ISYS90048 Managing ICT Infrastructure

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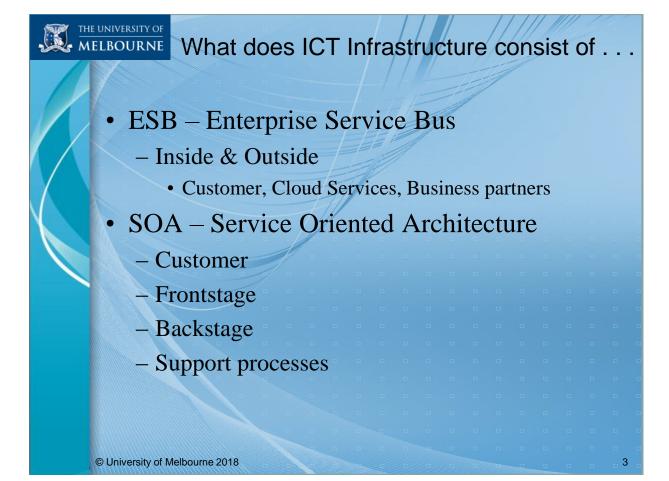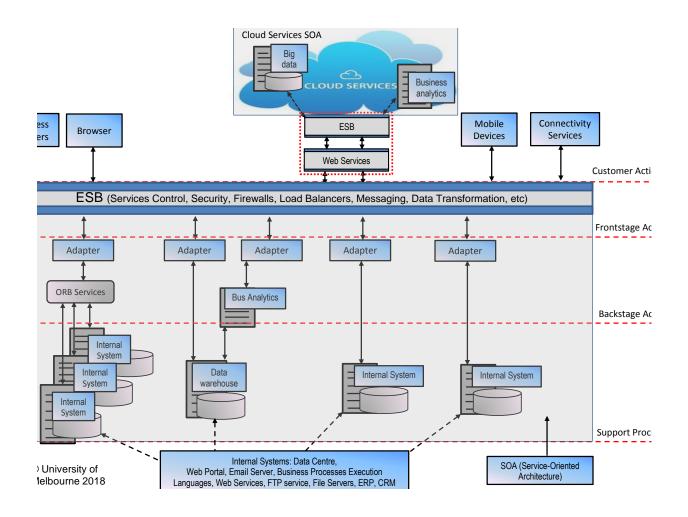
Semester 2, 2018, Week 9

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Teaching Session 09

- Enterprise Architecture as organising logic for business processes and ICT infrastructure
- Stages of maturity in the adoption of Enterprise Architectures
- Enterprise Architecture development methodologies
- Integration of concepts of SOA with an Enterprise approach
- Demonstrate an understanding of the need for the achievement of interoperability in enterprise-wide ICT infrastructures

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What does ICT Infrastructure consist of . . .

- ESB – Enterprise Service Bus
  - Inside & Outside
    - Customer, Cloud Services, Business partners
- SOA – Service Oriented Architecture
  - Customer
  - Frontstage
  - Backstage
  - Support processes

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Cloud Services SOA

Big data

CLOUD SERVICES

Business analytics

Browser

ESB

Web Services

Mobile Devices

Connectivity Services

Customer Acti

ESB (Services Control, Security, Firewalls, Load Balancers, Messaging, Data Transformation, etc)

Frontstage Ac

Adapter | Adapter | Adapter | Adapter | Adapter

ORB Services

Bus Analytics

Backstage Ac

Internal System

Internal System

Internal System

Data warehouse

Internal System

Internal System

Support Proc

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Internal Systems: Data Centre, Web Portal, Email Server, Business Processes Execution Languages, Web Services, FTP service, File Servers, ERP, CRM

SOA (Service-Oriented Architecture)

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Infrastructure, Architecture: what are the differences?

- Infrastructure is the assets - people, hardware, systems, networks - deployed to support a business
- Architecture is the design of how these assets work together to address business needs with people, process, and technology and defines the purpose, intent, and structure of any system
- So Infrastructure supports Architecture and is the minimum components required to give the architecture a physical existence
- Architecture is linked closely with business aims and goals

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What is an Enterprise Architecture?

