Genres and Ontologies in Enterprise Architecture - A Short Introduction to GOBIAF

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Enterprise Architectures Course Seminar

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Outline

- Theory base
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  - Metadata and Ontologies
  - Communication Genres
- GOBIA Framework
  - GOBIA Development Method
  - Business Process and Information Management Levels
  - Ontology Level
  - Architecture Level

Enterprise Architectures

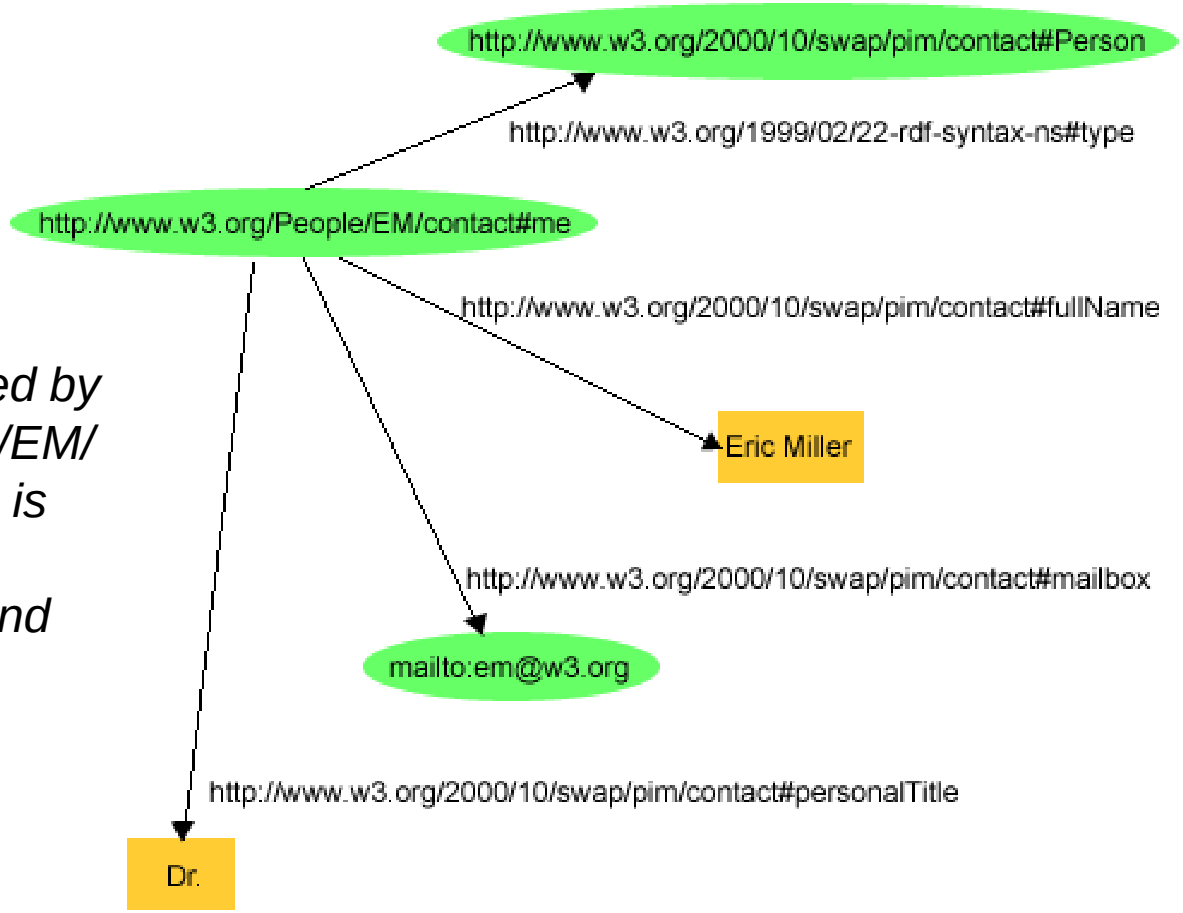
- An enterprise architecture (EA) is the overall framework or blueprint of how the enterprise uses information technology to achieve its business objectives (van den Hoven, 2003) defining the business, information necessary to operate the business, and applications and technologies necessary to support business operations (cf. CIO Council, 1999).
- A way to map the holistic information needs of an organization, relate them to specific business functions, and document their interrelationships for software development, integration and sharing of data (Brancheau 1989).
- The main objective of the EA can be regarded to act as a bridge between the business and technical domains (Young, 2001) within organizations.
- Problems:
  - too pervasive; complicated (time-consuming) to use and maintain; lack of a holistic information presentation mechanism to present interconnections within and between cells in the grid; systems oriented; lack of business information support; inefficient domain analysis methods; digital information oriented
- There exists a need for a single model type and notation for modeling the semantics between entities in EA models.

