Group Project

Presented by Group 7

Enterprise Information Systems

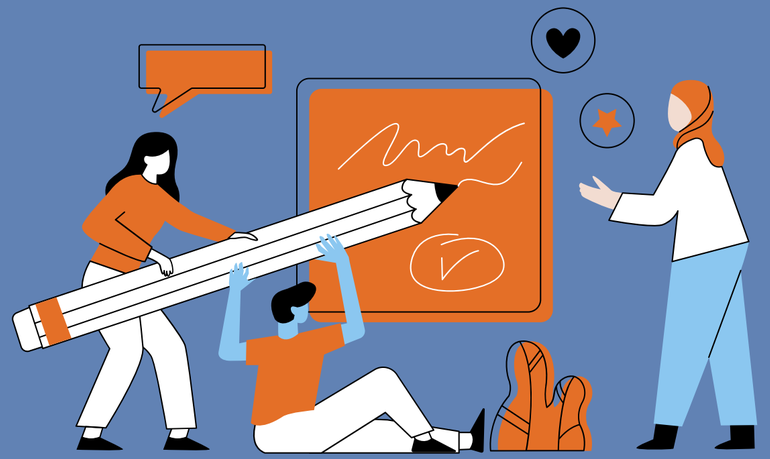
EIS definition

EIS is defined as a software system for business management encompassing planning and supporting organizational functions like sales and planning. It includes software, hardware, processes, and data.

EIS Sub-systems

Physical

Information



Desicion

EIS vs ES

Enterprise Information System

Focus : Manages and utilizes information resources for strategic planning.

Scope : Subset of ES focusing on managing organizational information.

Enterprise System

Focus : Integrates business functions for unified operations.

Scope : Comprehensive software suite supporting various organizational functions.

ES covers a wide range of organizational functions, while EIS specifically manages and utilizes information resources within the organization.

With the emergence of Industry Revolution 4.0, EIS has evolved to provide solutions for integrating information in both manufacturing and services sectors, supporting operations across supply networks

EIS History

- EIS started in 1960s when the computers were introduced to industries.
- The primary function was to automate manual tasks and replace paper-based systems
- The first-generation EISs were standalone systems focused on specific functions such as human resources, accounting, finance, and invoicing. They were mainly used for intensive data processing.

EIS History

Gradual Integration and Sophistication

Expansion in Functionality

Rise of ERP Systems

Transition to ERP/II and ERP/III

Types of EIS :

1 Enterprise Resource Planning (ERP)

- ERP systems have evolved from standalone systems to integrated solutions supporting collaboration.
- ERP/I focused on internal processes, while ERP/III aims for a 'borderless enterprise.'
- Technological advancements have driven ERP evolution.
- ERP adoption has shifted from on-premise to cloud-based and hybrid models.

2 Supply Chain Management (SCM):

- SCM originated in the 40s but emerged as computer-based systems in the late 70s and 80s.
- It evolved to include market information, order management, and customer satisfaction.
- Future SCM systems will leverage SOA, RFID tagging, and wireless communication for real-time decision support.

Types of EIS :

3 Manufacturing Execution Systems (MES)

- MES addressed real-time management and control of production processes.
- Initially focused on data collection, MES evolved to support dynamic manufacturing operations.
- Next-generation MES (MES/III) will focus on plant management and production system flexibility.

4 Customer Relationship Management (CRM):

- CRM originated in the 80s and evolved into proactive sales and service automation.
- CRM systems transitioned from on-premise to cloud-based and mobile delivery mechanisms.
- These systems enhance data mining and reporting capabilities.

Types of EIS :

5 Product Lifecycle Management (PLM):

- PLM systems emerged in the late 80s, managing engineering data and integrating with ERP systems.
- PLM supports product data management across the lifecycle, enabling collaboration and traceability.
- Continued evolution includes enhancements in collaboration environments and product information traceability.

6 Business Intelligence (BI) & Analytics:

- Continued evolution includes enhancements in collaboration environments and product information traceability.
- Second-generation BI offers faster processing and advanced analytics methods.
- The emergence of big data technologies is transforming BI, enabling advanced analytics beyond traditional methods.