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- Enterprise Architecture (EA) is a method and an organising principle that aligns functional business objectives and strategies with an ICT strategy and serves the organisation's execution plan and overall mission
  - The overall goal is to provide a unified ICT environment across the organisation that is linked to the business of the organisation
  - More specifically, the goal is to promote alignment, standardisation and reuse of existing ICT assets
  - The purpose of enterprise architecture is to create a map of ICT assets and business processes and a set of governance principles
  - Many frameworks, but basic four domain frameworks is the most common
  - Enterprise Architecture must be part of an overall framework that allows the business, through its culture, people and processes, to formulate an appropriate corporate strategy

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Enterprise Architecture goals

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- A more efficient business operation:
  - Lower business operation costs
  - More agile organisation
  - Business capabilities shared across the organisation
  - Lower change management costs
  - More flexible workforce
  - Improved business productivity
- A more efficient ICT operation:
  - 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 like security
  - Easier upgrade and exchange of system components

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Enterprise Architecture goals cont

- Better return on existing investment, reduced risk for future investment:
  - Reduced complexity in the business and ICT
  - Maximum return on investment in existing business and ICT infrastructure
  - The flexibility to make, buy, or out-source business and ICT solutions
  - Reduced risk overall in new investments and their cost of ownership
- Faster, simpler, and cheaper procurement
  - Especially cloud services

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Complete EA Approach cont

For an EA approach to be complete, six core elements must be present and work synergistically together

1. *Governance*
   - Governance identifies the planning, decision-making, and oversight processes and groups that will determine how the EA is developed and maintained, accomplished as part of an organisation's overall governance

2. *Methodology*
   - Methodology are specific steps to establish and maintain an EA program, via the selected approach

3. *Framework*
   - Framework identifies the scope of the overall architecture and the type and relationship of the various sub-architecture levels and threads

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Complete EA Approach cont

4. *Artefacts/Objects*
   – Artefacts identifies the types and methods of documentation to be used in each sub-architecture area, including strategic analyses, business plans, internal controls, security controls, and models of workflow, databases, systems, and networks
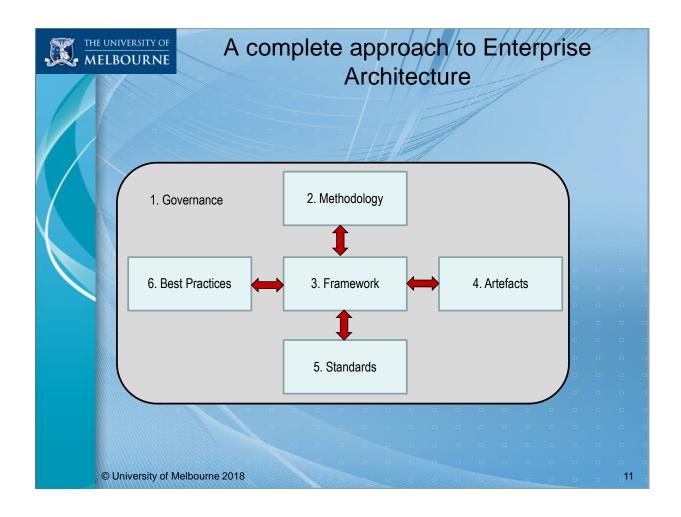
5. *Standards*
   – Standards identify business and technology standards for the enterprise in each domain, segment, and component of the EA
     • This includes recognised international, national, local, and industry standards as well as enterprise-specific standards

6. *Best Practices*
   – Best Practices are ways to implement parts of the overall architecture or sub-architectures

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A complete approach to Enterprise Architecture

1. Governance

2. Methodology

6. Best Practices

3. Framework

4. Artefacts

5. Standards

Drivers of the adoption of Enterprise Architectures

- Opportunity costs of not adopting new technologies, meeting new markets and changes in business goals
  - Opportunity Cost: In economic terms, the opportunities forgone in the choice of one expenditure over others
  - Since every resource can be put to alternative uses, every action, choice, or decision has an associated opportunity cost

- Need to account for, and manage, ICT & information assets at a whole of enterprise level

