

TDT4252 / DT8802

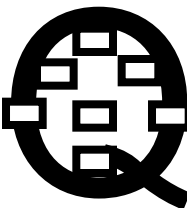
Enterprise Modelling and Enterprise Architecture

ArchiMate for Enterprise modelling

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Professor, IDI, NTNU

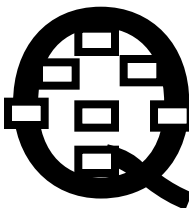
Overview of presentation

- **Recap on enterprise modeling from last week**
 - **Main aspects and roots of ArchiMate**
 - **Business (enterprise) modelling in ArchiMate**
 - **Defined modeling viewpoints on the business layer**
-
- **Material : Gerben Wierda. ArchiMate 2.0 Understanding the Basics**



Enterprise Models: Definition

- An enterprise model is a consistent set of special- purpose and complementary models describing various facets of an enterprise to satisfy some purpose of some **business users**. (Vernadat)
- In this case, the purpose of business users mostly deals with describing, designing, analysing, deciding or controlling operations and components of this enterprise.
- The **contents of the enterprise model** is whatever the **business user** considers important to describe.

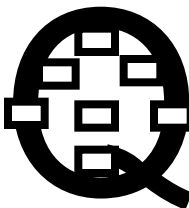


Enterprise Modelling: Purpose

Remember we said that modelling is not always for IT systems design.....

- To **represent and understand** how the enterprise works.
- To **capitalise acquired knowledge and know-how** for later use.
- To rationalise and secure information.
- To **(re)design** and specify a part of an enterprise (functional, information, organisational or structural aspects).
- To **analyse** some aspects of the enterprise (economic analysis, organisational, qualitative, etc.)
- To **simulate the behaviour** of some parts of the enterprise.
- To **make better decisions** about enterprise operations and organisation
- To **control, coordinate or monitor** some parts of the enterprise.

It's all about
the
ENTERPRISE,
not just an IT
system!



The ArchiMate Research Project

- Develop a modelling language for representing Enterprise Architectures
- 2½ years, July 2002 - December 2004
- approx. 35 man-years, 4 million euro
- Consortium of companies and research institutes
- Directed by Novay (then Telematica Instituut)

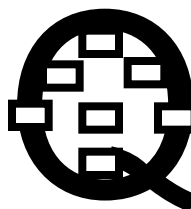


Universiteit Leiden

Belastingdienst



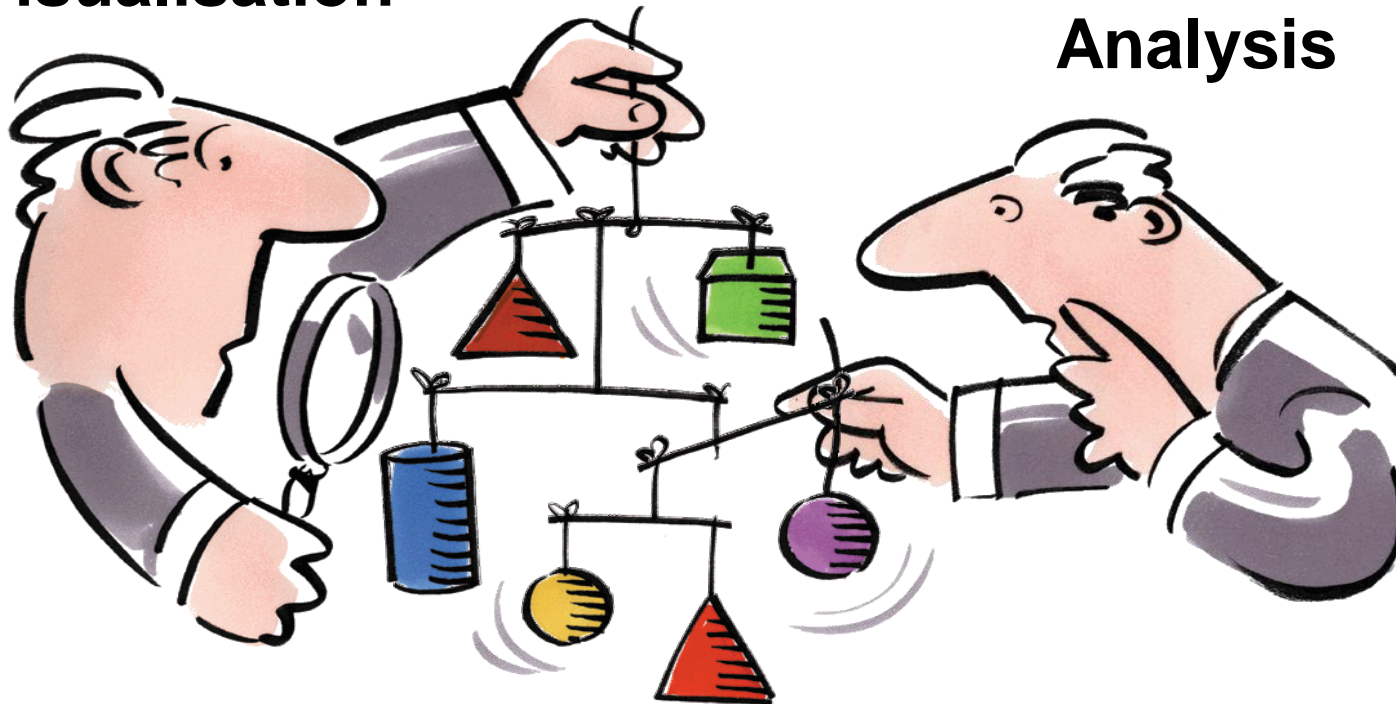
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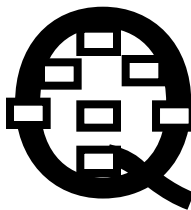
ArchiMate focus

Visualisation

Analysis

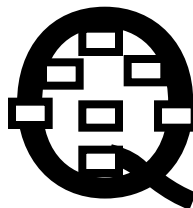


Integration

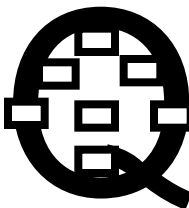
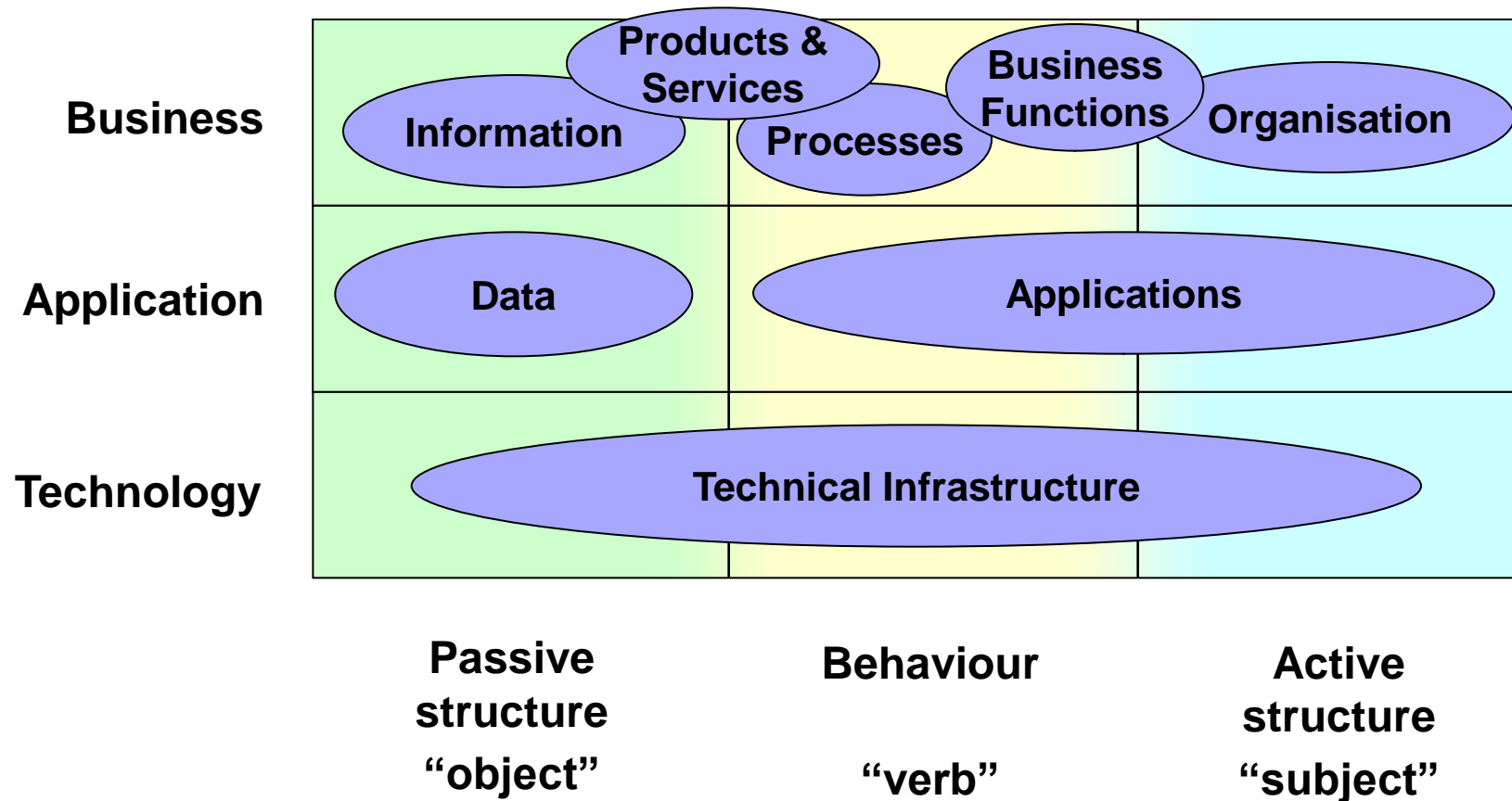


Main Traits of ArchiMate

- **A *Lean* language:**
 - just enough concepts, not bloated to include everything possible
 - 80/20 rule
- **Well-founded concepts & models give *precision***
 - clear communication about architectures
 - get away from the 'fuzzy pictures' image
- **Links to *existing approaches***
 - UML, BPMN, TOGAF
- **International *vendor-independent standard***
 - The Open Group
- ***Tool support***
 - several tools available

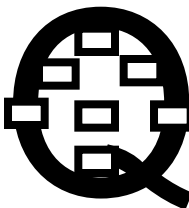


Layers, aspects, and viewpoints in ArchiMate









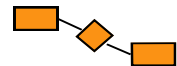
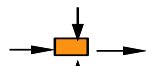

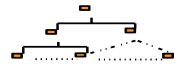
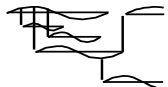
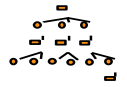
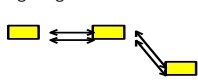
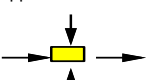

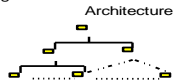

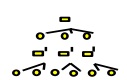












Short on layers in ArchiMate relative to Enterprise Architecture frameworks and methods

- Zachman Framework
- TOGAF
- NB focus in this lecture is on the business layer (cf. focus in enterprise modeling)
- More on the use of a full Enterprise Architecture and Archimate in connection to this later in the course



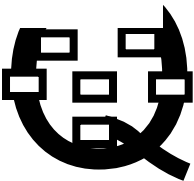
Zachman's EA Framework

ENTERPRISE ARCHITECTURE - A FRAMEWORK™













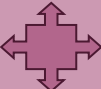
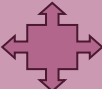
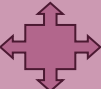
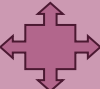
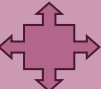
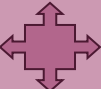
	DATA <i>What</i>	FUNCTION <i>How</i>	Aspects/perspectives		TIME <i>When</i>	MOTIVATION <i>Why</i>	
SCOPE (CONTEXTUAL)	List of Things Important to the Business 	List of Processes the Business Performs 	List of Locations in which the Business Operates 	List of Organizations Important to the Business 	List of Events Significant to the Business 	List of Business Goals 	SCOPE (CONTEXTUAL)
<i>Planner</i>	ENTITY = Class of Business Thing	Function = Class of Business Process	Node = Major Business Location	People = Major Organizations	Time = Major Business Event	Ends/Mean=Major Bus. Goal/ Critical Success Factor	<i>Planner</i>
ENTERPRISE MODEL (CONCEPTUAL)	e.g. Semantic Model 	e.g. Business Process Model 	e.g. Business Logistics System 	e.g. Work Flow Model 	e.g. Master Schedule 	e.g. Business Plan 	ENTERPRISE MODEL (CONCEPTUAL)
<i>Owner</i>	Ent = Business Entity Rein = Business Relationship	Proc. = Business Process I/O = Business Resources	Node = Business Location Link = Business Linkage	People = Organization Unit Work = Work Product	Time = Business Event Cycle = Business Cycle	End = Business Objective Means = Business Strategy	<i>Owner</i>
SYSTEM MODEL (LOGICAL)	e.g. Logical Data Model 	e.g. Application Architecture 	e.g. Distributed System Architecture 	e.g. Human Interface Architecture 	e.g. Processing Structure 	e.g., Business Rule Model 	SYSTEM MODEL (LOGICAL)
<i>Designer</i>	Ent = Data Entity Rein = Data Relationship	Proc. = Application Function I/O = User Views	Node = Data Entity Proc. = Process Link = Line Characteristics	People = Role Work = Deliverable	Time = System Event Cycle = Processing Cycle	End = Structural Assertion Means = Action Assertion	<i>Designer</i>
TECHNOLOGY MODEL (PHYSICAL)	e.g. Physical Data Model 	e.g. System Design 	e.g. Technology Architecture 	e.g. Presentation Architecture 	e.g. Control Structure 	e.g. Rule Design 	TECHNOLOGY MODEL (PHYSICAL)
<i>Builder</i>	Ent = Segment/Table/etc. Rein = Pointer/Key/etc.	Proc. = Computer Function I/O = Data Elements/Sets	Node = Hardware/System Software Link = Line Specifications	People = User Work = Screen Format	Time = Execute Cycle = Component Cycle	End = Condition Means = Action	<i>Builder</i>
DETAILED REPRESENTATIONS (OUT-OF-CONTEXT)	e.g. Data Definition 	e.g. Program 	e.g. Network Architecture 	e.g. Security Architecture 	e.g. Timing Definition 	e.g. Rule Specification 	DETAILED REPRESENTATIONS (OUT-OF-CONTEXT)
<i>Sub-Contractor</i>	Ent = Field Rein = Address	Proc. = Language Stmt I/O = Control Block	Node = Addresses Link = Protocols	People = Identity Work = Job	Time = Interrupt Cycle = Machine Cycle	End = Sub-condition Means = Step	<i>Sub-Contractor</i>
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

