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# Architectural Principles & Business Rules

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# Motivation and Purpose

The concepts of *architectural principle* and *business rule* are currently ill-defined. As a consequence, there is a lot of misunderstanding and confusion.

Only by putting these concepts in an appropriate and theoretically sound conceptual framework can they become well-defined.

Only well-defined concepts are useful, both in science and in practice.

# Approach and Prospect

The concepts of architectural principle and business rule will be defined in the framework of the  $\Psi$ -theory (for further information, visit [www.demo.nl](http://www.demo.nl)), particularly by applying:

**Enterprise Ontology**; reduces complexity by focusing on the implementation independent *essence* of an enterprise and subsequently achieving *objective* understanding of it.

**Enterprise Architecture**; reduces complexity by aligning policy statements (mission, strategy) and converting them into consistent and coherent *design principles*.

# Outline

Design and Engineering

Architectural Principles

Ontological System Analysis

Business Rules

Conclusions

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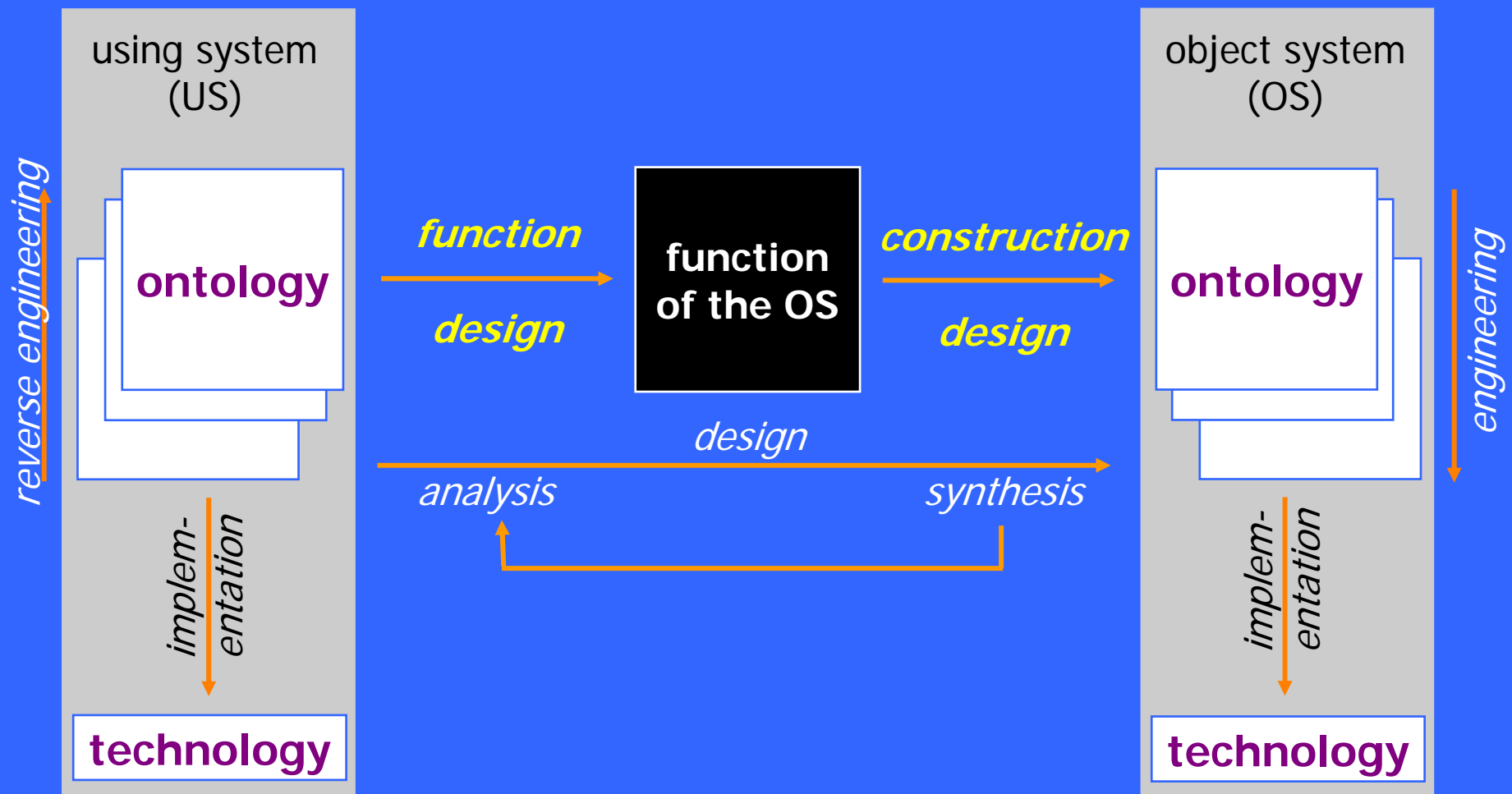
# Ontology