- Better utilisation of ICT and information resources

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Drivers of the adoption of Enterprise Architectures cont

- Greater ability to work with external partners – supply chain partners, competitors, clients
- Need to maintain compliance with evolving government regulations
- Need to adopt ICT governance plans across the whole of the enterprise
- Recognition of the ICT and information assets being enterprise owned
- Need for greater business agility to meet changing market needs and client expectations
- Increased management and compliance costs of diverse ICT system

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Objectives of Enterprise Architectures

- To delivery enterprise-wide value, and control over core business processes
- To promote standards of best practice for ICT adoption across the whole enterprise
- To provide a unifying technology that assists an enterprise move from disjoint business units to the adoption of enterprise systems
- To improve risk management by basing core business in centralised enterprise systems
- To improve control, monitoring and compliance through the use of centralised enterprise systems
- To improve the strategic position of enterprise systems in becoming more flexible and able to support greater agility

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Four basic domains

- There are many different suggested frameworks to develop an enterprise architecture
  - However, most frameworks contain four basic domains, as follows:

1. **Business Architecture**: The business architecture describes the main business structures of an enterprise which drive the enterprise's activities
   - The main elements of the business architecture are business processes, business functions, planning, products, business units and business objects, policies & procedures
   - Provides the basis for identifying the requirements for the information systems that support the business activities

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Four basic domains cont

2. **Information architecture**: identifies where important information are kept and how one typically accesses them

    – Shows how the information resources are managed, accessed and shared for the benefit of the whole enterprise

    – Enterprises cannot afford to have isolated information stores that are closed or do not associate with each other

    – An Information Architecture needs to be developed to manage the information resources at an enterprise level

    – Structuring and classifying web sites and intranets to help people find and manage information

    – Information Management focusses on content and meta-content management

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Four basic domains cont

3. **Application Architecture**: The application architecture provides the means for describing the enterprise's application landscape, ie for the applications, their data and interfaces or information flows

   – The application architecture serves as the bridge linking the business architecture with the technology and infrastructure architectures

   – The links into the business architecture show how and where IT delivers support for the business

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Four basic domains cont

4. **ICT infrastructure/technology architecture**: The technology architecture is all about defining enterprise-specific technical standards for implementing applications, interfaces and infrastructure elements

   – The most critical, but also the most difficult to implement
   – Describes the servers, networks and other systems employed by the enterprise to support its information processing requirements
   – Designed as an architecture to ensure accountability, stability, security, best practice in design, planning, deployment, monitoring and management
   – The ICT Infrastructure Architecture needs to support the Information Architecture, the ICT Service Architecture, and the Business Architecture of the enterprise
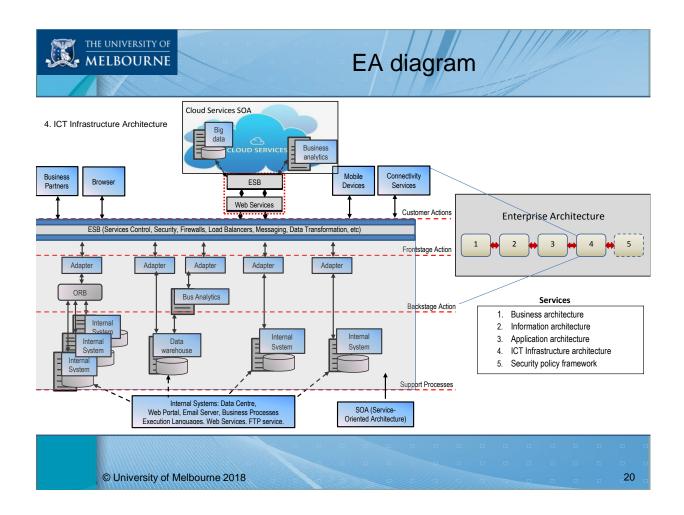
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The fifth domain