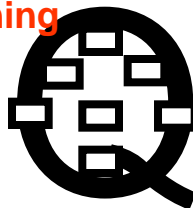
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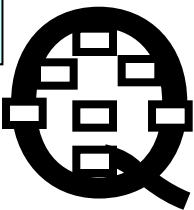
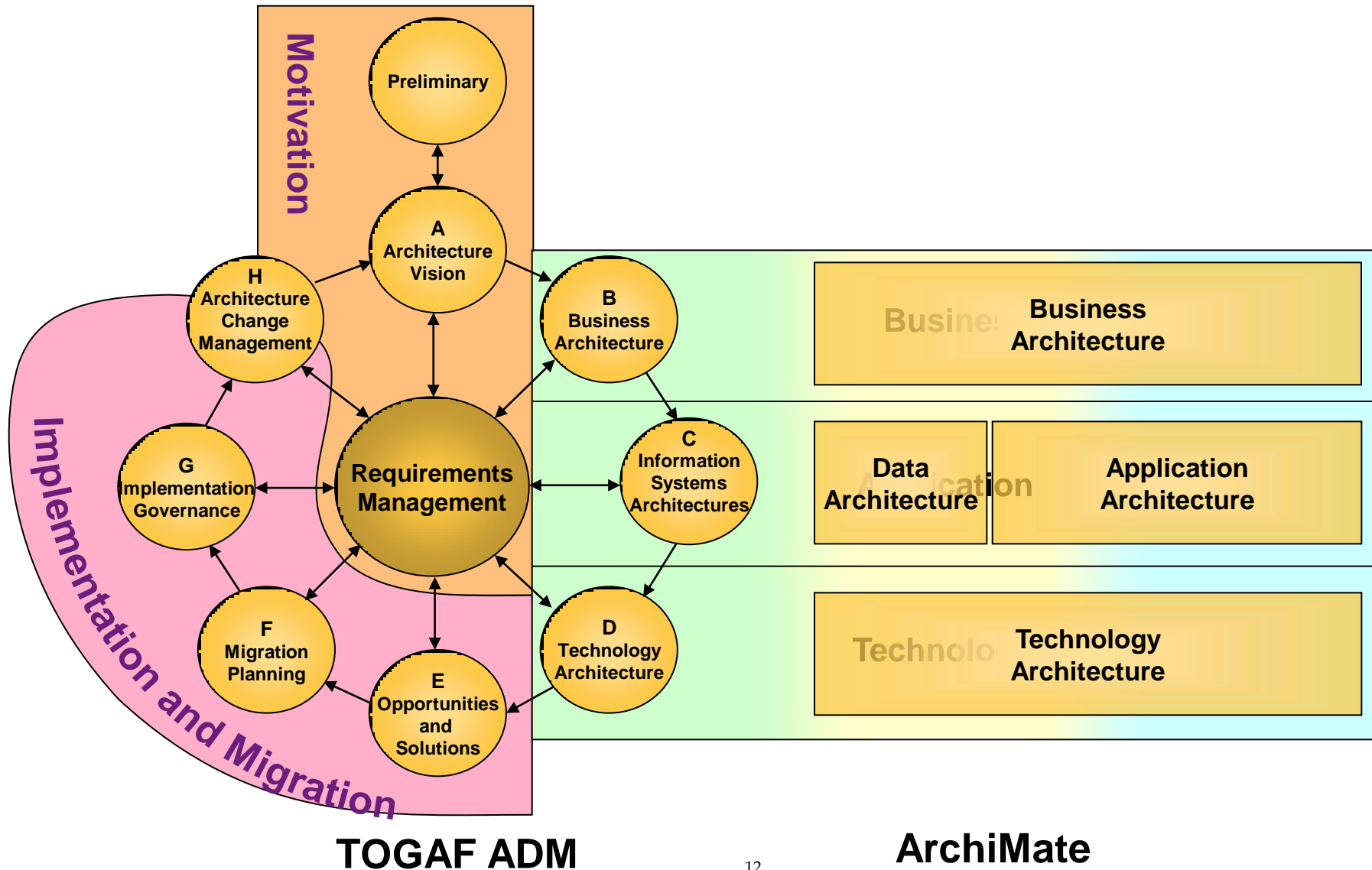


ArchiMate and Zachman

	What	How	Where	Who	When	Why					
<div>Scope</div> <div>= Planner's view</div>							Contextual				
<div>Enterprise Model</div> <div>= Owner's view</div>	Information	Business		Structure		Attributes	Motivation extension	Conceptual			
<div>System Model</div> <div>= Designer's view</div>		Application						Logical			
<div>Technology Model</div> <div>= Builder's view</div>		Technology						Physical			
<div>Detailed representation</div> <div>= Subcontractor's view</div>							As Built				
<div>Functioning Enterprise</div> <div>= User's view</div>							Functioning				

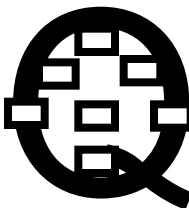


TOGAF, ArchiMate and Extensions

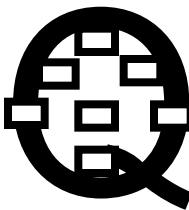
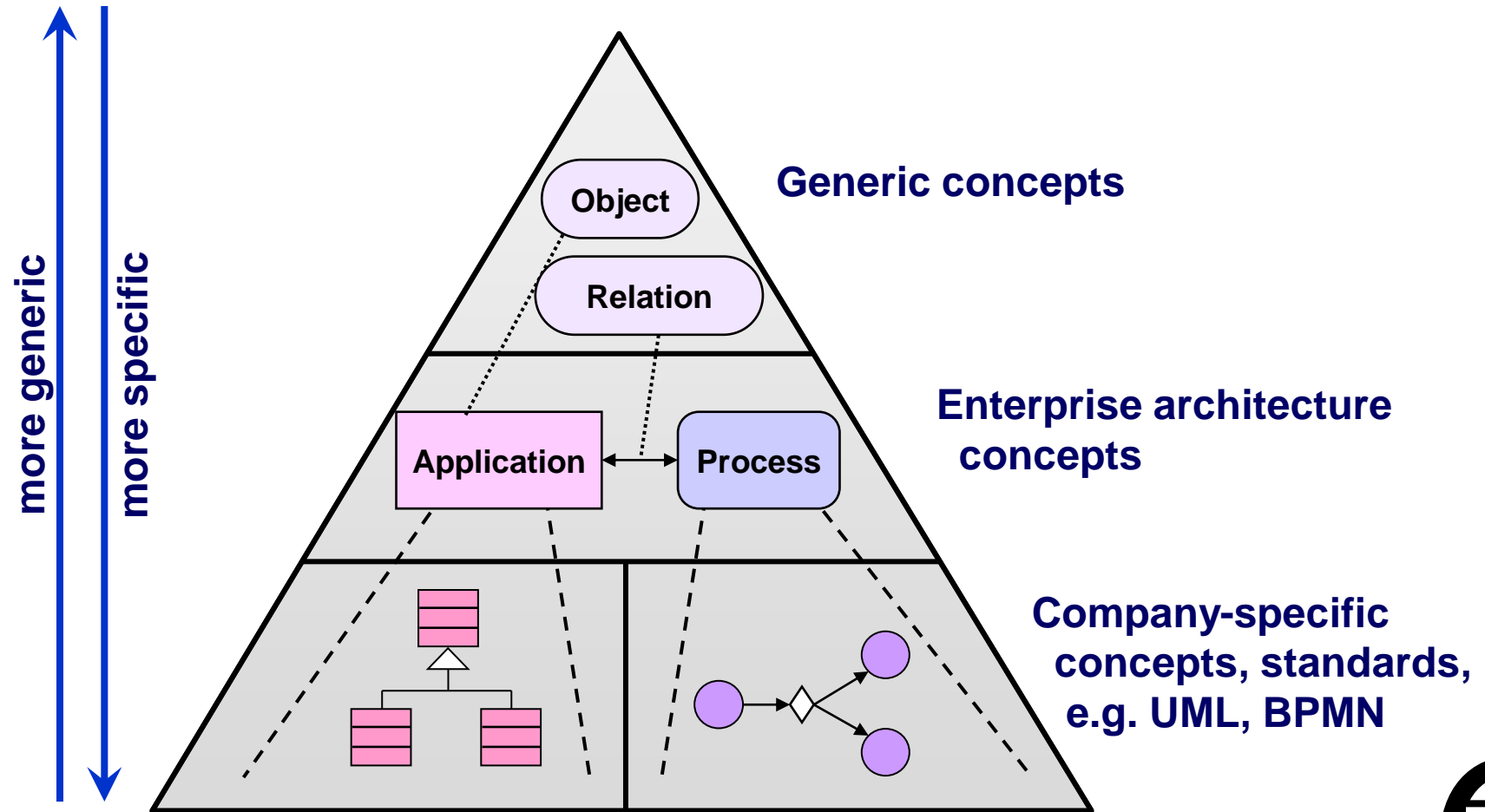


From lecture on perspectives to conceptual modelling

- **Structural - Passive aspect. More detailed using e.g. UML class diagrams**
- **Functional - Behaviour aspect**
- **Behavioral - Only limited control flow, more detailed using e.g. BPMN**
- **Rule-oriented - Motivational extension**
- **Object-oriented - Not directly, more details using e.g. UML**
- **Social communication – Speech acts mentioned under passive structure (meaning)**
- **Actor/role-oriented – Active aspect**
- **Topological - Location (as part of the active aspect)**

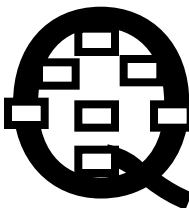


Abstraction Levels



ArchiMate and UML/BPMN/...

- **ArchiMate connects architectural domains**
 - Broader scope, but less detail than e.g. UML (software), BPMN (processes)
 - No replacement for these, but an ‘umbrella’ on top
- **Several ArchiMate concepts/notation derived from BPMN (esp. business processes) and UML (esp. for application and infrastructure)**
 - Easy to link to e.g. UML descriptions of detailed design or BPMN process models



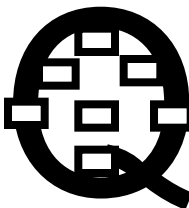
Service Orientation in ArchiMate

Service

- Unit of externally available functionality
- Offered via clear interfaces to the environment
- Hide internal operations

Service Oriented Architecture (SOA) as an example on the Technology layer

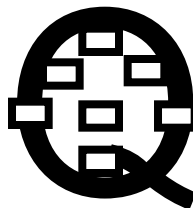
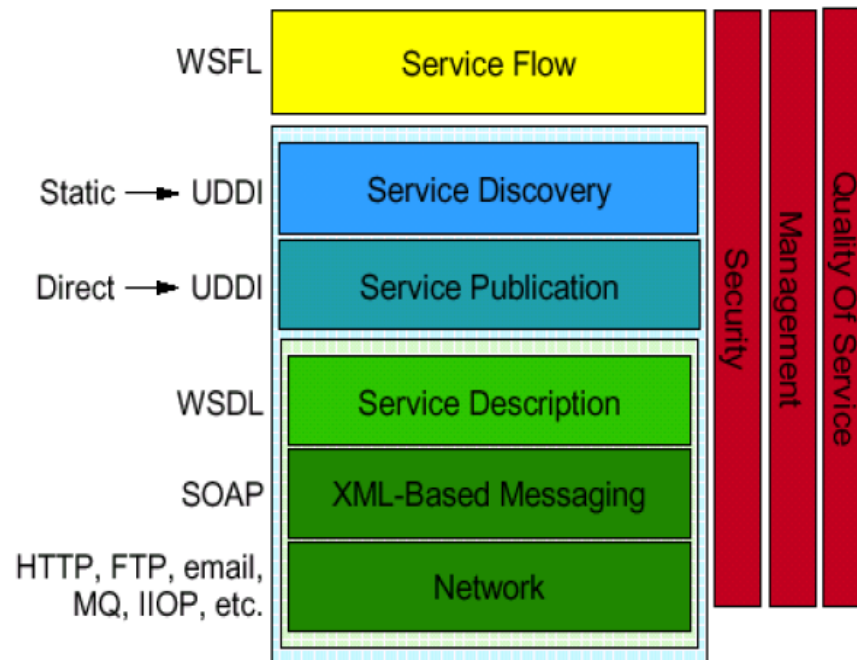
- Definition
 - *“A set of components which can be invoked, and whose interface descriptions can be published, discovered and invoked over a network.”
(W3C)*