Metadata and Ontologies

- Metadata
  - Data about data (Gilliland-Swetland: ”perceives as the sum total of what one can say about any information object at any level of aggregation”)
  - An information object is, anything that can be addressed and manipulated by a human or a system as a discrete entity. In GOBIAF, the enterprise architecture descriptions are a form of explicit, external and centralized metadata
  - RDF: flexible **graph**-based datamodel and XML-based serialization format for metadata. URIs are used as an addressing mechanism
  - RDF descriptions are statements (triples) of form (resource,property,value)
- Ontology
  - Vocabulary/schema for metadata (Gruber:”explicit specification of conceptualization”)
  - Diverse forms: a vocabulary, taxonomy, thesaurus, object-oriented class hierarchy or logical theory can be regarded as an ontology
  - **Knowledge base contains ontology populated with metadata.**
  - RDFS (RDF Schema) and OWL (Web ontology language): RDF-based ontology languages. RDFS allows construction of class hierarchies and type constraints in properties, OWL adds advanced features (cardinality, metaclasses etc).
  - Ontology development is hard (multiple ”standards”, information aquisition bottleneck)
  - Provides shared, formal knowledge about the domain

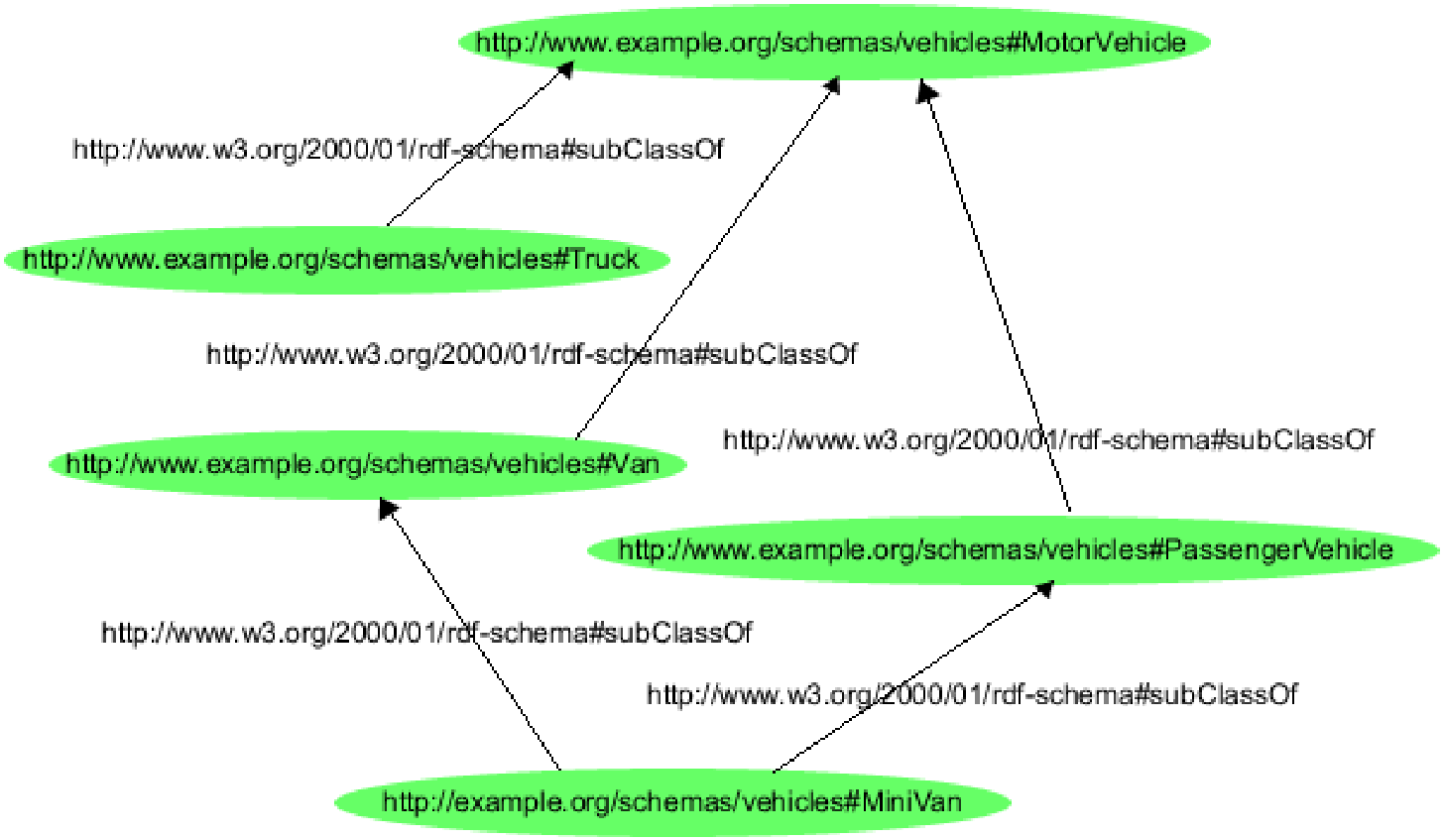
Metadata example

”there is a Person identified by http://www.w3.org/People/EM/contact#me, whose name is Eric Miller, whose email address is em@w3.org, and whose title is Dr.”



