the complexity level of business and IT. At the same time, better understanding translates into better investment decisions, such as “Should the enterprise invest in developing an application from scratch?” or “Should the enterprise buy that application off-the-shelf?”.
- **Ensures Faster and Simpler Procurement** — Well-documented information governing plan translates into simpler buying decisions with the flexibility of procuring heterogeneous, multi-vendor open systems for quicker procurement. This ensures that a “fit-for-purpose” solution is procured. In the long-term, such solutions usually prove cheaper.

Apart from these, good Enterprise Architecture increases the efficiency of operation by lowering business operation and change management costs, improving agility, sharing business capabilities between different business units, and enhancing business productivity.

Adapted from *Whitepaper W076, Why Enterprise Architecture Matters?*, The Open Group

ARCHITECTURE FRAMEWORK

The Concept



The concept of architecture framework has been explained using a comic strip.

Before presenting the comic strip, the instructor is advised to:

- Present this comic strip in continuation with the ones in Module 1: Course Introduction, enterprise, architecture, and Enterprise Architecture topics of this module. The instructor might use the following pointers:
 - Rose is the Chief Enterprise Architect, who has just joined the university.
 - Donny is an Enterprise Architect working with Rose. He is essentially a half-resigned cynic, who tries to see the dark side of situations. At the same time, he is well-versed with the dynamics of the university.
- Show the comic strip, allowing participants enough time to go through the storyline.

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Enterprise Architecture – An Introduction

Architecture Framework: The Concept

Rose is discussing her proposal on adopting an architecture framework with Donny.

If we want Manny to even consider our proposal, we must tell him what an architecture framework is. It must be near zero jargon. That is, we must explain the architecture framework with a common example...

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Enterprise Architecture – An Introduction

Architecture Framework: The Concept

That's a good idea. We can use the building architecture analogy. Something like... I want to construct a three bedroom house. So, I discuss with my friends and call an architect.

The architect creates a blueprint based on my requirements. He then calls his team of engineers – civil, electrical, and mechanical – to construct the house. Each of these engineers creates other artifacts that are used for construction.

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Enterprise Architecture – An Introduction

Architecture Framework: The Concept

My friends, the architect, and his team understand the meaning and their role in the "three bedroom house" analogy. This is the universally accepted "lingo".

Wow Rose!

The blueprint is the result of executing a method, artifacts such as diagrams and lists are generated as the method is executed, templates are the tools used by the architect, and building regulations are the recommended standards. The electricians, plumbers, and construction people use what has been generated by the architect to construct the house.

This is exactly what an architecture framework is...a method to reach target state, common tools, and language, standards, and other artifacts are essentially the list of recommendations. This analogy sums it up beautifully.

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Notes for the Instructor

After running the comic strip, the instructor is advised to:

- Spend a minute in reinforcing the message from the comic strip. Alternately, the participants can be asked to summarize their understanding of the comic strip.
- Arrive at the definition given in this slide using pointers from the comic strip. For example:
 - Understands the "lingo".
 - Clear understanding of the abstract idea.
 - The blueprint is the method that is followed.

The slide is titled "Enterprise Architecture – An Introduction" and is part of the "Architecture Framework" section. It features the TOGAF 9 Accredited Training Course logo at the top left. The main content area contains the following text and bullet points:

In short, an architecture framework:

- Describes a method for designing a target state of the enterprise.
- Contains a set of tools.
- Provides a common vocabulary.
- Lists recommended standards and compliant products.

A large watermark reading "Sample Material - Not for Reprint" is diagonally across the slide. A small number "27" is in the bottom right corner.

Announcement for the Participant

TOGAF defines an architecture framework as a conceptual structure used to develop, implement, and sustain an enterprise architecture.

An architecture framework essentially provides a method and a list of artifacts for creating an Enterprise Architecture. Ideally, an architecture framework puts forth a method for designing the target state of an enterprise. In order to utilize the method, a set of artifacts are required. Usage of a common method and a common set of artifacts ensures consistency. In case of TOGAF, the method is the Architecture Development Method (ADM) and the artifacts are defined by the content framework.

An architecture framework shortens the development cycle of architecture, provides comprehensive coverage, and provisions for business-triggered growth.