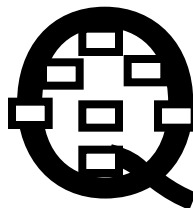
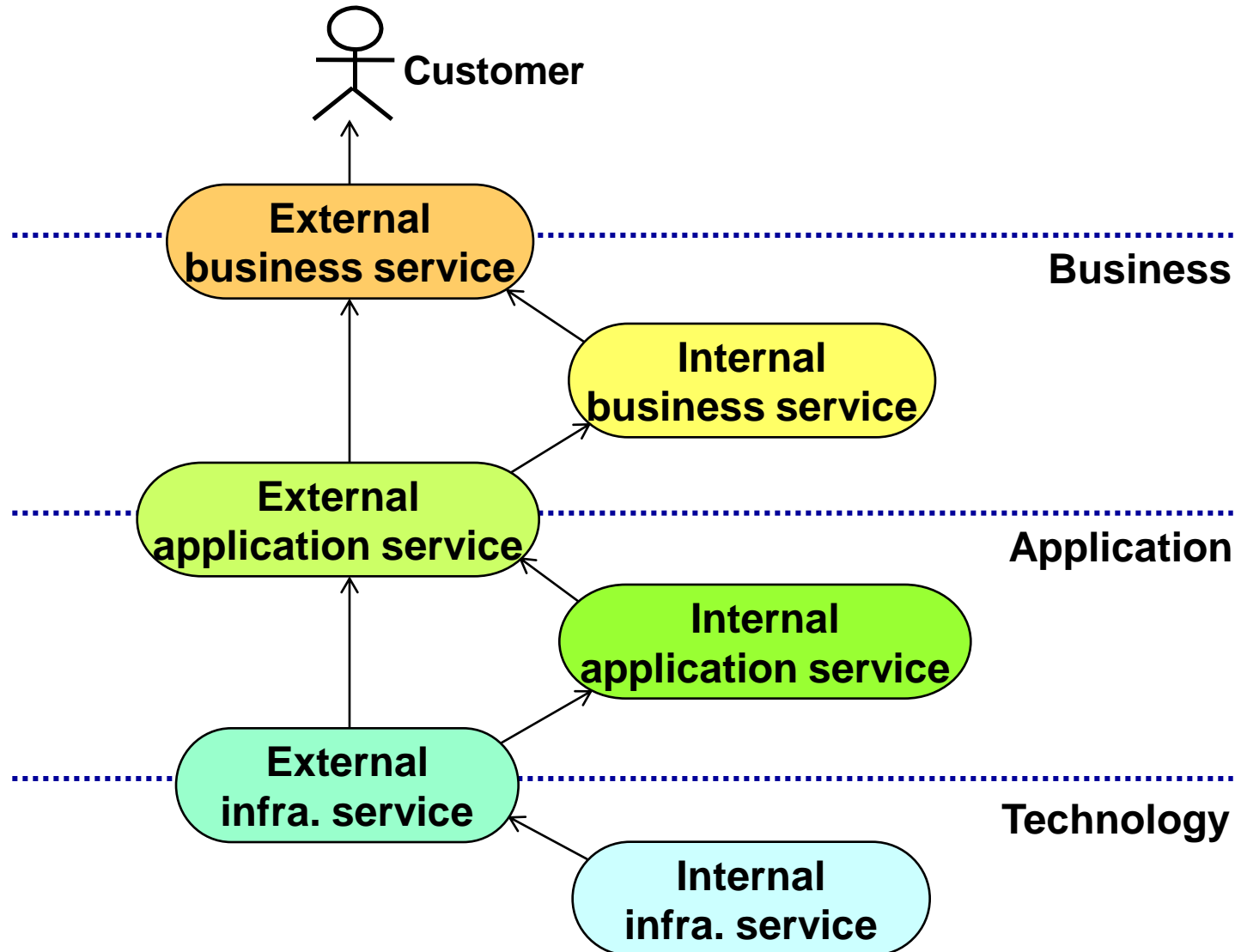
Web Services as an example technology to implement SOA

Web services architecture

- Web services can be used to implement service-oriented solutions
- They adhere to the set of roles and operations specified by the service oriented model.
- They have also managed to establish a standardized protocol stack.

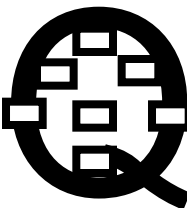


Services as binding concept in ArchiMate

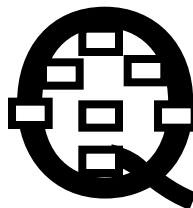
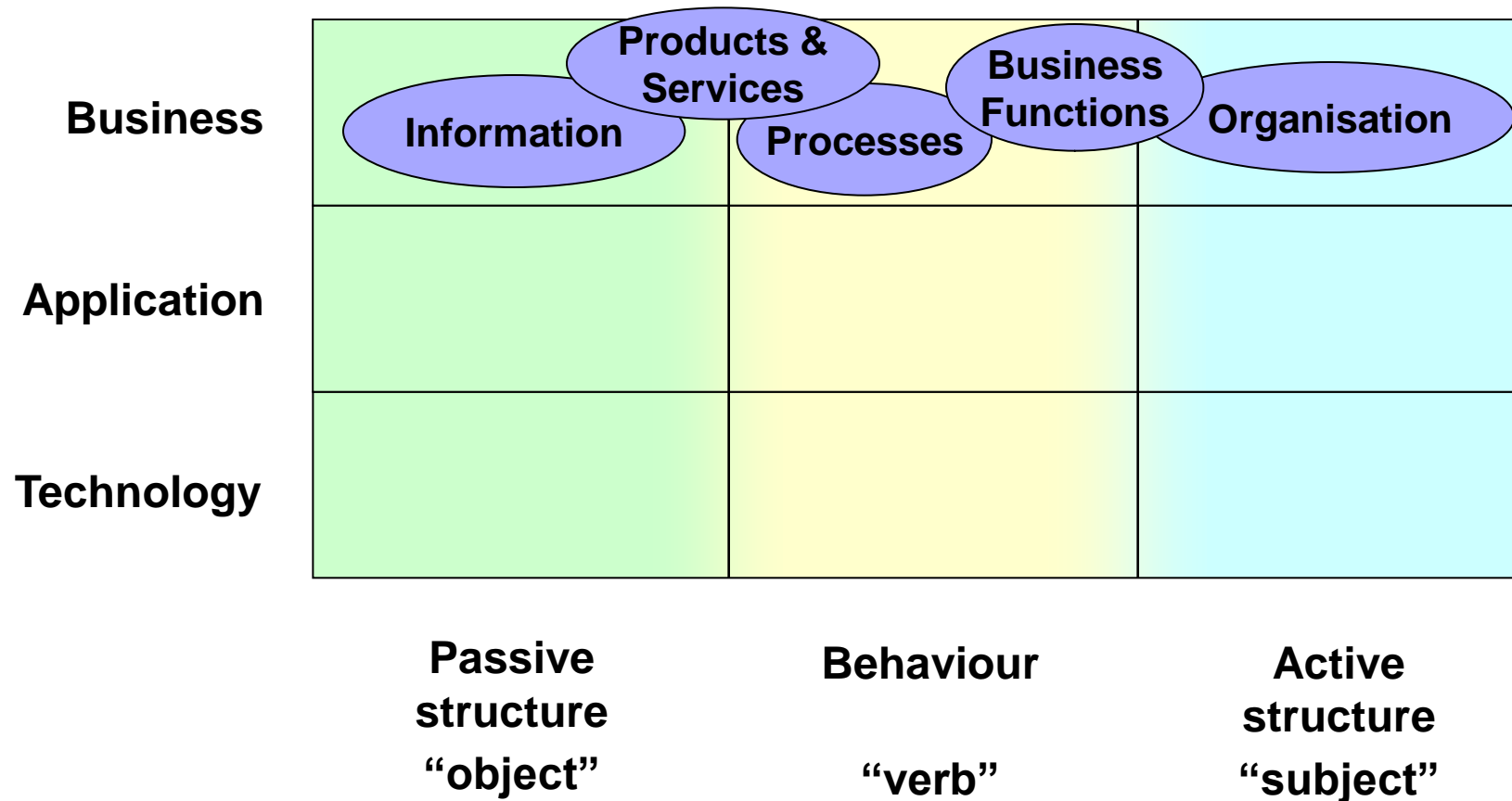


Enterprise Modelling with ArchiMate

- The ArchiMate modelling language on the Business layer
- Viewpoints on the Business layer



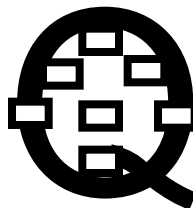
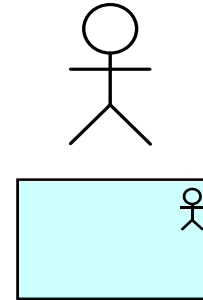
Layers, aspects and viewpoints



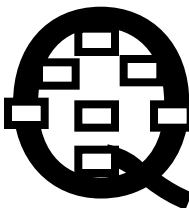
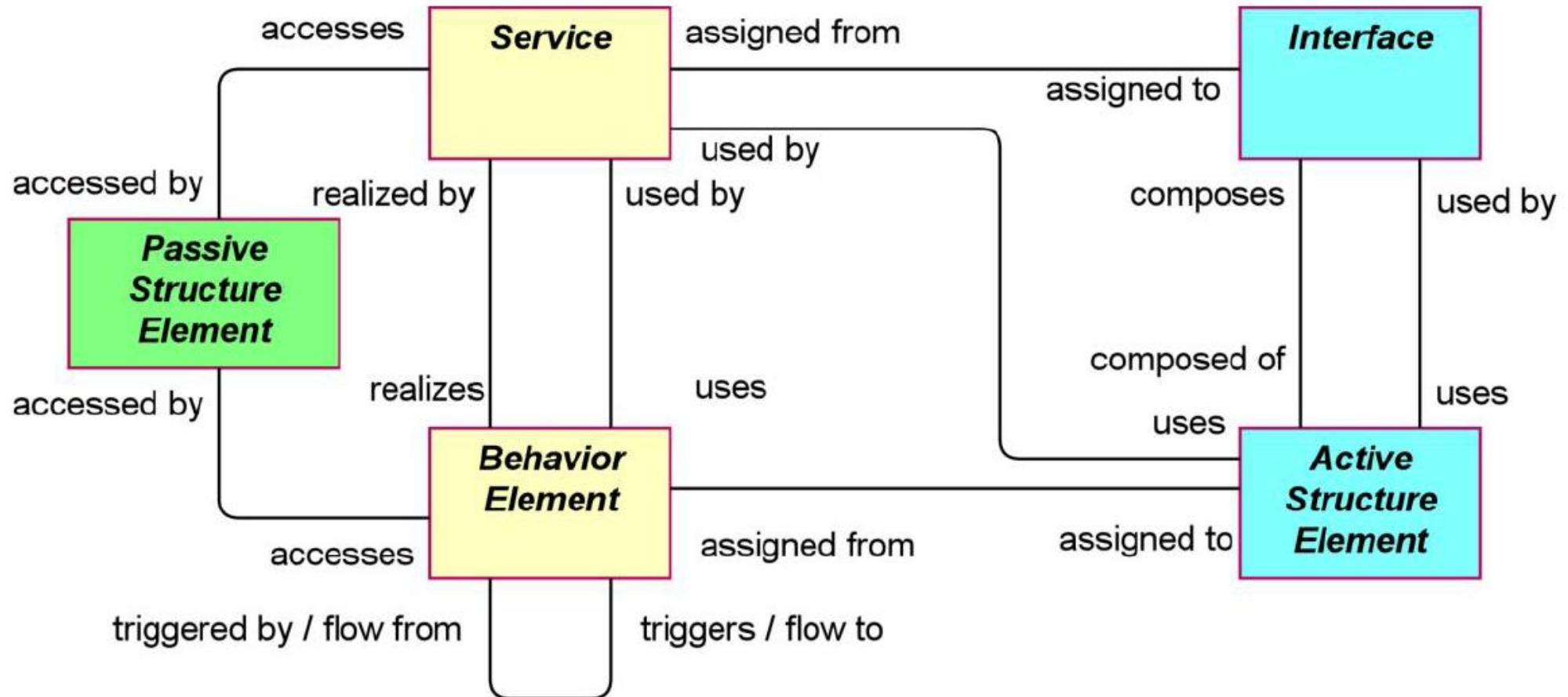
ArchiMate Concepts on the business level using an insurance company example

ArchiMate Notation













- **Most concepts have two notations:**
 - Icon
 - Box with icon
- **Sharp corners = active/passive structure**
- **Rounded corners = behavioural aspects**
- **Notation resembles UML and BPMN**
- **Relations (arrows etc.) are also mostly taken from existing languages**
- **Colors used e.g. according to aspect or layers (not necessarily used like this in all tools)**