An RDF Graph Describing Eric Miller (source: RDF Primer)

Ontology example



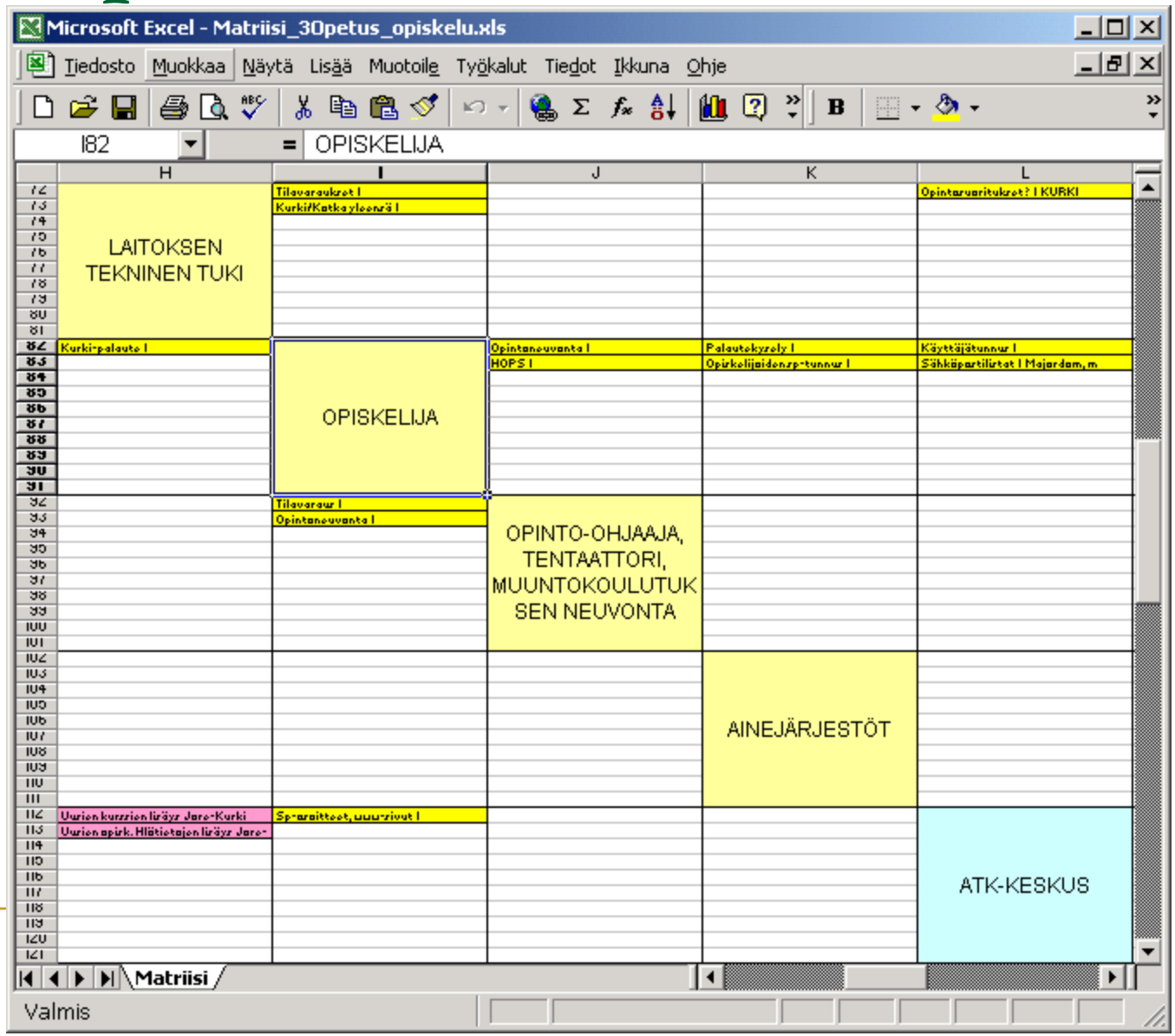
A Vehicle Class Hierarchy (source: RDF Primer)