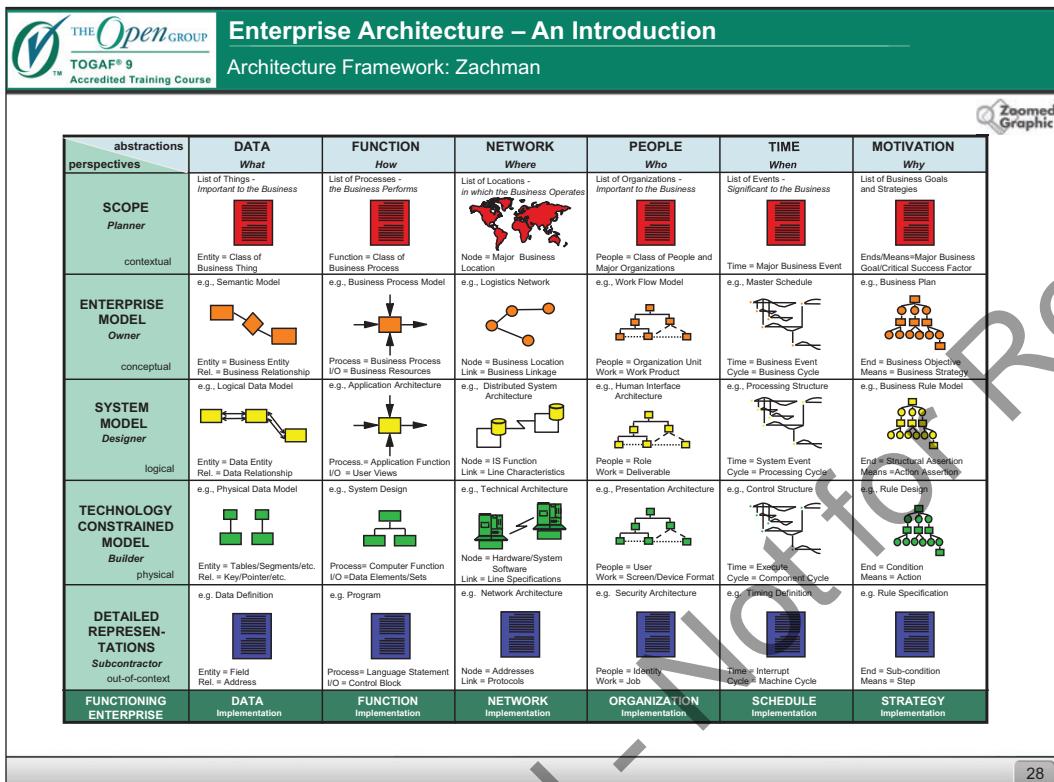
Danny Greefhorst, Henk Koning, and Hans van Vliet in *The Many Faces of Architectural Descriptions* (Springer, 2006) state:

Architecture Frameworks offer a standard approach to architecture. This approach encompasses a model for architecture description as well as a method to produce them.

Architecture frameworks either emphasize the model or the method.

The Enterprise Architecture frameworks might lead to numerous architectural models. Some examples are Zachman, TOGAF, Federal Enterprise Architecture Framework (FEAF), the United States' Department of Defense Architecture Framework (DoDAF), the British Ministry of Defence Architecture Framework (MODAF), PRISM, Pragmatic Enterprise Architecture Framework (PeaF), and Gartner. Zachman and TOGAF have been explained in detail.

Zachman



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Refer to Appendix F, page 722, for Zoomed Graphic



John Zachman laid the foundation of Enterprise Architecture framework in 1987, and provided a way of consistently describing an enterprise. Zachman studied the design artifacts of various industries, such as building construction, aircraft manufacturing, and ship building, and arrived at a generic model (taxonomy). This generic model provides a means for classifying and organizing the information of an enterprise that is useful for both the management and the systems.