Design & Engineering

EcoSystem

stand-alone

tightly integrated with information systems inside or outside the enterprise

interfaced with some others

Classification

Transaction-oriented

Database Centric

Web Application

Enterprise Portal

Traditional EIS Development

Analyse the business environment and the functional requirements

Deeper analysis of the functional requirements

Implementation using the Object Class Diagrams of UML

Traditional EIS Development

Web applications

Integrate

Web dissemination systems

EIS And The Enterprise Architecture Discipline

Introduction: EIS And The Enterprise Architecture Discipline

DEFINITION

Enterprise Architecture (EA) defined by Gartner as a proactive and holistic discipline for guiding enterprise responses to disruptive forces.

PURPOSE

EA knowledge is systematized using Enterprise Architecture Frameworks (EAFs) to represent, analyze, and design enterprise states

Enterprise Architectures: Past and Present

1 Industrial Engineering Community

Originating from Industrial Engineering, focusing on seamless integration of information, control, and material flows

2 Information Systems Community

Originating from software development, concentrating on software system development within the enterprise

EA Frameworks Developed

1 Industrial Engineering Community

EI community initially focused on manufacturing systems but expanded to cover the complete enterprise and supply chain.

Frameworks include Purdue Enterprise Reference Architecture (PERA) and Computer-Integrated Manufacturing Open System Architecture (CIMOSA).

2 Information Systems Community

Created frameworks after the pioneering work on the Zachman Framework.

Frameworks include ARIS, TOGAF, and ArchiMate.

EA Framework Components

1. Modelling Languages
2. Ontologies
3. Reference Models
4. Enterprise modules
5. Enterprise engineering methodologie
6. Enterprise modelling tools

Drivers of EAF Evolution

1 Advances in Technology

- Shift from application-centric database silos to distributed service-oriented solutions (SOA)
- Emergence of Cloud Computing, Big Data, and Internet-of-Things (IoT)
- Challenges: Cybersecurity, data utilization, algorithmic complexity

2 Advances in Bussiness Models

- Growth of e-commerce (B2B, B2C) and social media platforms
- Adoption of service orientation, leading to cost-effective service delivery
- Emergence of the sharing economy facilitated by mobile technology
- Industry 4.0 vision, combining industrial and digital technologies for future manufacturing

3 Advances in Global Economic & Financial Systems and Legal Frameworks

- Stretching the limits of current legal, financial, political, and social systems
- Need for global consensus on regulating technological and business model innovations

Enterprise Architectures: Future Trends

Traditional EA

Framework-centered, tool-driven, technology-centric and business restrictions

Digital Architecture/ Next Generation (NGEA)

Involvement of latest digital capabilities: social Web, SOA, big data analytics, omni-channels, cloud computing, virtualisation, Internet-of-Things (IoT)

Next Generation Enterprise Architecture (NGEA)

Business Archictecture

Information Archictecture

Application Archictecture

Technical Archictecture

1 Business Architecture

Cross-business processes that can be quickly altered to address changes through enhancements/fine-tuning, which will makes the adaption normal

2 Information Architecture

It oriented towards big data and various analytic types (descriptive, predictive, prescriptive, inductive) and social business intelligence

3 Application Architecture

Approach reusable components such as portal, mashup servers, RSS, etc to form edge applications

4 Technical Architecture

- Defined as a strong service orientation such as Service-Oriented Architecture (SOA) and Service-Oriented Computing (SOC)

Aim: Interoperabiltiy and integration of systems, applications and data sources supported by Web-services and XML-based approaches

4 Technical Architecture (cont.)

Encompass infrastructure elements such as

- Specifying service properties (Web Services Description Language (WSDL))
- Interaction between services (Simple Object Access Protocol (SOAP))
- Services invocation (Web Services Invocation Framework (WSIF)
- Services registry (Universal Description, Discovery & Integration (UDDI))
- Tunnelling through firewalls (Web Services Gateway (WSG))
- Scheduling (Web Services Choreography Language (WSCL))