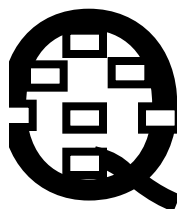


Generic meta-model in ArchiMate

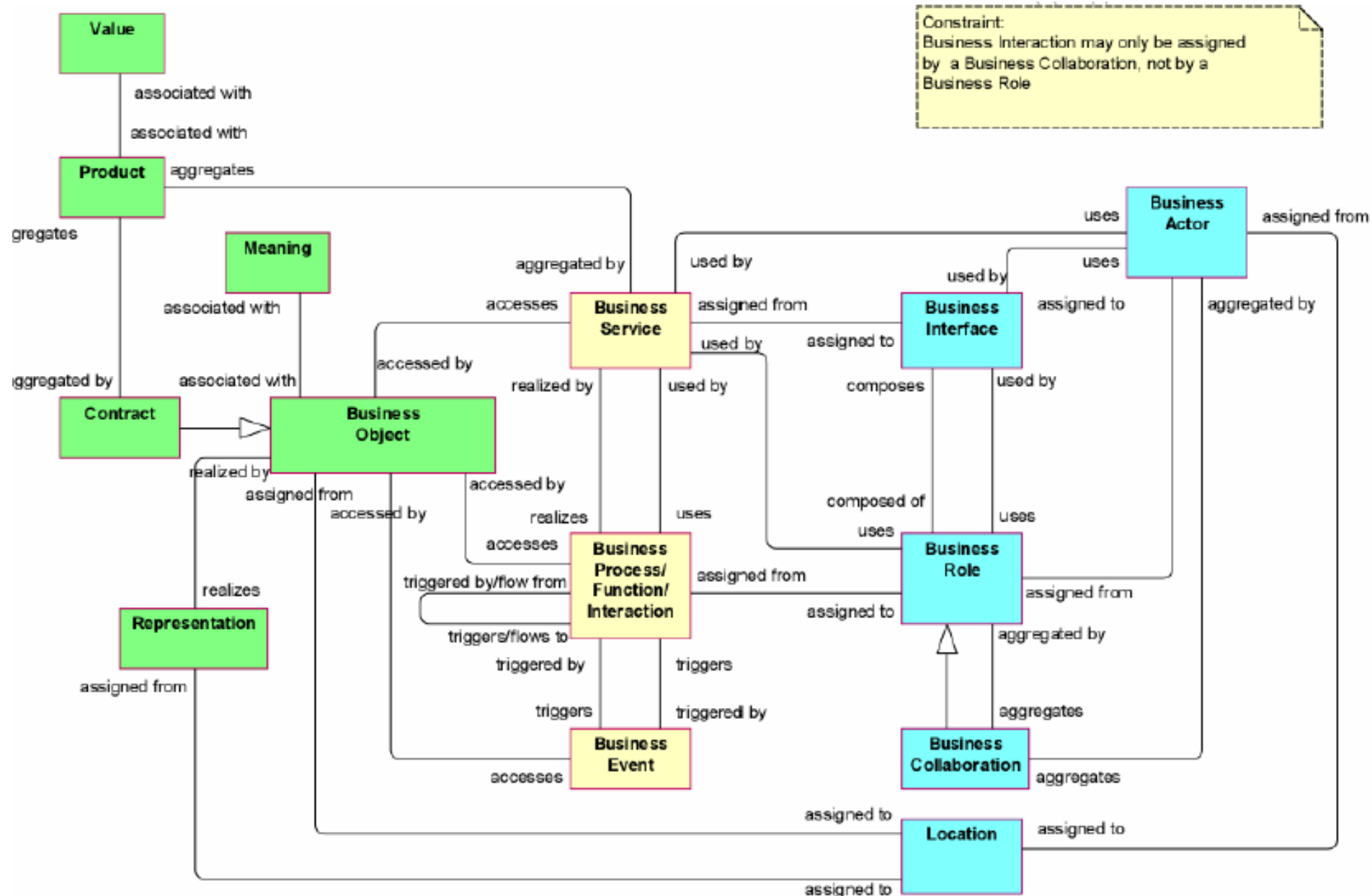


Relationships

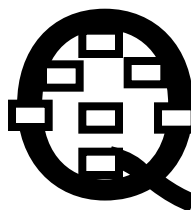
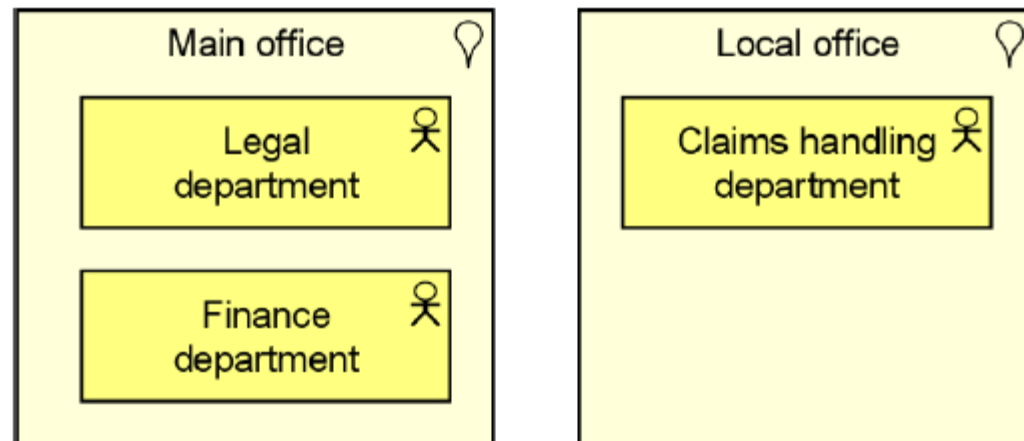
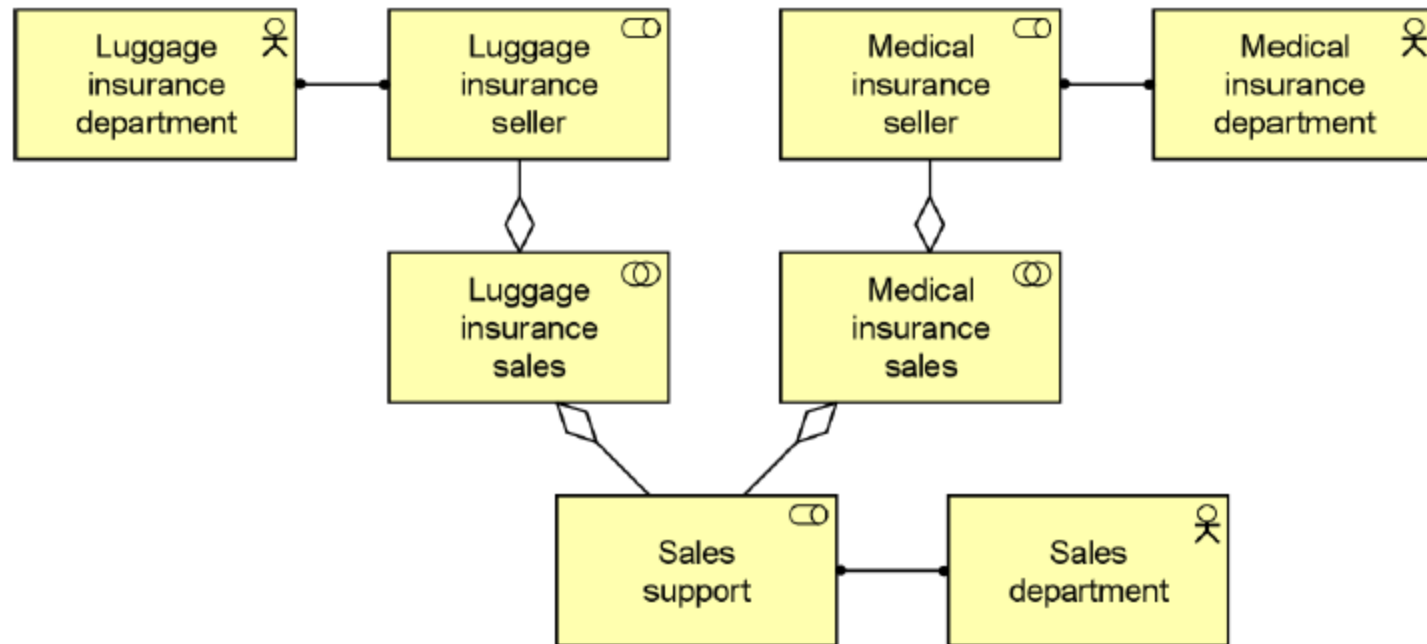
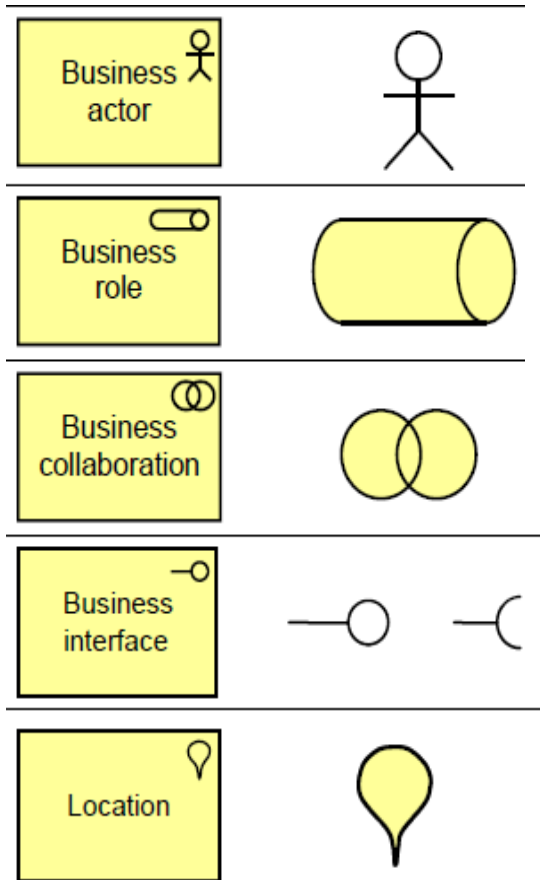
Structural Relationships		Notation
Association	Association models a relationship between objects that is not covered by another, more specific relationship.	
Access	The access relationship models the access of behavioral concepts to business or data objects.	
Used by	The used by relationship models the use of services by processes, functions, or interactions and the access to interfaces by roles, components, or collaborations.	
Realization	The realization relationship links a logical entity with a more concrete entity that realizes it.	
Assignment	The assignment relationship links units of behavior with active elements (e.g., roles, components) that perform them, or roles with actors that fulfill them.	
Aggregation	The aggregation relationship indicates that an object groups a number of other objects.	
Composition	The composition relationship indicates that an object is composed of one or more other objects.	
Dynamic Relationships		Notation
Flow	The flow relationship describes the exchange or transfer of, for example, information or value between processes, function, interactions, and events.	
Triggering	The triggering relationship describes the temporal or causal relationships between processes, functions, interactions, and events.	
Other Relationships		Notation
Grouping	The grouping relationship indicates that objects, of the same type or different types, belong together based on some common characteristic.	
Junction	A junction is used to connect relationships of the same type.	
Specialization	The specialization relationship indicates that an object is a specialization of another object.	