Communication Genres

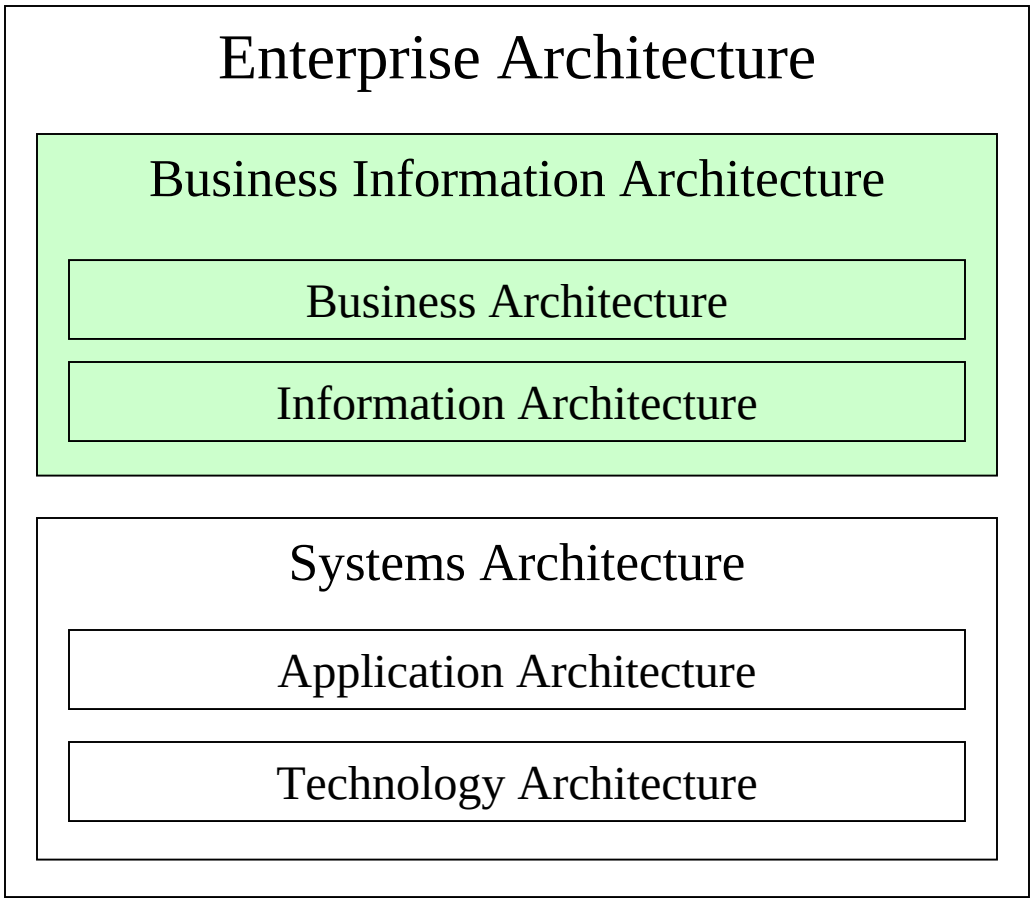
- Genres can be regarded as domain specific concepts expressed in organizational communication (cf. ontologies)
  - … prototypical models for communication (Swales, 1990)
- Captures all information flows (Spinuzzi, 2001) including verbal communication, data in information systems, and paper as well as electronic documents
- Provides a way to evaluate the key internal operations in the success of a business process without technology constraints in mind. A “lightweight” way to model business processes
- The genre-based analysis method (Tyrväinen, Kilpeläinen and Järvenpää, 2005) is used here as a domain analysis method to model the business process from information flow viewpointf
- Genres complement and ease the develoment of ontologies, since genres highlight information concepts that are modeled in domain ontologies.

Genre example

Diagonal matrix of producers & users of information modeled in PROMI project (Process & information flow modeling in Faculty of Information Technology), 2001.