AIM: to support service-based interoperability and integration

EIS & the Enterprise Integration Discipline

Enterprise Integration (EI)

both technical and organizational challenge

requires Enterprise Modelling (EM) and Enterprise Architecture(EA) for analysing functional, information, resource and organisation aspects that need to be integrated

focus on facilitating information, control and material flows across organisational boundaries by connecting all the necessary functions and heterogeneous functional entities

happens when two or more enterprises need to coordinate their business or to work together as a single entity

Importance

improve the 3C's within the enterprise

communication cooperation collaboration

enhancing its overall productivity, flexibility and capacity for management of change or reactivity

Scenarios

event of enterprise mergers or acquisitions

adding partners to an extended enterprise organisation

rationalisation of a business to increase its efficiency or productivity

Levels of Integration

1 Physical Integration

communication level , which deals with systems interconnections and data exchange

2 Application Integration

cooperation level , works on interoperability of software applications and database systems in heterogeneous computing environment

3 Business Integration

collaboration level , coordinating functions, processes and people that manage, control and monitor the operations of the enterprise

Classes of Integrated Information Systems

1 Interfaced Systems

- weakest (but still widely used) form of integration
- systems can only exchange data using predefined exchange protocols and data schema

2 Tightly-coupled Systems

iIntegrate all data sources by creating mappings using standardized interfaces and predefined schemas, facilitated by Enterprise Application Integration (EAI) platforms

3 Loosely-coupled systems

coordinating autonomous component data sources and software applications with a set of federated schemas and open data exchange formats and protocols

Approaches to Integrating Enterprise Information Systems

1 Master Model

- single reference model is used for all other models and instantiations are derived
- ex : ARIS architecture

2 Unified Model

- a supra meta-model is used for translation between the models of the EISs
- ex : CIMOSA architecture

3 Federated Model

- loose coupling occurs using late binding and formal mechanism
- ex : TOVE (Toronto Virtual Enterprise) approach

Advancement in Technologies

XML

WEB SERVICES

SOA

Goals

- integrate any form of data in enterprises and networks of enterprises
- provide uniform interface for information access, manipulation and integration across multiple data sources

Challenges

- rely on loosely-coupled systems
- face comparable scalability and semantic challenges

Future Trends

Towards Run-time Integration

- To build evermore loosely-coupled systems
- less rigid and pre-defined solutions, to sustain e-business agility and rapid enterprise evolution

More Collaborative EIS

- federated information systems that can support collaborative work or that can cooperate with one another
- requires high agility of the enterprise systems and non-monolithic integration solutions

Openess and Security

- Importance of devising collaboration schemes and new collaboration protocols increases
- Balancing openness to partners while protecting the security of my data or my intellectual property rights

Future Trends

Cloud Computing

- manufacturing companies are going to shift to SaaS (Software as a Service) solutions or provided by their partners
- small and medium-sized enterprises might outsourced their data centre and pay per use for the software

Strategic Decisions

- top managers in terms of strategic decisions at the organisational level of EI

Integration of Trust

- integrate 'trust' to the concept of collaboration in new EA frameworks
- organisational trust is essential to influence the degree of EIS integration in horizontal relations, the quality of the collaboration, the type of alliances and the nature of IT solutions implemented in interfirm cooperation

EIS & the enterprise interoperability discipline

Differences of Interoperability VS Integration

1

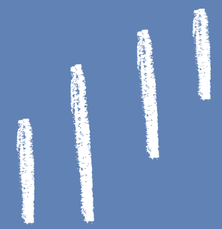
Integration is to unite or complete a system

2

Interoperability is the ability of one system to benefit from a part of another system.

3

Interoperability is the method to achieve integration, which is the goal



Enterprise Interoperability (Ei):

Is a concern of communication between information systems, devices, and applications.

Enables peer entities to exchange information based on mutual understanding and use each other's functionalities or services.

Three Layers of Interoperability:

Organizational Interoperability:

- Aligns business processes across organizations.
- Utilizes common service architectures (e.g., SOA).

Semantic Interoperability:

- Focuses on shared meaning and context.
- Involves universal standards and self-describing data.