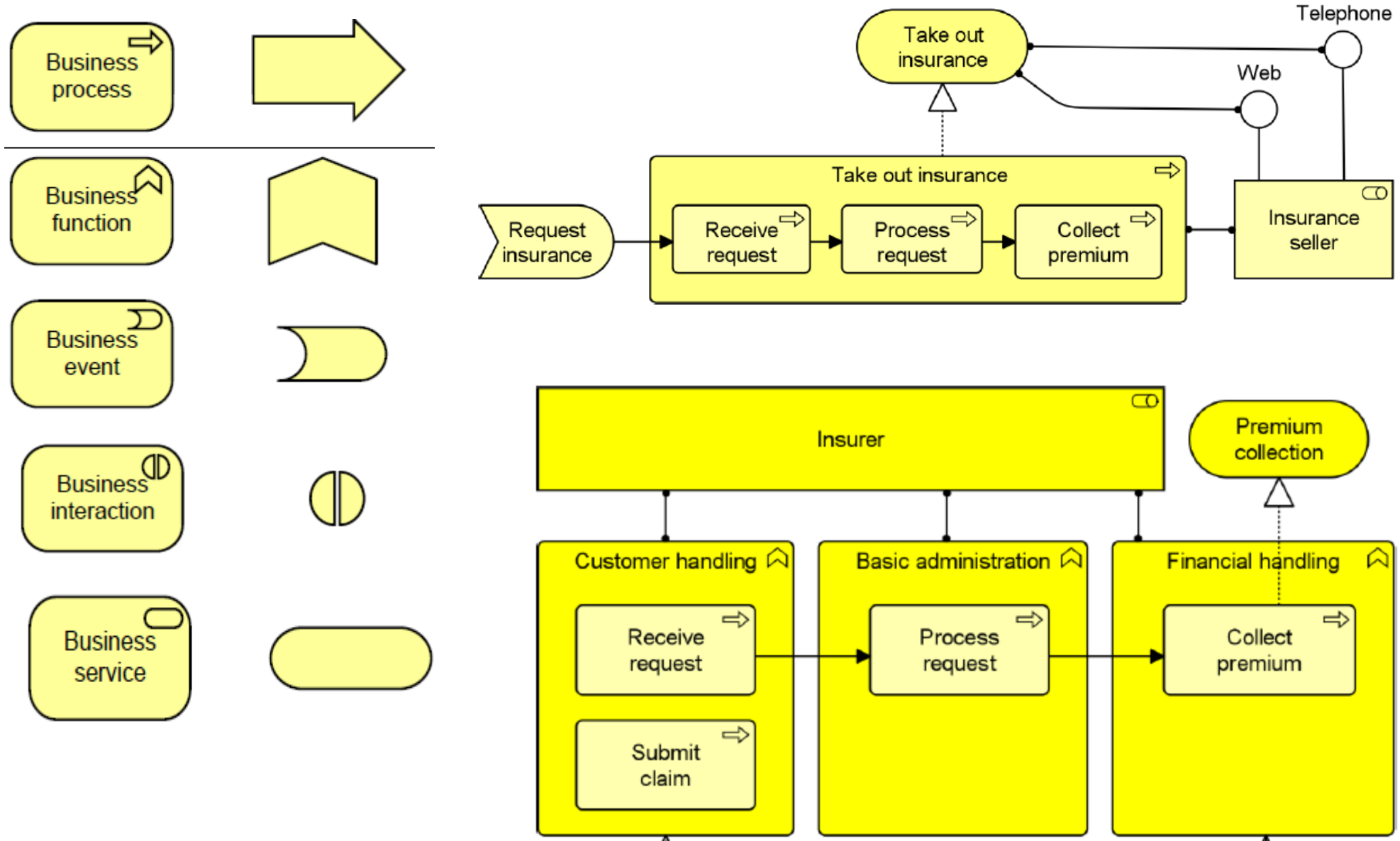
Business layer meta-model



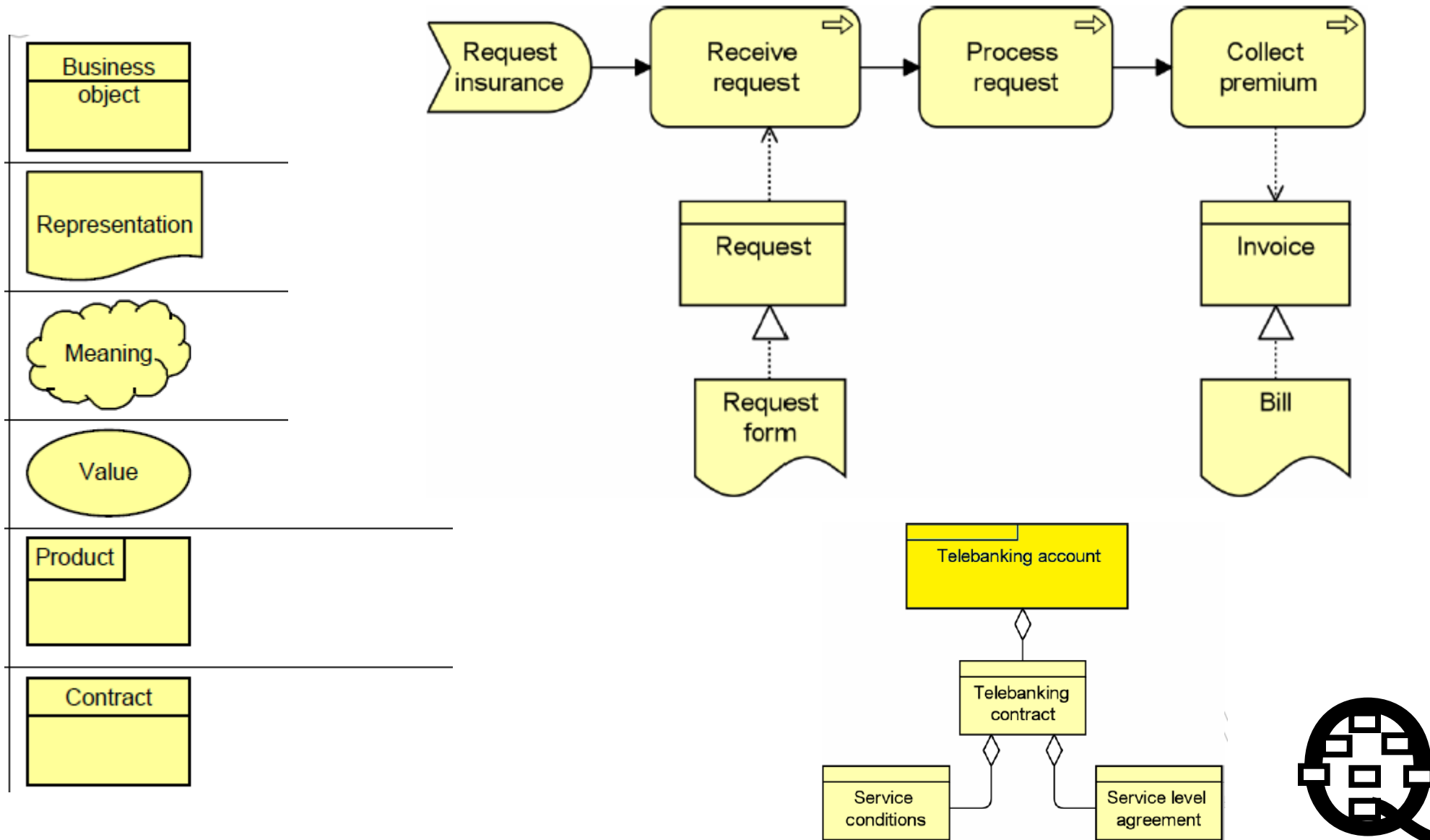
Active concepts on the business level



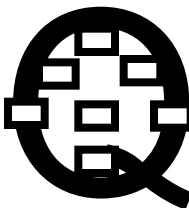
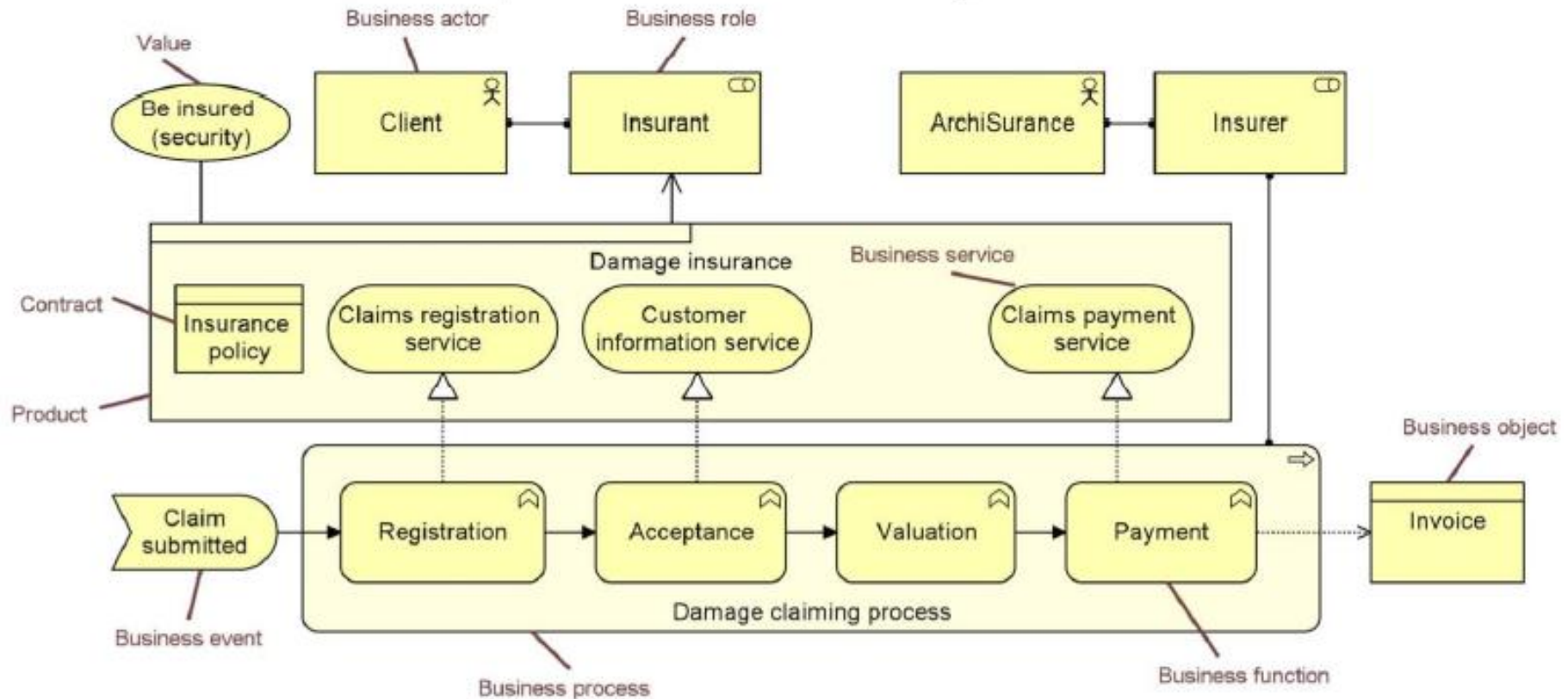
Behavioural concepts on the business layer



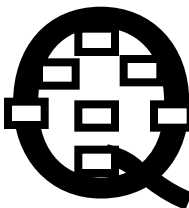
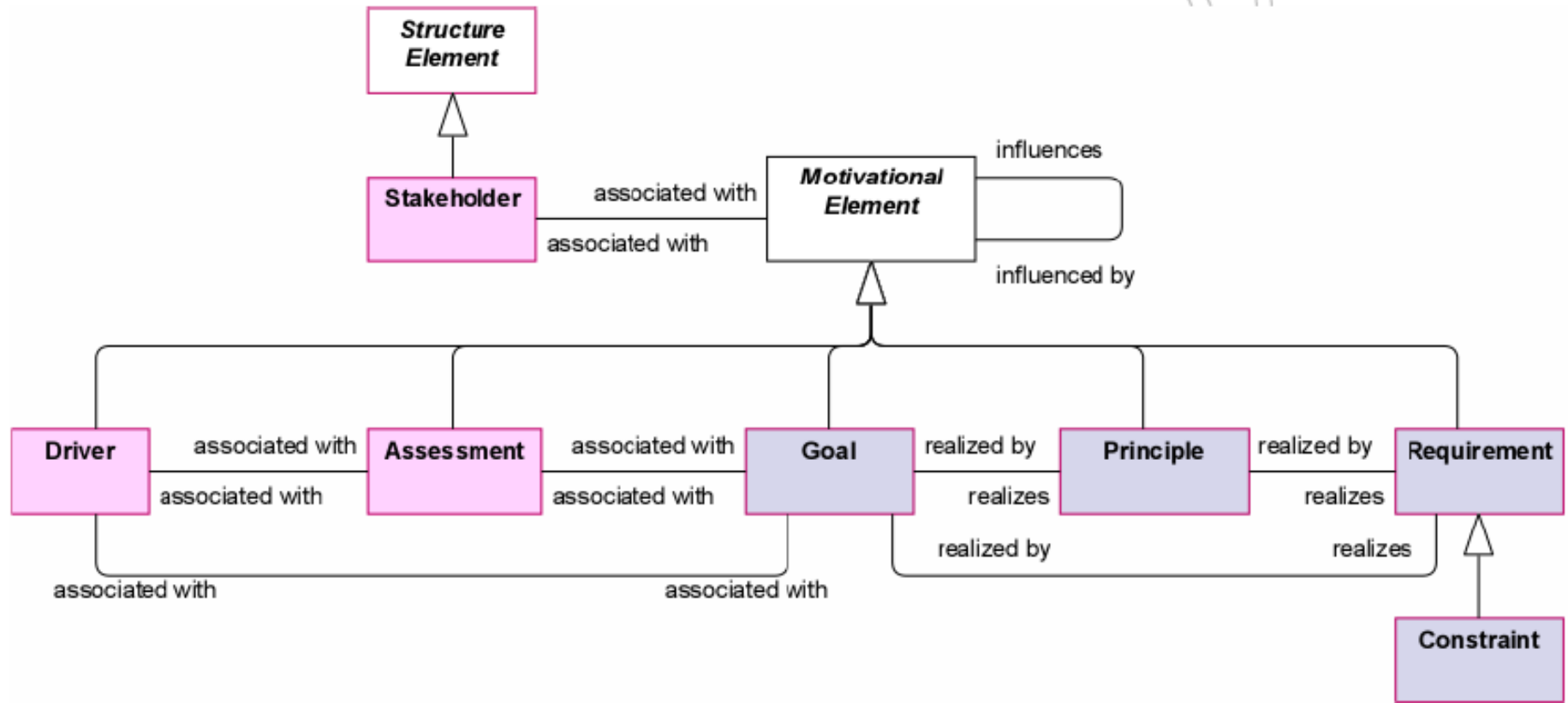
Passive concepts on the business layer



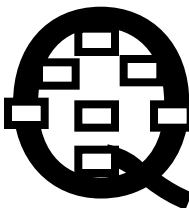
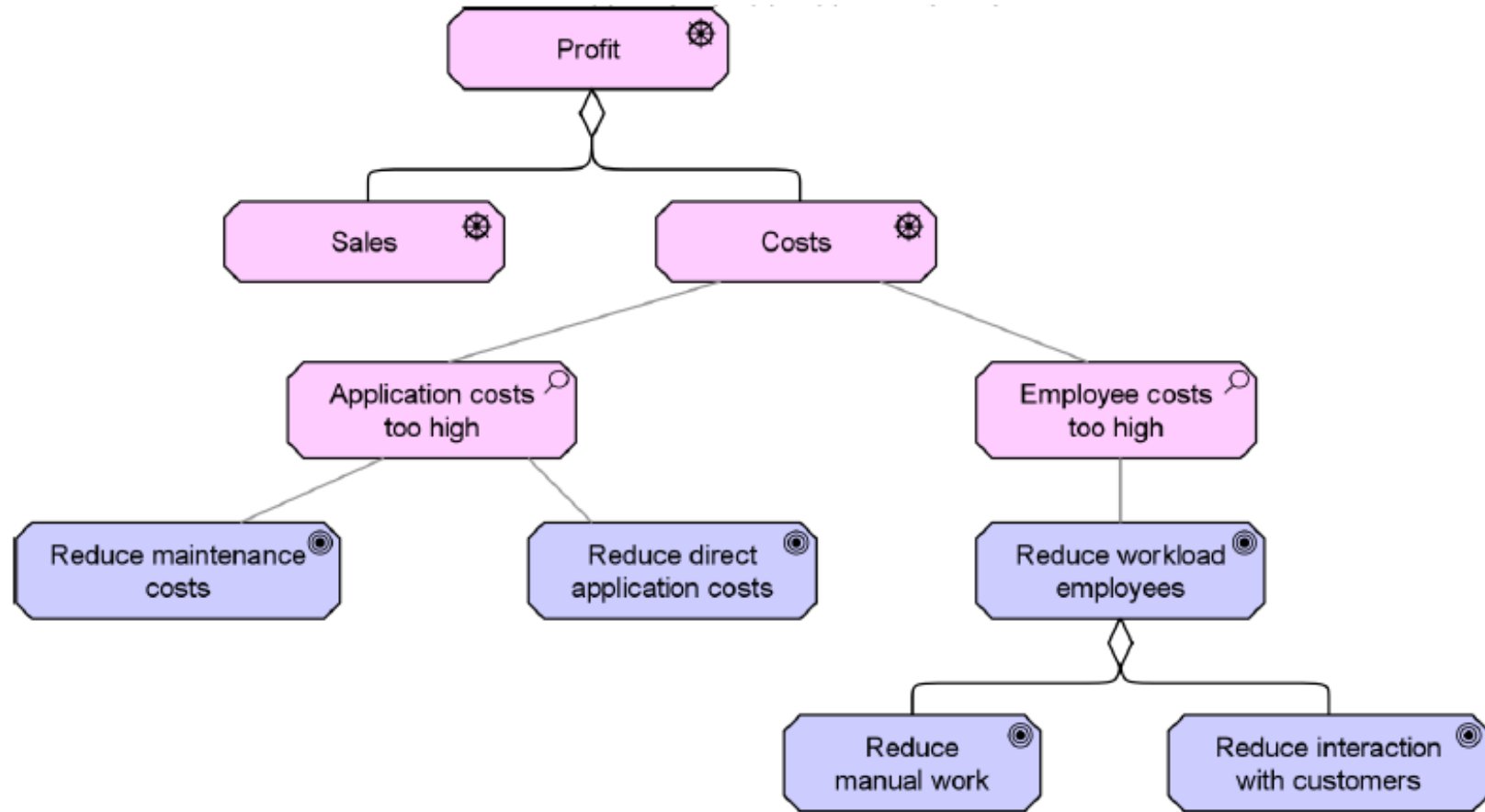
Example Business Layer Model