Scoping GOBIAF

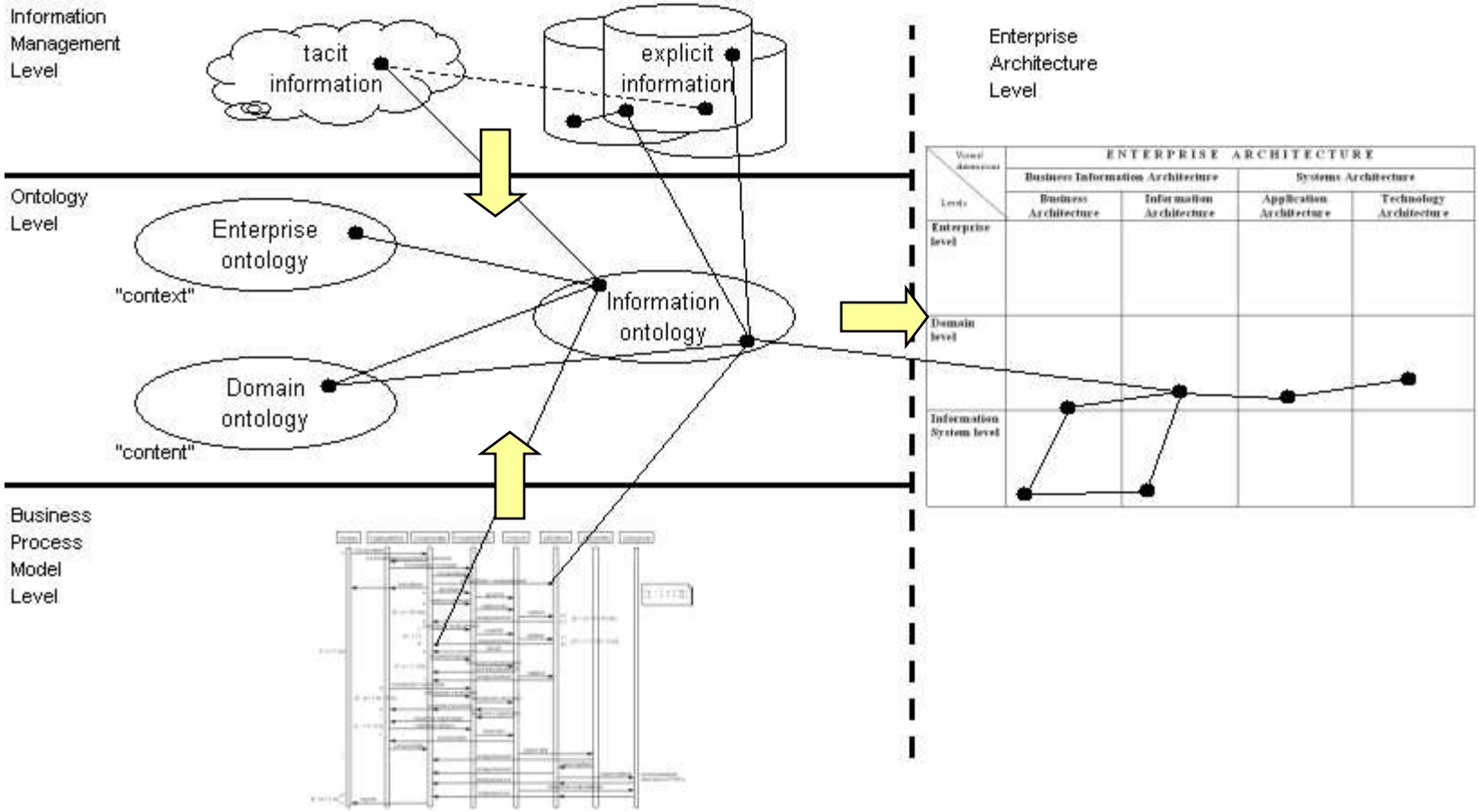


BIA in Architecture Taxonomy

Instead of placing information (architecture) on the hard side with applications and technologies as in Business Application Architecture (Pienimäki, 2005), it should be placed on the soft side with business architecture. This kind of architecture taxonomy implies business information (requirements) that are not necessarily expressed in explicit formats, i.e. in digital documents.

Applications and technologies are supportive elements of business operations.