Zachman used two dimensions in his Enterprise Architecture framework, namely perspectives and abstractions. Both can be understood by the following tables:

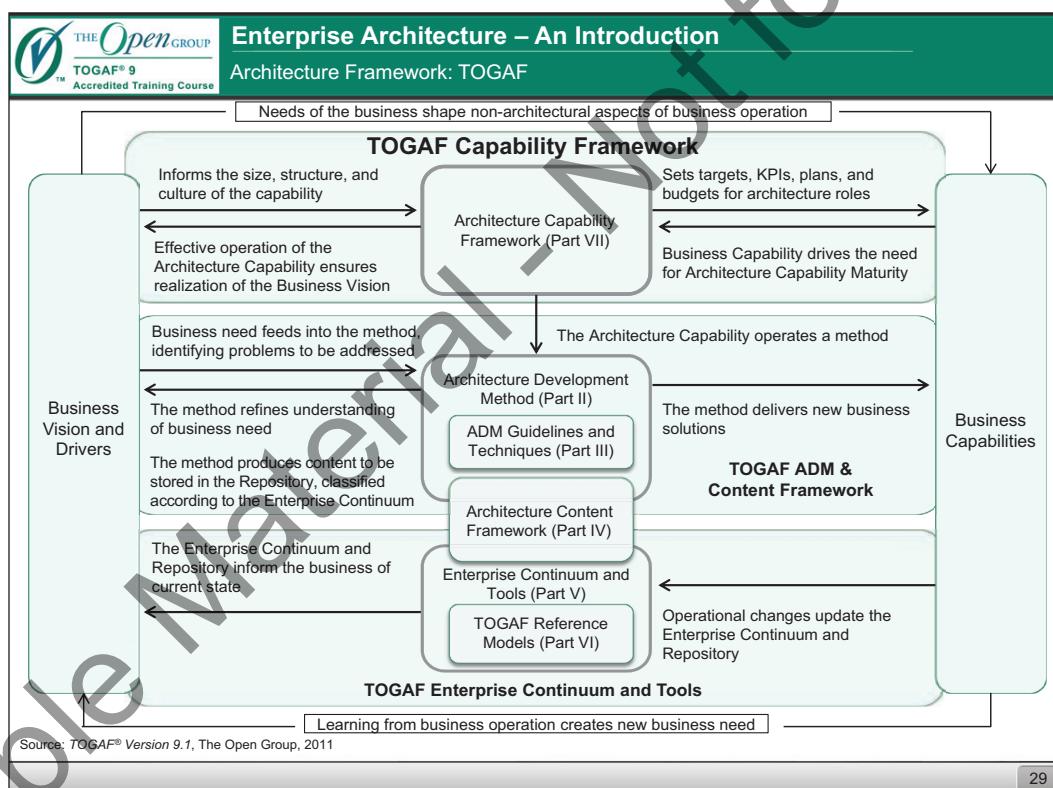
| Perspective | Models |
|--------------------------------------|--------------------------|
| Planner or Contextual view | Enterprise scope |
| Owner or Conceptual view | Enterprise model |
| Builder or Logical view | System model |
| Designer or Physical view | Technology model |
| Subcontractor or Out-of-Context view | Detailed representations |

Table 1: Perspectives in Zachman Framework

| Abstraction | Models |
|-------------------|------------------------|
| What or Data | Enterprise information |
| How or Function | Enterprise processes |
| Where or Network | Enterprise locations |
| Who or People | Enterprise hierarchies |
| When or time | Schedules |
| Why or Motivation | Goals |

Table 2: Abstractions in Zachman Framework

TOGAF



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Announcement for the Participant