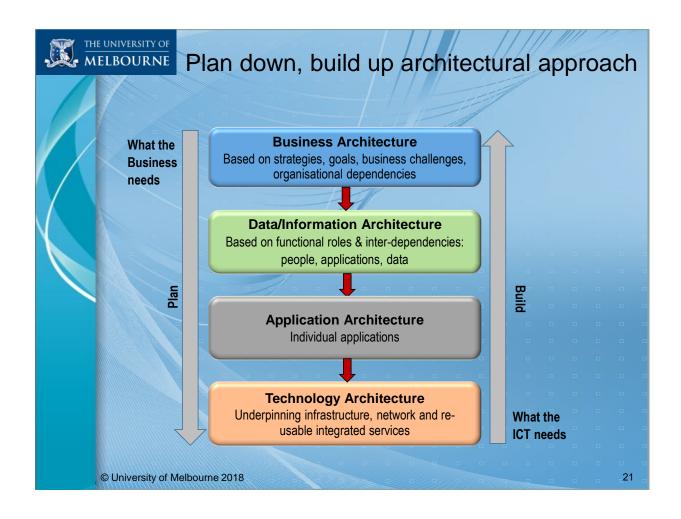But an important fifth domain is also necessary:

5. The organisation's information resources, application and ICT portfolios must be protected in accordance with the Information **Security Policy Framework/Architecture**
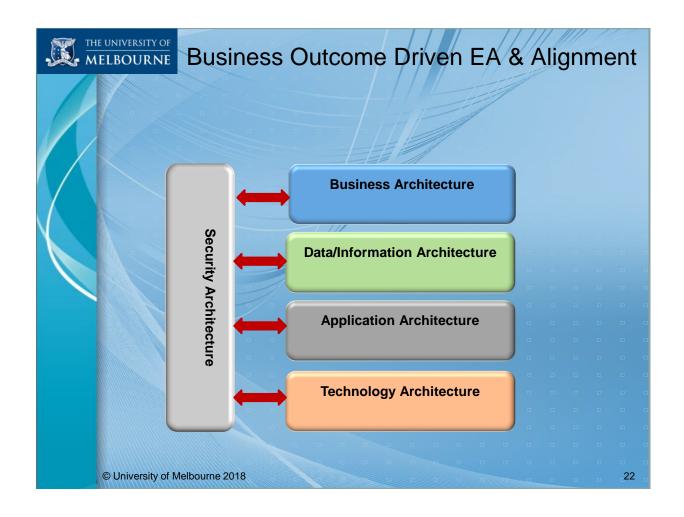
   – A Security Architect designs, builds and oversees the implementation of network and computer security for an organisation

   – Responsible for creating complex security structures and ensuring they work

Enterprise Architecture = Strategy + Business + Technology

EA diagram

4. ICT Infrastructure Architecture

Services
1. Business architecture
2. Information architecture
3. Application architecture
4. ICT Infrastructure architecture
5. Security policy framework

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Plan down, build up architectural approach

What the Business needs

Plan

Build

Business Architecture
Based on strategies, goals, business challenges, organisational dependencies

Data/Information Architecture
Based on functional roles & inter-dependencies: people, applications, data

Application Architecture
Individual applications

Technology Architecture
Underpinning infrastructure, network and re-usable integrated services

What the ICT needs

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Business Outcome Driven EA & Alignment

Security Architecture

Business Architecture

Data/Information Architecture

Application Architecture

Technology Architecture

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Plan down, build up architectural approach cont

- **Business Architecture** – the priorities and business functions of the organisation, currently and in the foreseeable future

- **Application Architecture** – Applications

- **Data Architecture** – the systems and interdependencies that will support the identified priorities

- **Technical Architecture** – the underpinning and enabling infrastructure, that is built to support all of the business priorities and ambitions

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Stages of Enterprise Architecture Maturity

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Enterprise Integration developed first from System Integration, followed by Application Integration, then Business Integration and finally Enterprise Integration

1. <u>Business Silos Architecture</u>: organisations or individual business units seek to optimise their unit's needs
   – Consisted of standardisation of data and moving away from silos

2. <u>Standardised Technology Architecture</u>: improving ICT efficiency through ICT standardisation and centralisation of ICT management
   – Focusing on system interconnection, electronic data interchange, product data exchange and distributed computing environments

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Stages of Enterprise Architecture Maturity cont