**Conceptually**, the *ontology* of a system is the *understanding* of its construction and operation that is completely independent of the way in which the system is implemented. It shows the *essence* of the system.

**Operationally**, the ontology (or ontological model) of a system is its 'highest' level *constructional model*.

The  $\Psi$ -theory-based ontological model of an enterprise is the (ontological) model of its *business system* (as opposed to information system and infrastructural system).

# The Generic System Development Process (1)



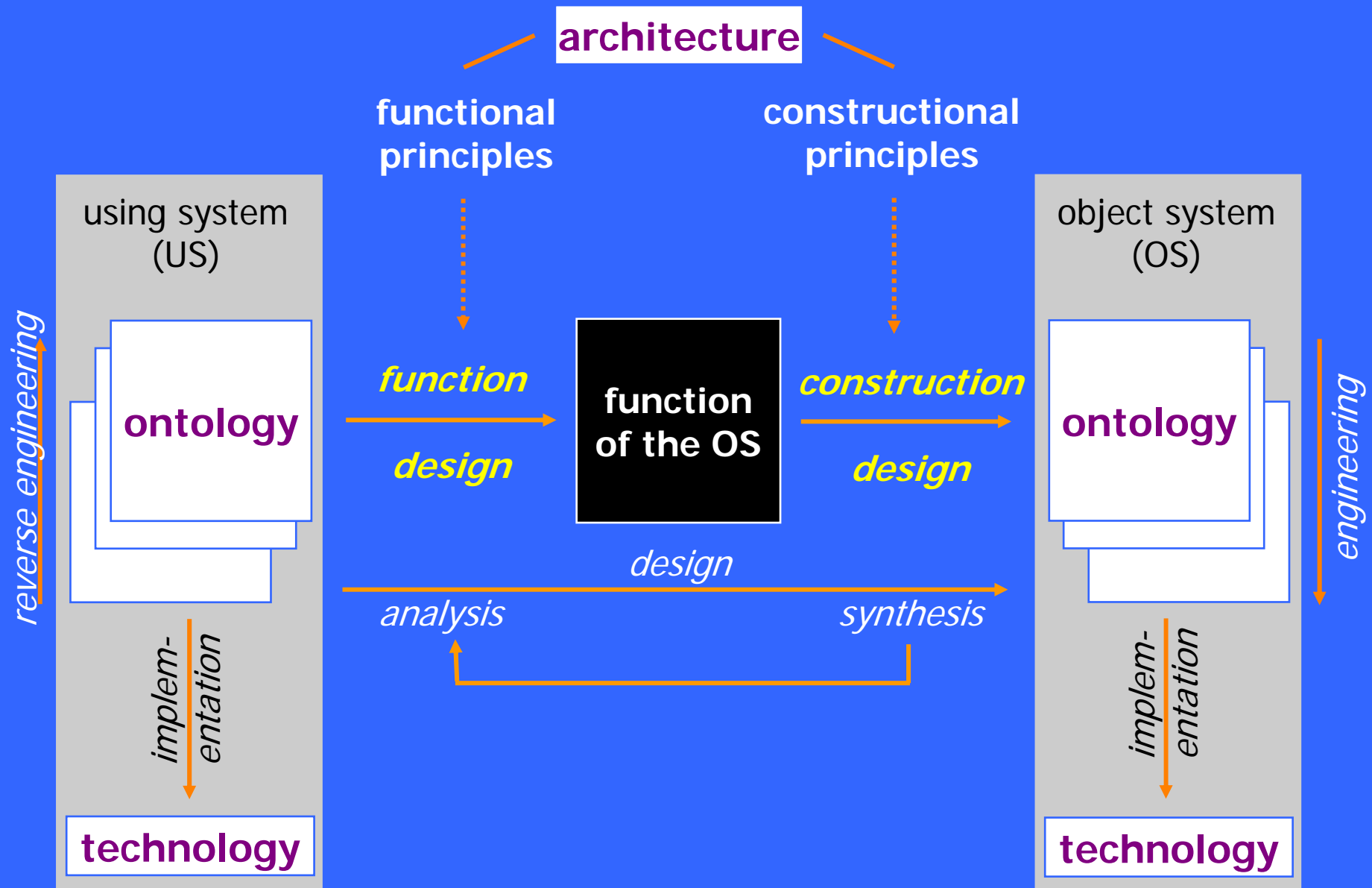
# Architecture

**Conceptually**, *architecture* is the *normative restriction of design freedom* in system development.

**Operationally**, architecture is a set of *design principles* that address all *general requirements* (i.e., requirements that hold for classes of systems).

Note that architecture is not equal to design. It is correct, though, to say that one may *recognize* from a design (or a concrete system) the applied *architecture*: architecture is not what you see but what shaped what you see.

# The Generic System Development Process (2)



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# Architectural Principles

Architectural principles are unambiguously formulated rules for designers, derived from 'higher order' policy statements (mission, strategy) in a coherent and consistent way.

Example of a **functional principle**:

*Our customers must be able to inspect and modify their address data at any time.*

Example of a **constructional principle**:

*If available, public web services must be used instead of developing our own.*

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# Statics, kinematics, and dynamics in physics



*Statics* is about the possible *states* in which the system is in equilibrium, so in which the balls lie 'still'.

*Kinematics* is about the possible *processes* in the system, so about the movements of the balls.

*Dynamics* is about the *actions* that cause movements, so the activated pins and strings.

# Statics, kinematics, and dynamics in enterprises

We distinguish between *enterprise system* (the acting people) and *enterprise world* (where the effects occur).

By the *statics* or *state space* of an enterprise is meant the *states* in which the enterprise world may find itself.

By the *kinematics* or *process space* of an enterprise is meant the *processes* (sequences of events) that may take place in the enterprise world.

By the *dynamics* or *action space* of an enterprise is meant the *actions* an enterprise may perform; actions are taken in response to events and cause (other) events.