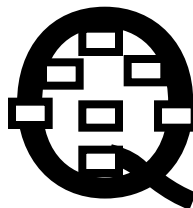
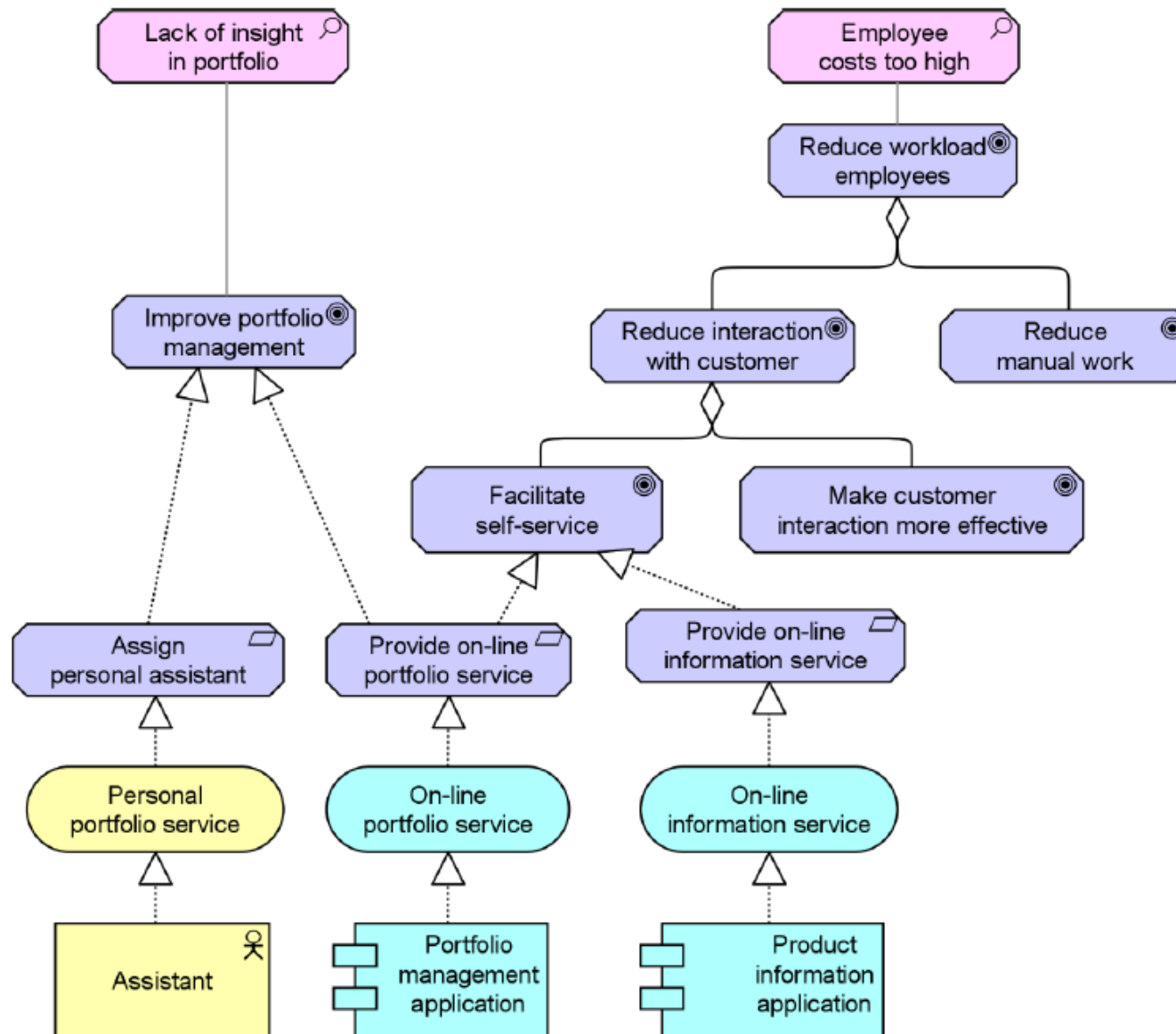
Motivation aspects at the business layer



Drivers, assessment and goals

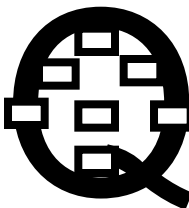


Goals, requirements and services



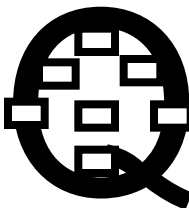
Viewpoints in ArchiMate

- **Limited modelling-palettes based on different concerns of different stakeholders**
- **Viewpoint classification**
 - Designing a new enterprise -> architect, developer
 - Deciding – supporting decision making -> product manager, CIO, CEO
 - Informing -> customer, employee, other stakeholder
- **Abstraction level**
 - Details – one layer/one aspect
 - Coherence – multiple layers or aspects
 - Overview – both multiple layers and multiple aspects

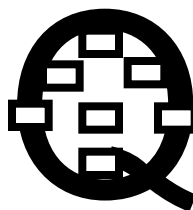
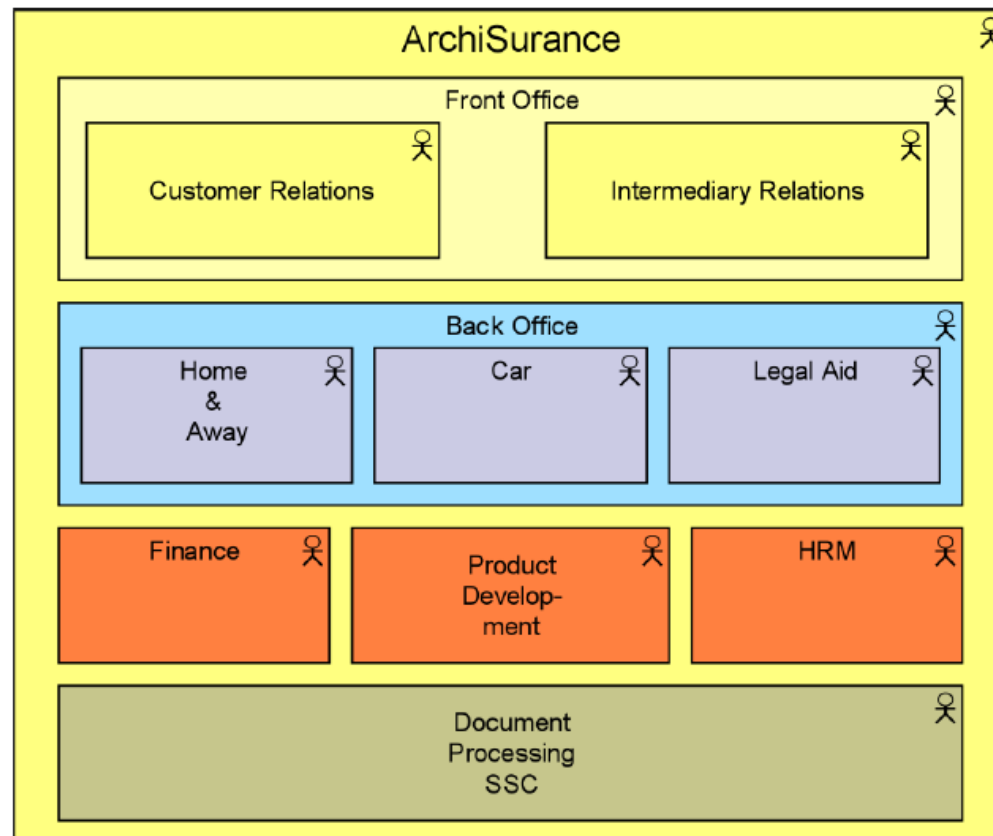
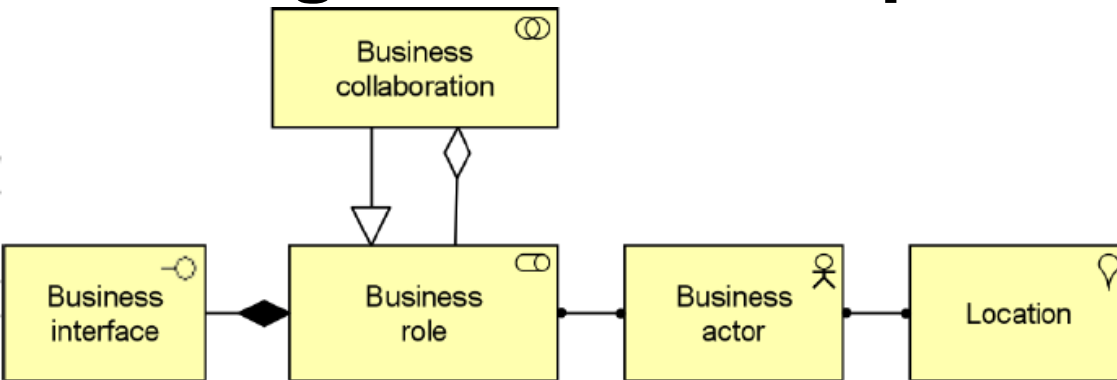


Predefined viewpoints on the business layer

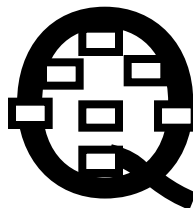
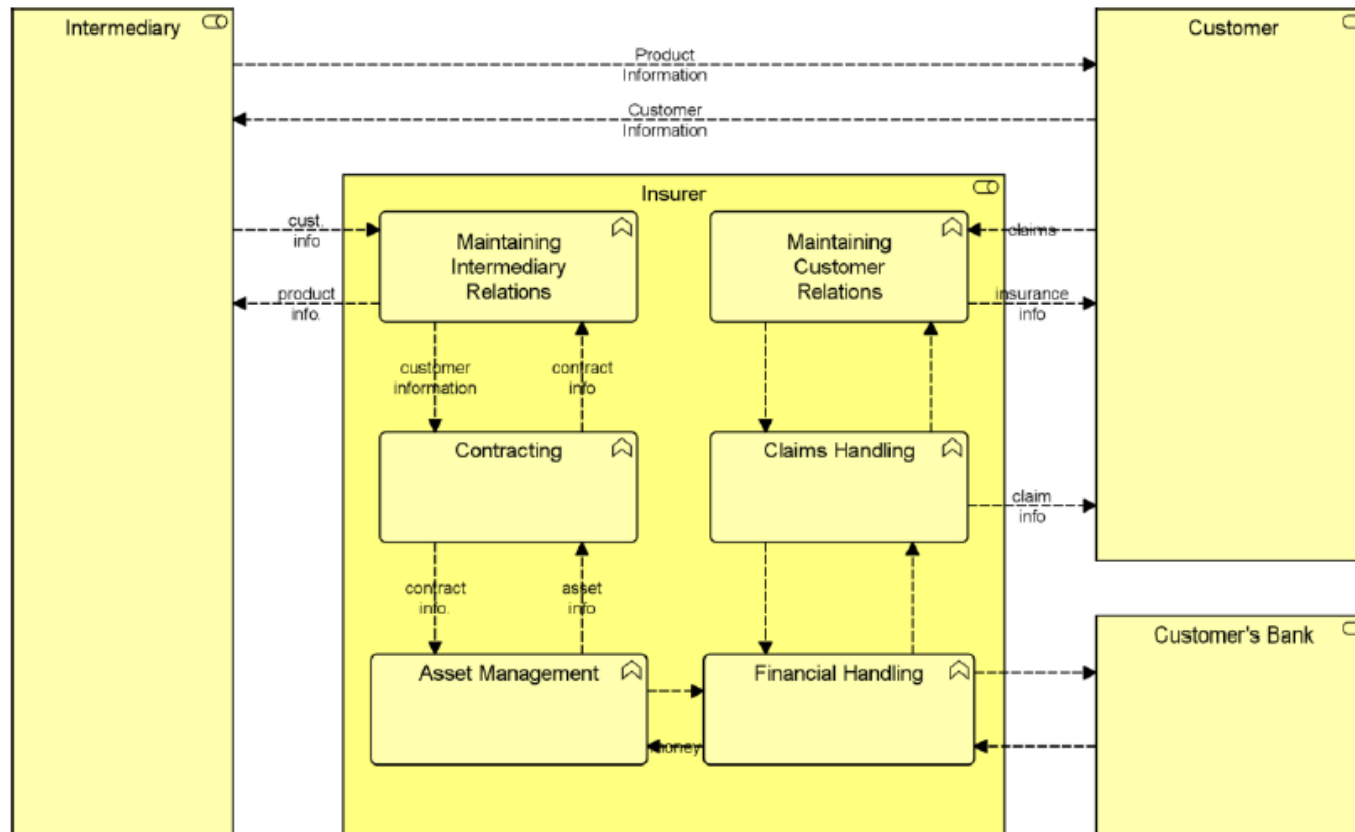
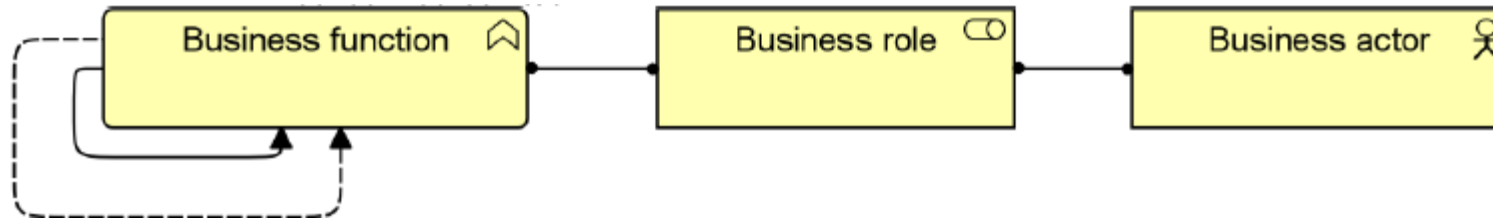
- Organization viewpoint
- Business function viewpoint
- Business process viewpoint
- Product viewpoint
- Information viewpoint