3. <u>Optimised Core Architecture</u>: implementing organisation-wide data and process standardisation, as appropriate to their chosen operating model

4. <u>Business Modularity Architecture</u>: managing and re-using loosely coupled ICT-enabled business process components to maintain a balance between organisation standards and local diversity

   - Business Modularity: the degree to which a system's components may be separated and recombined

   - Degree by which a system is made up of relatively independent but interlocking components or parts

   - Not many enterprises are at this stage

- IT value increases as EA Matures

Benefits of an Enterprise Architecture Approach

- Complexity Management
  - Coordination of systems, projects & documentation at a standardised, integrated whole-of-enterprise level
- Management of technical resources
  - Bringing ICT under asset resource management, managing redundancy, acquisition, deployment and disposal at enterprise level
- Knowledge Management
  - Seeking to document, manage & share ICT knowledge in a defined modular fashion across all levels of the enterprise
- ICT visibility
  - Aligning ICT resources, systems & services with business processes, and treating ICT & information as core enterprise assets
- Better response to process redesign
  - Better understanding of business processes at an enterprise level, & ability to re-engineer business processes successfully
- Decision making
  - Enterprise level decision making, based on EA design principles

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Challenges of Enterprise Architectures

- Need to gain CEO & business managers' approval
- Complexity of whole of enterprise modelling, specification, implementation & documentation
- Need to maintain trust & confidence of business units
- Lack of realisation of ROI until the business modularity stage
- High risk of project failure, and loss of credibility / drive
- Complexity of enterprise system maintenance
- Complexity of enterprise system configuration – hidden costs in establishing enterprise systems
- Lack of available knowledge & skills
- Lack of comparable, industry-based case studies
- High learning curve – enterprise approach, service orientation, ICT governance, meeting business goals, business process modelling, financial accountability, outsource contract management

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Categories of Systems/Apps in the Enterprise

- **Enterprise Systems :** enterprise-wide applications, managing enterprise data, such as ERP, CRM, PRM, MRP & EIS
- **Enterprise Comms**: email, bulletin boards, calendars, discussion boards, video-conference, audio-conference, decision support systems, Intranet
- **Personal & Enterprise Applications:** office, graphics, personal productivity
- **Legacy Systems:** older systems that have not yet been replaced by SOA-ready systems, typically payroll, asset tracking, logistics & transaction processing systems
- **Personal & Group Communication Systems:** mobile devices, social networking, personal publication systems
- **SOA-enabled Systems**: service register, SOA-APIs to existing systems, new SOA interfaced systems

Challenge: How to integrate all of these diverse systems, interfaces and communication pathways

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SOA and Enterprise Architecture

- SOA is a software development approach that links conceptual objects directly to the business strategy
  - Thus SOA is a linked subset architecture of the overarching Enterprise Architecture
- Enterprise Architecture promotes the adoption of SOA as an enterprise-wide integration solution
  - This enables loose coupling, interoperability, agility, reliability and standardised messaging services

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Summary

- Enterprise architecture frameworks have existed for over 20 years
- Not all organisations need to adopt EA solutions – diversified or replicated businesses may not see any gain
- EA is based on frameworks, with ideals at the whole of organisational level
- The business drivers determine the need to adopt an EA approach
- A Service Oriented Architecture is one approach to established an enterprise-wide service framework

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- De Haes, S., & Van Grembergen, W. (2015). Enterprise Governance of IT (Chapter 2) Enterprise Governance of Information Technology: 11-43: Springer. 43 pp

- Gorman, M. (2007). Gorman, GM. G. (2007). Enterprise Architectures. Whitemarsh Information Systems Corporation. 59-66

- Ross, J. W., (2006) "Enterprise Architecture: Driving Business Benefits from IT", MIT Sloan Research Paper No. 4614-06; CISR Working Paper No. 359. 19 pp

Videos

- Why Enterprise Architecture (3.44 min) https://www.youtube.com/watch?v=qDI2oF1bASk

- Enterprise Architectures (6 min) https://www.youtube.com/watch?v=d6Is4g14r20

- Enterprise Architecture Framework (2 min) https://www.youtube.com/watch?v=xl7GGHQyy1g

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