# The State Space of an Enterprise

The (ontological) **state space** is specified by:

## business objects

Examples: *customer, car;*

## business facts

Example: *customer X has rented car Y;*

## state laws

Example:

*a customer is allowed to rent only one car at a time;*

# The Process Space of an Enterprise

The (ontological) **process space** is specified by:

## business events

Examples:

*car\_rent #56893 is requested;*

*car\_rent #56893 is promised;*

## process laws

Examples:

*the promise of a car\_rent occurs after its request;*

*a car\_rent is paid after the car has been returned;*

# Enforcing lawful states and processes

The means to enforce lawful states and processes are the (ontological) **action procedures**.

There is an action procedure for every business event; executing an action procedure results into the creation of a set of events and a set of objects/facts.

Note: An action procedure is a *guideline* for a person. Acting responsibly does not always mean blindly executing action procedures. Sometimes one must disobey them for the sake of acting responsibly!

# Example of an Action Procedure

**on** requested car\_rent (R)

**if**     *the requested car of R is available and  
the customer of R is okay* →

promise car\_rent (R)

◇     **not** (*the requested car of R is available and  
the customer of R is okay*) →

decline car\_rent (R)

**fi**

**no**

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# Results of the Ontological Analysis

The ontological model of an enterprise contains a complete set of:

- (business) **objects**
- (business) **facts**
- (business) **events**
- (business) **state laws**
- (business) **process laws**
- (business) **action procedures**

# Business Rules

We propose to reserve the term “business rule” for:

the **state laws** and the **process laws**

of the Business System of an enterprise.

**Compliance** with the applicable business rules is *enforced*  
by **action procedures**.

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# Architectural Principles $\Leftrightarrow$ Business Rules

**Architectural Principles** guide the *design* of a system (business system, information system, infrastructural system).

**Business Rules** guide the *operation* of an enterprise by determining the state space and the process space of its *business system*.

They are *created* as part of the design of the business system.

They are *enforced* by action procedures.

# References

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