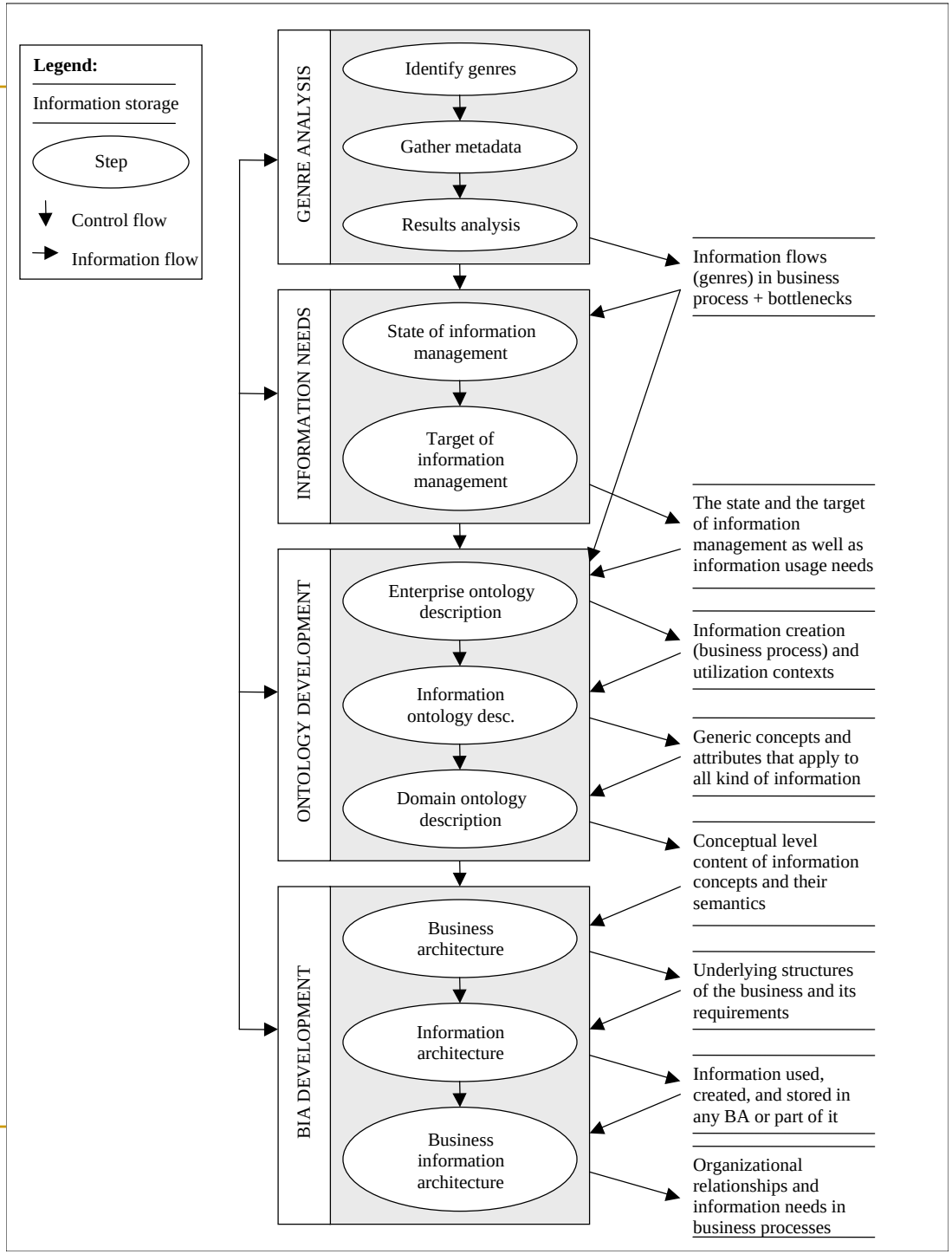
GOBIA Framework



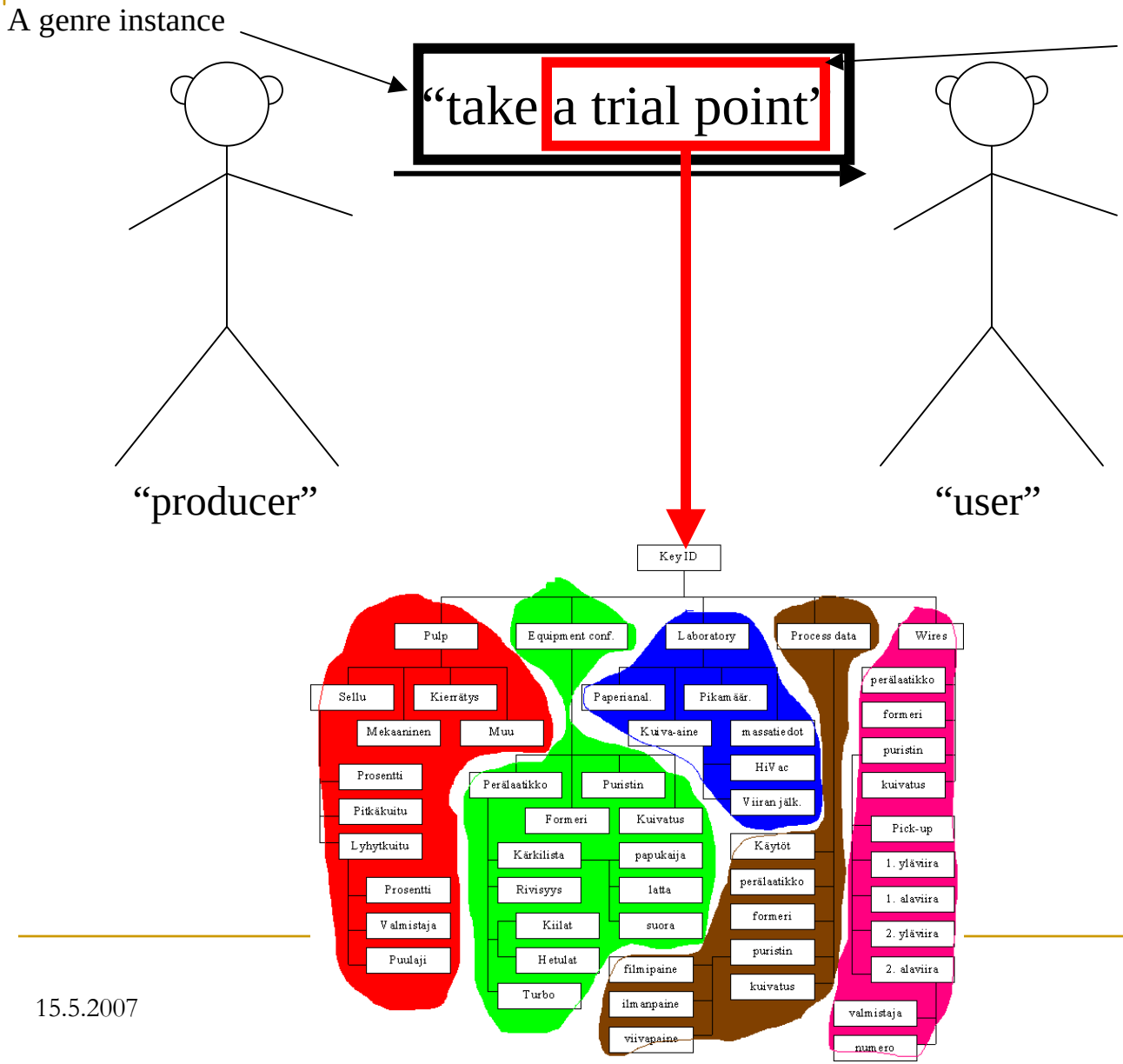
IDEA: To express an in-depth state of the most important aspects of key business processes and related information, as well as their management, so that the extensive use of the business information can be assured in the organizational scale. The direction of emphasis is, first, on business, second, on information necessary to operate the business, and, third, on applications and technologies necessary to support business operations.

GOBIA Development Method

- Phases
  - Genre analysis
  - Information needs interviews
  - Ontology development
  - BIA development
- In practice, the process is iterative and phases overlap.