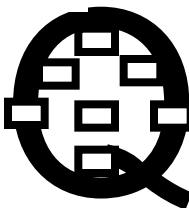
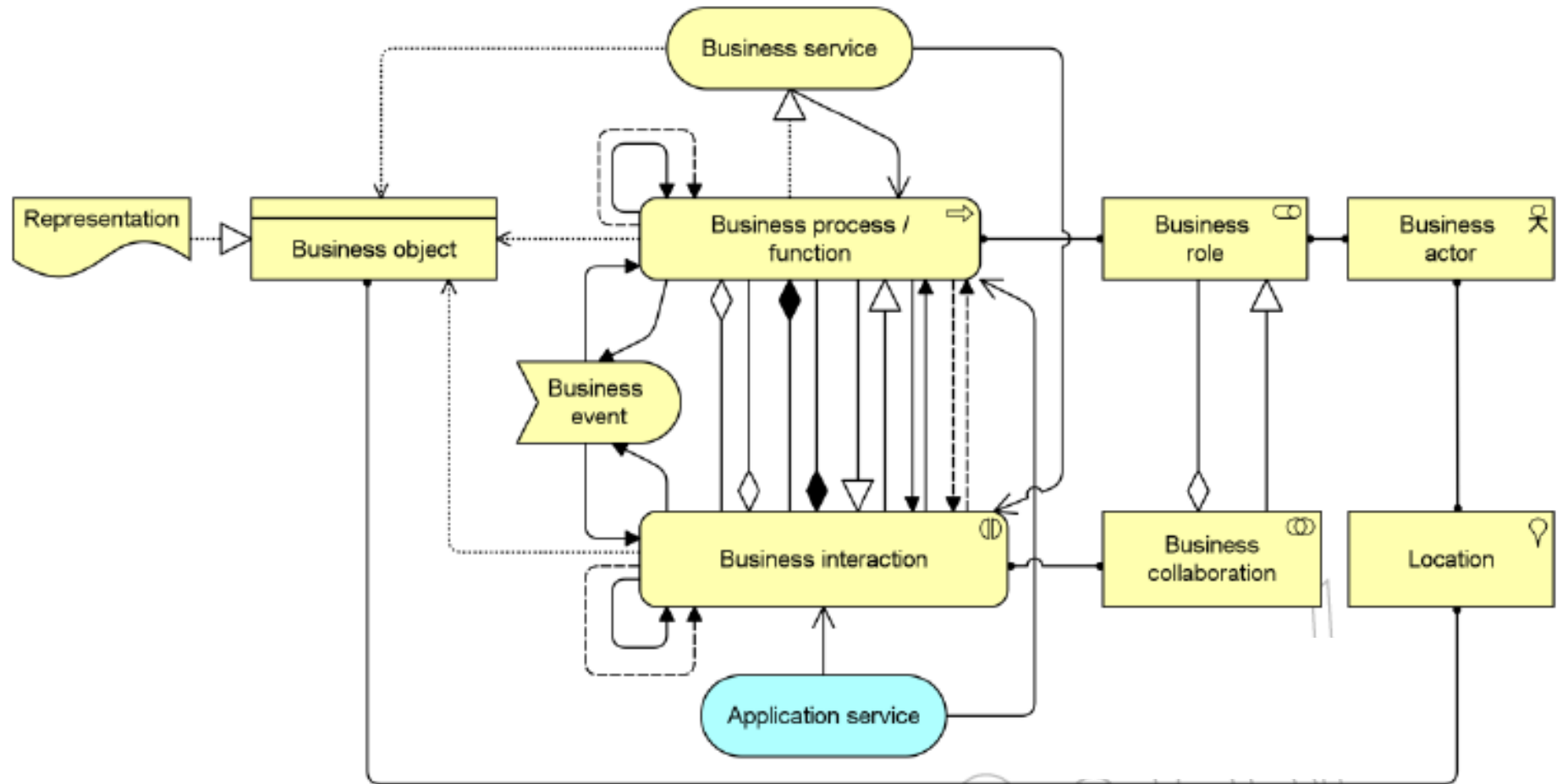
Organization viewpoint



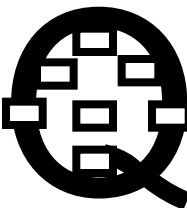
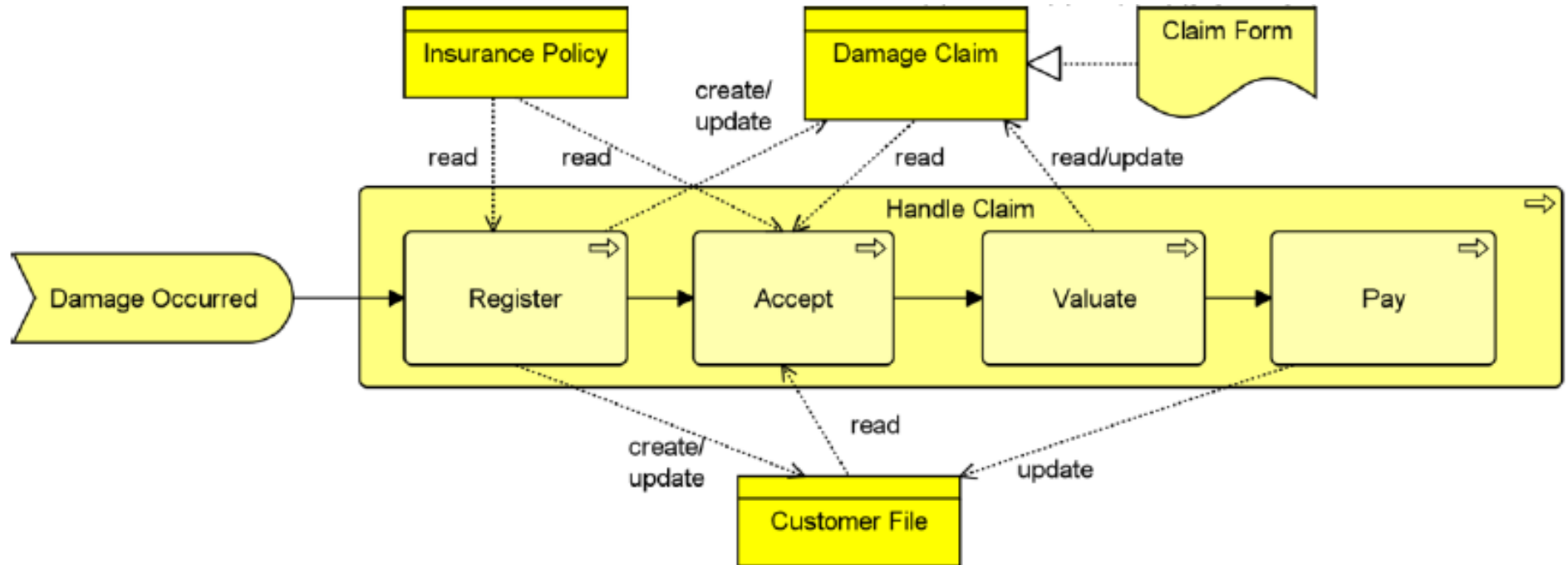
Business function viewpoint – designing, coherence



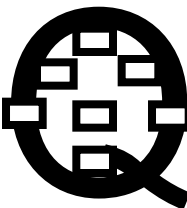
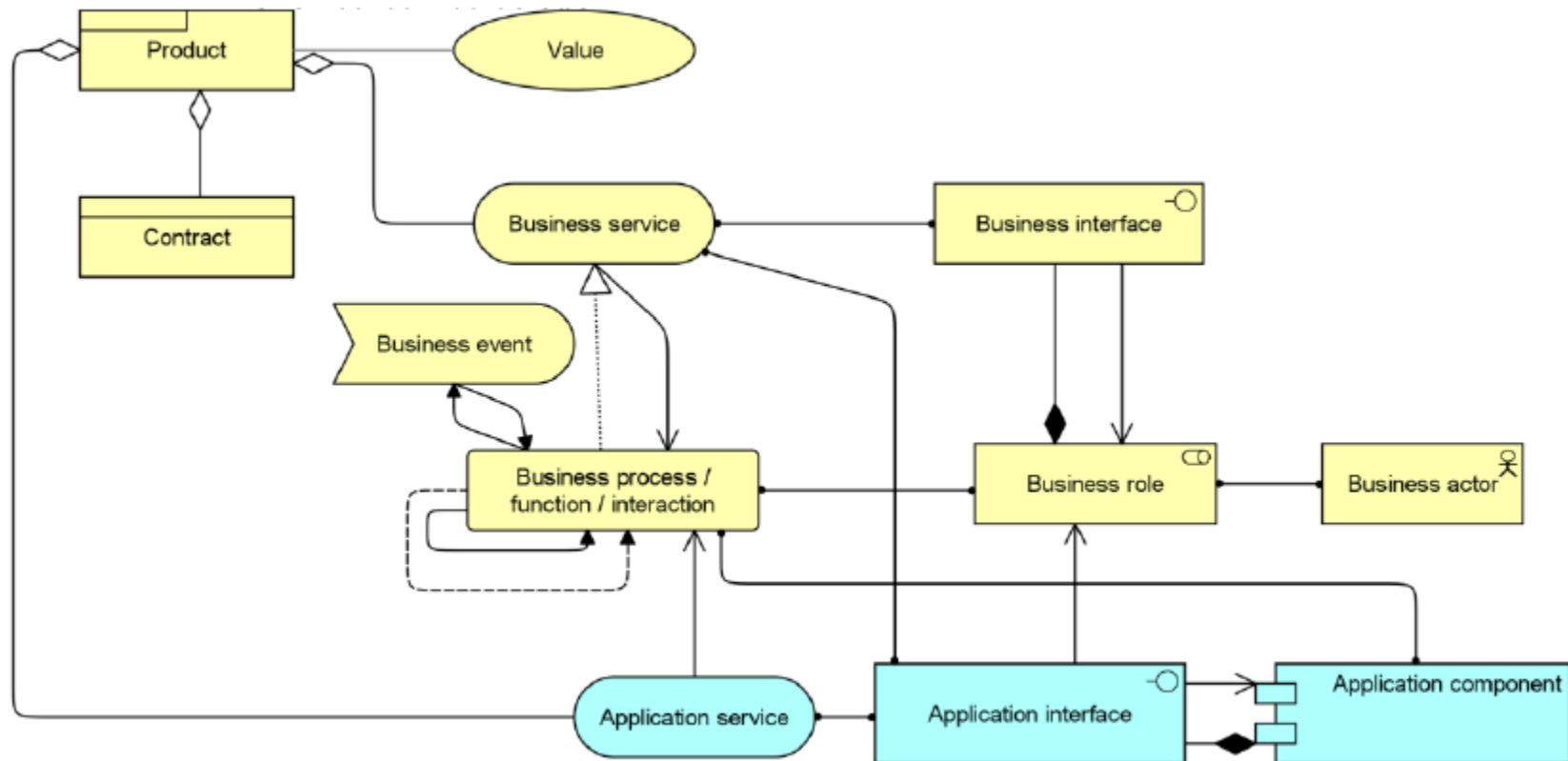
Business process viewpoint – designing detail



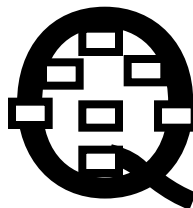
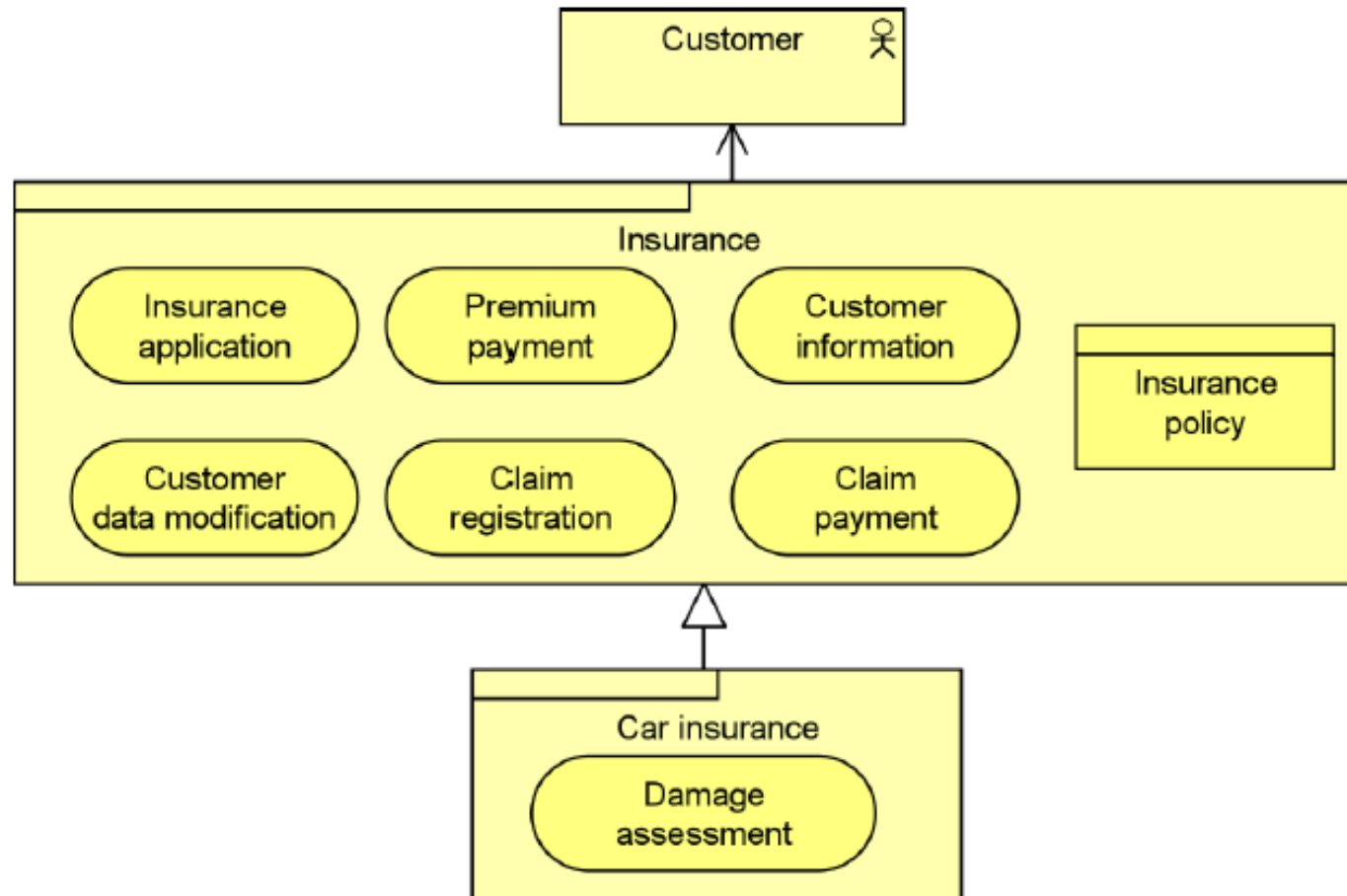
Business process example