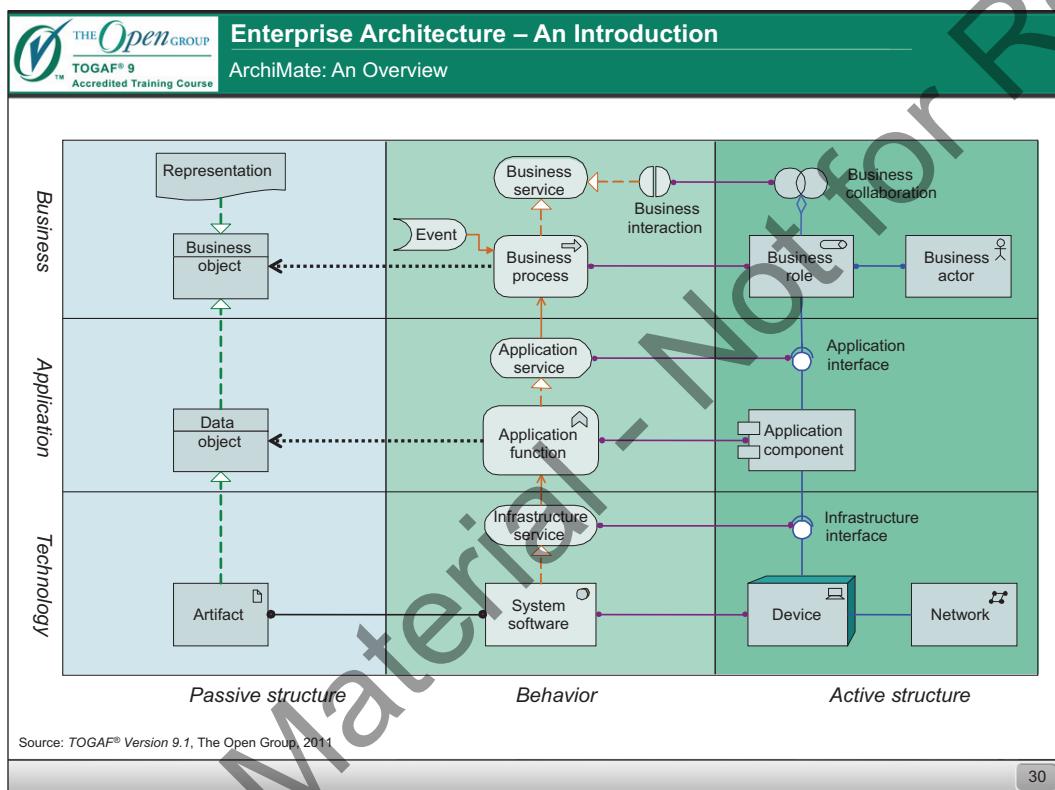
TOGAF is an Enterprise Architecture framework aimed at quickening the consistent development of Enterprise Architecture. More than 200 member companies of the Architecture Forum actively contributed in creating this framework by sharing their time-tested best practices. This is a generic framework that can be used with different methods and tools to create a cost-efficient architecture to effectively utilize various resources of the enterprise.

Central to the TOGAF is the ADM that takes inputs from business vision and drivers and transforms the vision and drivers into business capabilities. A set of guidelines, tools, techniques, and reference models plays an active role in implementing the ADM.

The first TOGAF version was introduced in 1995 and is based on the Technical Architecture Framework for Information Management (TAFIM), developed by the US Department of Defense. The most current version of TOGAF is 9.1. The next few modules will discuss TOGAF in more detail.

ARCHIMATE

An Overview



Announcement for the Participant

Representations or perspectives play a very important role in Enterprise Architecture. There are many parts in an Enterprise Architecture, such as business, IT, principles, methods, and models. Depicting the relationships between these parts, so that it is clearly understood by all stakeholders, is a difficult task. Archimate is a visual language designed specifically to cater to this requirement.

According to The Open Group website, Archimate is an independent modeling language that can be used to:

Describe, analyze, and visualize the relationships among business domains in an unambiguous way.

In the building architecture, architectural drawings use a common vocabulary to describe the architecture. The same role is played by Archimate for Enterprise Architecture. According to The Open Group website, Archimate:



Enables the creation of fully integrated models of the organization's enterprise architecture, the motivation for it, and the programs, projects and migration paths to implement it.

ArchiMate not only assists in evaluating the impact of changes but also assists in communicating them effectively.

ArchiMate is structured into three layers, namely business, application, and technology. The business layer sets the context among business processes, the roles involved in the processes, and the information exchanged between the processes. The application layer presents applications, functionality of applications, and the relationships between various applications. The technology layer offers infrastructure information, such as nodes and their constituent software and devices, networks and communication paths. Each of these three layers consists of multiple structures that are key to understanding the layer.

ArchiMate and TOGAF

Like TOGAF, ArchiMate is also an Open Group standard. Being a visual language, ArchiMate provides a notation. This notation is quite useful while implementing TOGAF. At the same time, ArchiMate overlaps with the content framework of TOGAF. Most probably, the future versions will have tighter integration with TOGAF.

SUMMARY

The screenshot shows a slide from a training course. The top header is green with the text 'Enterprise Architecture – An Introduction' and 'Summary'. On the left, there is a logo for 'THE Open GROUP' and 'TOGAF® 9 Accredited Training Course'. The main content area contains the following text and list:

In this module, you learned about:

- Enterprise and architecture
- Enterprise Architecture
- Architecture frameworks
- Distinction between various architecture frameworks

In the bottom right corner of the slide, there is a small grey box containing the number '31'.