Technical Interoperability (Syntactic Interoperability):

- Deals with technical issues (communication protocols, data formats, middleware).

Semantic Interoperability:

- Defined to enable systems to exchange data
- Needs Technical Interoperability
- It allows for machine-computable logic, inferencing, knowledge discovery, and data federation between information systems.

Future Trends:

- Technical Interoperability will remain crucial for advanced IT cooperation and Machine-to-Machine communication.
- Evolution depends on advances in ICT technologies (wireless networks, data integration, messaging formats, etc.).
- Semantic Interoperability continues to gain interest, especially with Semantic Web standards.

Interoperability in Enterprise Systems:

- Capability, requirement, or constraint impacting seamless communication.
- Not applicable to humans (who cooperate but aren't inherently interoperable).
- Essential for building integrated enterprise systems, but interoperable systems aren't always fully integrated.

Formal Ontology Development Languages:

- Common Logic-Based Languages: These languages, such as Common Logic Interchange Format (CLIF) and Knowledge Interchange Format (KIF), offer expressive power and robust inference capabilities.
- Widely Used Alternatives: While RDF (Resource Description Framework) and OWL (Web Ontology Language) are more commonly used, common logic-based languages provide richer capabilities.

The Internet of Everything (IoE):

- Emerging Paradigm: Pervasive or Ubiquitous Computing is shaping the IoE, connecting people, processes, data, things, and services.
- Key Role of Interoperability: IoE's full potential hinges on seamless interoperability.
- Challenges: Achieving universal interoperable systems involves addressing vulnerabilities and cybersecurity concerns, including identity and privacy management.

EIS and the enterprise networking discipline

Past

- Computer Supported Cooperative Work (CSCW)
- Workflow Management System (WfMS)
- Enterprise Application Integration (EIA)

Present

Advanced Collaborative Networked Organisations (CNOs)

Collaborative Networked Organisations (CNOs)

- Function: Designed to facilitate a wide range of digital transactions and collaborative environments, through information systems and computer networks
- Focus: enhancing collaboration, flexibility, and human participation, moving away from rigid, monolithic systems to more adaptable, autonomous, and intelligent software services.

Collaborative Business Infrastructures (CBIs) development

- Service-Oriented Architecture (SOA) & Web Services: all functions, or services, are defined using a description language described in a machine-processable format (e.g. XML), so platform-independent, and have evocable interfaces by any client, that are called to perform business processes.
- SaaS-U Models: offering access to utility solutions for cooperation such as software, platforms, and infrastructures under subscription-based, remotely hosted, and delivered over the Internet, without the need for complex ICT-infrastructure implementations, creating accessibility, especially for Small and Medium-sized Enterprises (SMEs), to digital ecosystems such as CNOs
- Advanced CBI Examples: Open, distributed, and secure service-oriented infrastructures help CNOs model and execute collaborative tasks, with on-demand access and pay-per-use models. Platforms created using SOA, SaaS-U, and semantic technologies improve enterprise collaboration and interoperability.

Standard networking platforms nowadays being developed by ICT vendors

Unified Communications Networking platform

Collaborative Workspaces, or shared Workspaces

Enterprise Social Networking platforms (Enterprise 2.0)

Architectural solutions for Collaborative Business Infrastructures (CBIs)

1 Pervasive or Ubiquitous Computing:

- Integrates computation into the environment and everyday objects, adhering to the AAA paradigm (Anywhere, Anytime, Anybody/Any type/Any device)

2 Peer-to-Peer (P2P) networks

- Improve the dependability and efficiency of computer power and networks by allowing the nodes work simultaneously for 'clients' and 'servers'

3 Multi-Agent System (MAS)

- As form of distributed AI, provide the opportunity to create collaborative systems made of one or more intelligent computing processors or agents that interact with each other asynchronously and autonomously, with other sources of knowledge, and with other systems

Conclusion

- Brief history of Enterprise Information Systems (EISs)
- Dicuss their essential aspect and addressing their future trends
- Addressed past and present aspects of EISs Design and Engineering