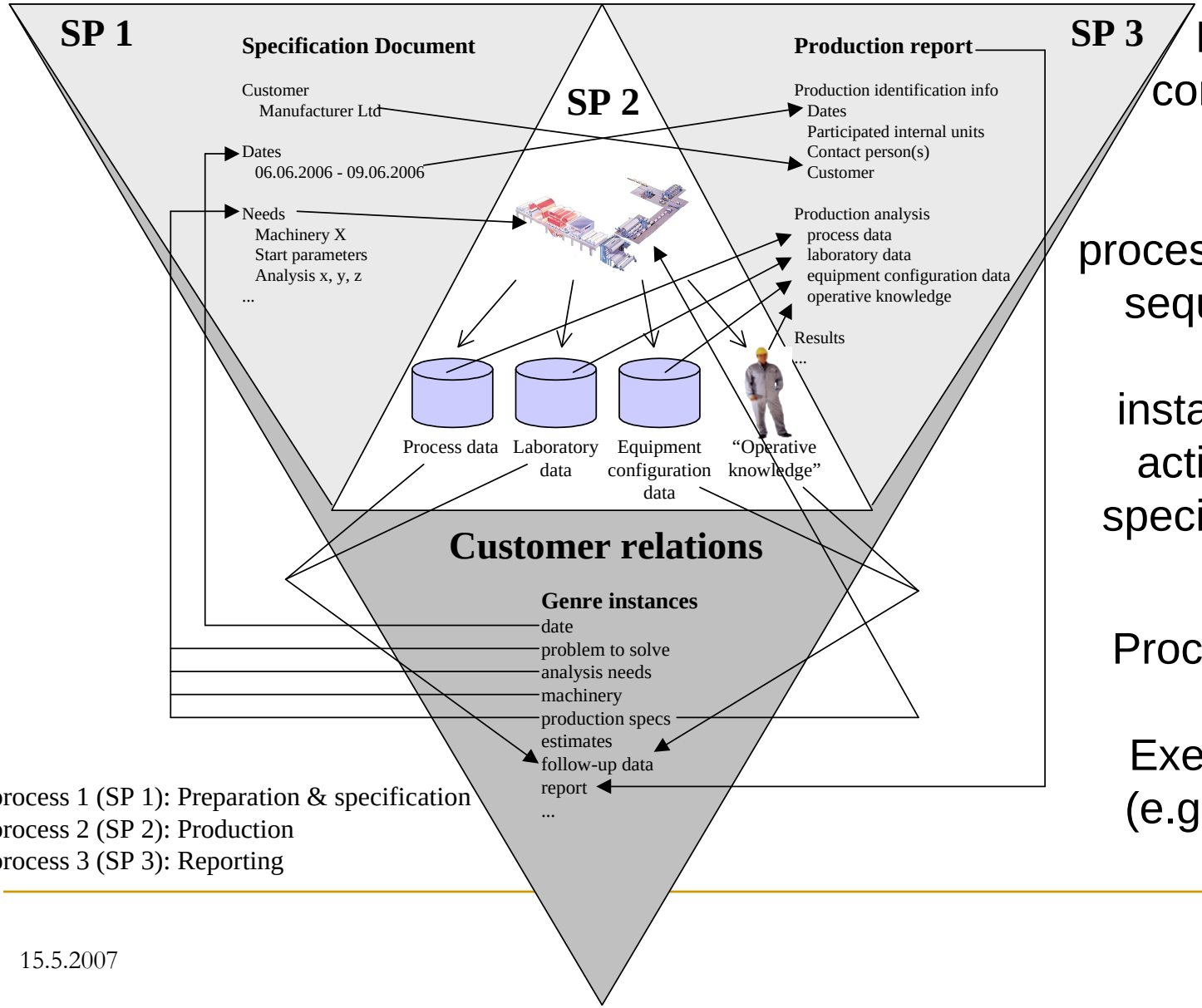


Genre Instances and Information Concepts



A domain-specific concept that is used here to instruct the receiver to act in the way the producer wants through a communicative action. However, the concept itself includes information that is not communicated because, first, it is tacit for both PUI entities, and, second, it is not necessary in terms of successful outcome of the action. Even though, the concept is, in reality, related to the total organizational information ontology that is of especial interest in our case.

Business Process Model Level



Sub-process 1 (SP 1): Preparation & specification
Sub-process 2 (SP 2): Production
Sub-process 3 (SP 3): Reporting

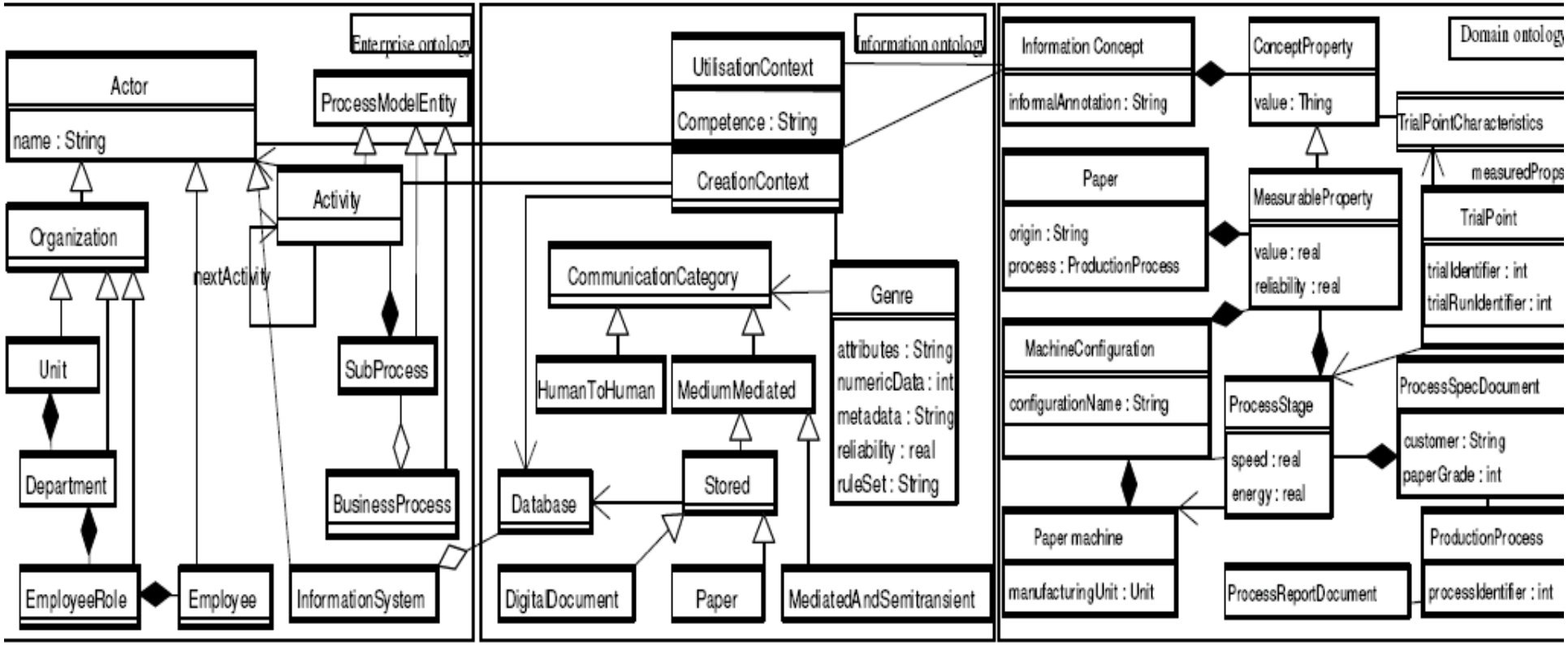
Diagonal matrix contrived in genre sessions is elaborated to a process model (e.g. a sequence diagram) where genre instances represent activities related to specific sequence of events.