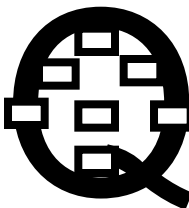
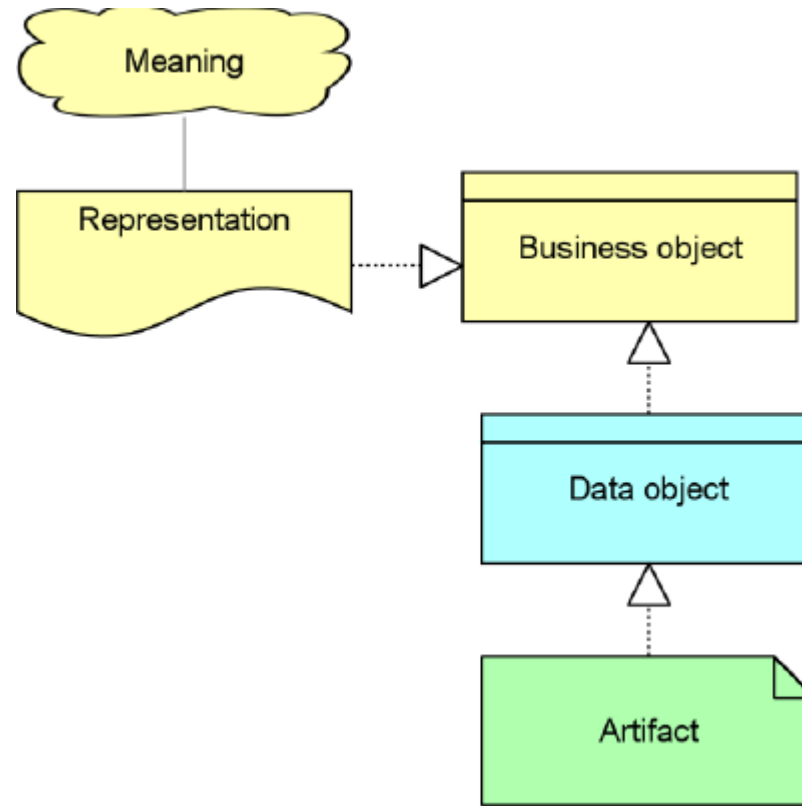
Product viewpoint –designing/deciding , coherence



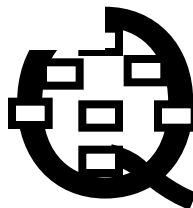
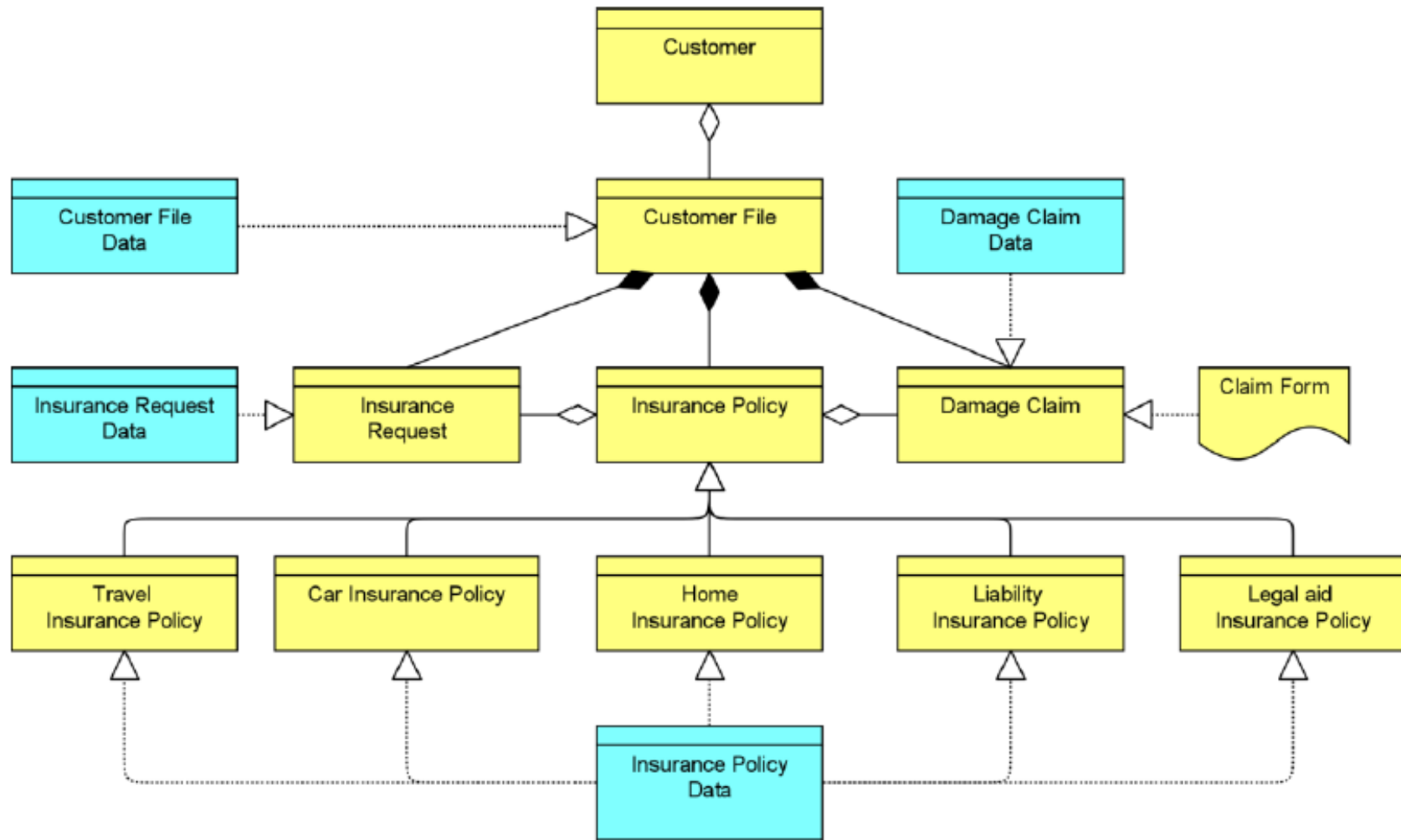
Example of product viewpoint



Information viewpoint - Designing details

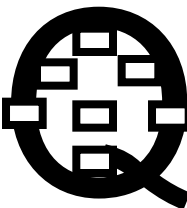
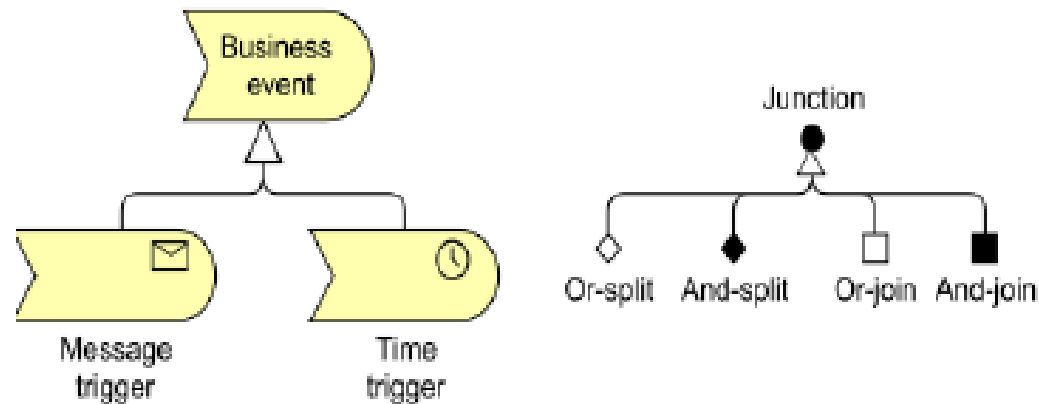


Example on information structure

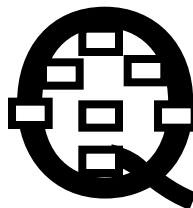
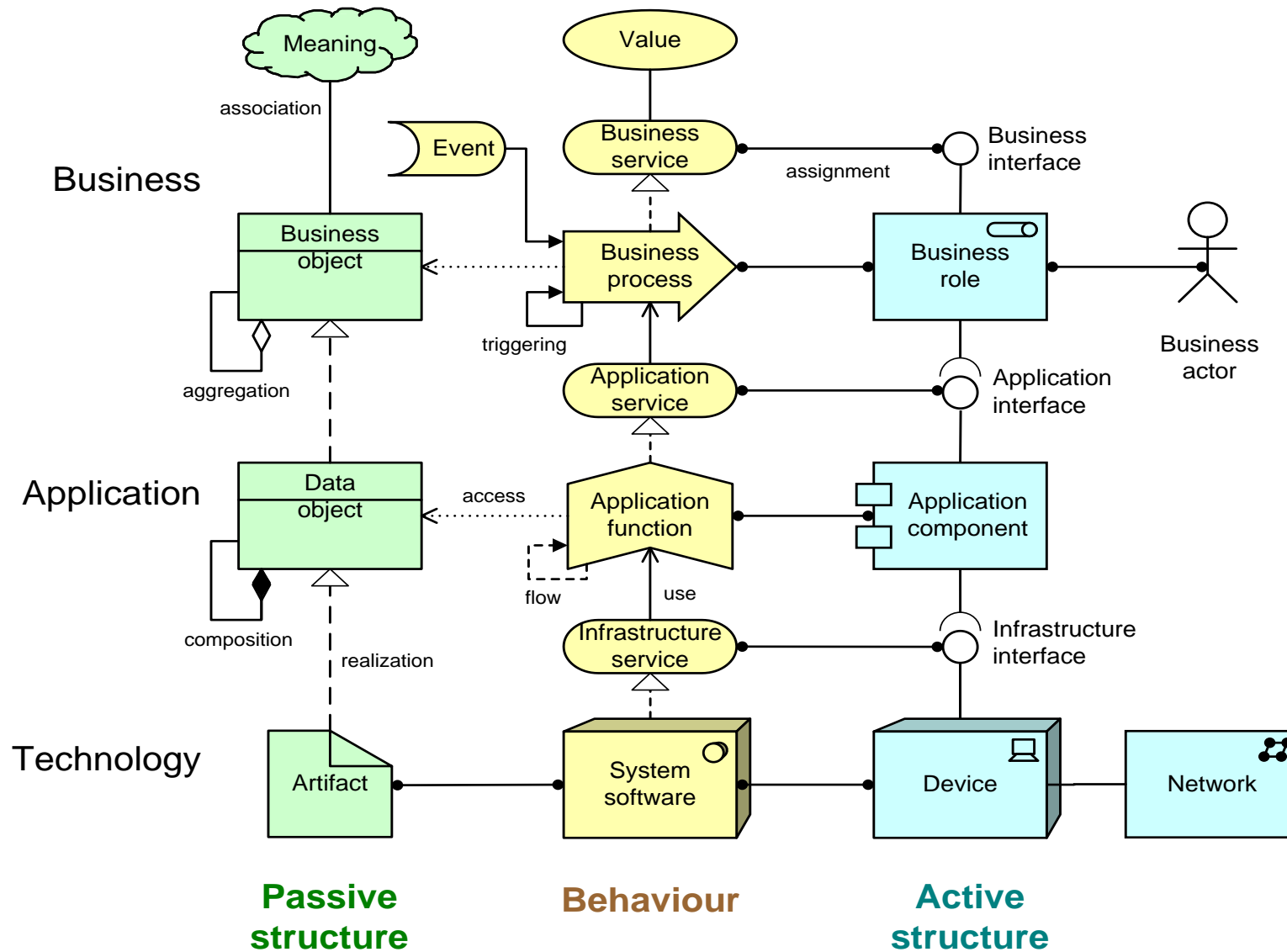


Extension mechanisms

- Additional properties (cf. Tagged values in UML)
- Sub-types (cf. Stereotypes in UML)



Overview of Core Concepts across layers



Tool Support for ArchiMate

■ Commercial:

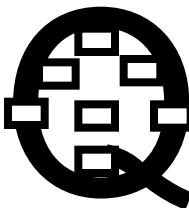
- BiZZdesign: Architect
- Software AG: ARIS ArchiMate Modeler
- Sparx: Enterprise Architect
- IBM: System Architect (via Corsa plugin)
- Casewise: Corporate Modeler
- Avolution: Abacus
- Agilense: EA Web Modeler
- Promis: EVA Netmodeler
- Visual Paradigm: Agilian
- MEGA: MEGA for ArchiMate
- Orbus: iServer Enterprise Architect
- Troux: Metis (oude versie)

■ Freeware:

- Archi (Bolton Univ.) archi.cetis.ac.uk
- ArchiLe sourceforge.net/projects/archile/
- Microsoft Visio www.archimate.org

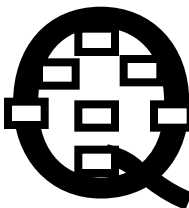
■ Online:

- Archivity www.archivity.org
- ModelWorld www.modelworld.nl



Active User Community

- ArchiMate Forum of The Open Group
 - <http://www.archimate.org>
- NAF working group
 - <http://www.naf.nl/nl/werkgroepen/archimate.html>
- ArchiMate LinkedIn group
 - <http://www.linkedin.com/groups/ArchiMate-50758>
 - > 2000 members



Final questions