Process models are semiformal. Executable models (e.g. BPEL) are not required.

Information Management Level

- The analysis of the present and target state of information management principles through semistructured and open information need interviews
  - Business personnel (information users)
    - Definition of the essential information to be integrated
    - What (more) should be (digitally) managed?
    - How information is wanted to be used?
  - IT personnel (ICT maintenance)
    - Identifies applications, information systems, databases (schemas), and technologies etc. underneath
      - Interoperability and/or integration needs
- Based on genre analysis, but deepens the results to a technical direction

Ontology Level



IDEA: To link a specific timestamp of a business process (genre instance) to information describing it as well as to explicate its relation to the total organizational information resource. Thus, genre instances describe progression of a business process in Enterprise ontology. In Information ontology, a fundamental ”constraints” of information (flows) as well as competencies different interest groups may have over the informational entities are presented. Domain ontology describes a relationship between information content of a genre instance and the other information entities within organization in a conceptual level.

Data Layers in Ontology Level

		Enterprise ontology	Information ontology	Domain Ontology (process industry)
Know-ledge-base	**Ontology layer (classes)**	Metamodel for process models	Metamodel for information categories in organizational communication	Informational concepts for a given domain
	Metadata layer (instances)	Process model specifications	Lists of genre instances, creation and utilization contexts	Machine configurations and field (property) information used in measurements
Resource layer (data)		Execution logs from a workflow management system	Document contents and database transactions related to a genre instance	Measurement and machine configuration data

Architecture Level

Views/ dimensions / Levels	ENTERPRISE ARCHITECTURE			
	Business Information Architecture		**Systems Architecture**	
	Business Architecture	**Information Architecture**	**Application Architecture**	**Technology Architecture**
Enterprise level	- Aggregated business requirements from corporate and enterprise perspectives - Requirements for strategic, enterprise-level ICT usage - List of main business processes, functions, and actions that the enterprise performs	- A list of aggregated business assets in which the enterprise is interested - Strategic information management decisions - Common information structures	- *Strategic application portfolio of the whole organization* - *High-level application architecture, application – process summary*	- *Strategic technology portfolio* - *EAI architecture roadmap principles* - *Technology principles* - *Technology/solution alternatives and choices* - *Core technology selection and maturity analysis*
Domain level	- A model of the actual business processes that the enterprise performs, independent of any system or implementation considerations and organizational constraints. - Presented as sequential diagrams that are derived from genre analysis - Targeted business requirements (needs) from BU perspective	- The relation (information ontology) between business processes (enterprise ontology) and significant informational assets (domain ontology) presented in ontology level descriptions (semantic model based on genre and information management level analysis)	- *Application map per each application domain* - *Applications and their relations (interoperability etc. requirements) based on overlaps in the semantic model*	- *Domain-level technology decisions* - *Integration architecture* - *Technology & application architecture* - *Product line architecture* - *Technology alternatives and choices*
Information System/operative level	- A model of the logical state of business operations and their relation to the operational requirements (development proposals in genre analysis) - Information need interviews	- A model of the logical representation of the business assets about which it records information (data storages) - A model may include aspects that should be digitally managed (tacit knowledge)	- *A model of the logical systems implementation supporting the business processes*	- *Systems-level technology platform* - *Application architecture principles and patterns*

Abstractions of Architectural Dimensions

	ENTERPRISE ARCHITECTURE			
	Business Information Architecture		Systems Architecture	
	Business Architecture	Information Architecture	Application Architecture	Technology Architecture
Enterprise level				
Domain level				
Information System/operative level				

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	ENTERPRISE ARCHITECTURE	
	Business Information Architecture	Systems Architecture
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GOBIAF As a Knowledge Cube