Business Processes Modelling
MPB (6 cfu, 295AA)
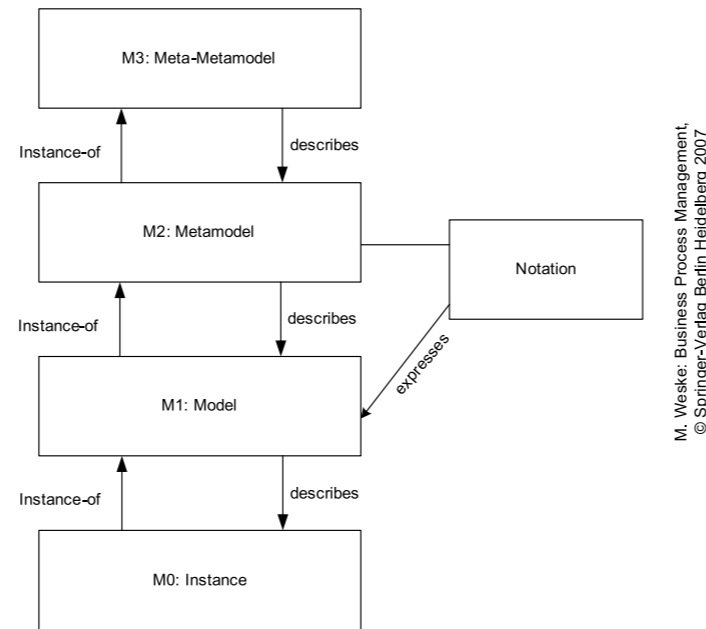
Roberto Bruni
http://www.di.unipi.it/~bruni

04 - Models and Abstraction

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Object

Overview of the conceptual models
and abstraction mechanisms
in business process modeling

Ch.3.1--3.3 of Business Process Management: Concepts, Languages, Architectures

Model

A model is a simplified representation of reality

*"Essentially all models are wrong,
but some are useful"*
(George P. Box)

Abstraction

To derive general rules and concepts
from specific examples of some phenomenon,
by selecting only the aspects which are relevant
for a particular purpose

A way to cope with complexity

Guiding principle

Separation of Concerns (SoC)
(to separate a system into distinct features that overlap in functionality as little as possible)

E. W. Dijkstra Archive

the manuscripts of

Edsger W. Dijkstra

1930–2002

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Edsger Wybe Dijkstra was one of the most influential members of computing science's founding generation. Among the domains in which his scientific contributions are fundamental are

- algorithm design
- programming languages
- program design
- operating systems
- distributed processing
- formal specification and verification
- design of mathematical arguments

In addition, Dijkstra was intensely interested in teaching, and in the relationships between academic computing science and the software industry.

(photo ©2002 Hamilton Richards)

http://www.cs.utexas.edu/users/EWD/

On the role of scientific thought (EWD447)

*Let me try to explain to you, what to my taste is **characteristic for all intelligent thinking**.*

*It is, that one is willing to study in depth an aspect of one's subject matter **in isolation for the sake of its own consistency**, all the time knowing that one is occupying oneself only with one of the aspects.*

On the role of scientific thought (EWD447)

...
*We know that a program must be **correct** and we can study it from that viewpoint only;*
*we also know that it should be **efficient** and we can study its efficiency on another day, so to speak.*
*In another mood we may ask ourselves whether, and if so: why, the program is **desirable**.*

But nothing is gained —on the contrary!— by tackling these various aspects simultaneously.

On the role of scientific thought (EWD447)

...

*It is what I sometimes have called **"the separation of concerns"**, which, even if not perfectly possible, is yet the only available technique for effective ordering of one's thoughts, that I know of.*

…

it does not mean ignoring the other aspects, it is just doing justice to the fact that
from this aspect's point of view, the other is irrelevant.

On the role of scientific thought (EWD447)

Business data processing systems are sufficiently complicated to require such a separation of concerns

and the suggestion that in that part of the computing world "scientific thought is a non-applicable luxury" puts the cart before the horse: the mess they are in has been caused by **too much unscientific thought***....*

SoC: an example

HyperText Markup Language (HTML):
organization of webpage content

Cascading Style Sheets (CSS):
definition of content presentation style
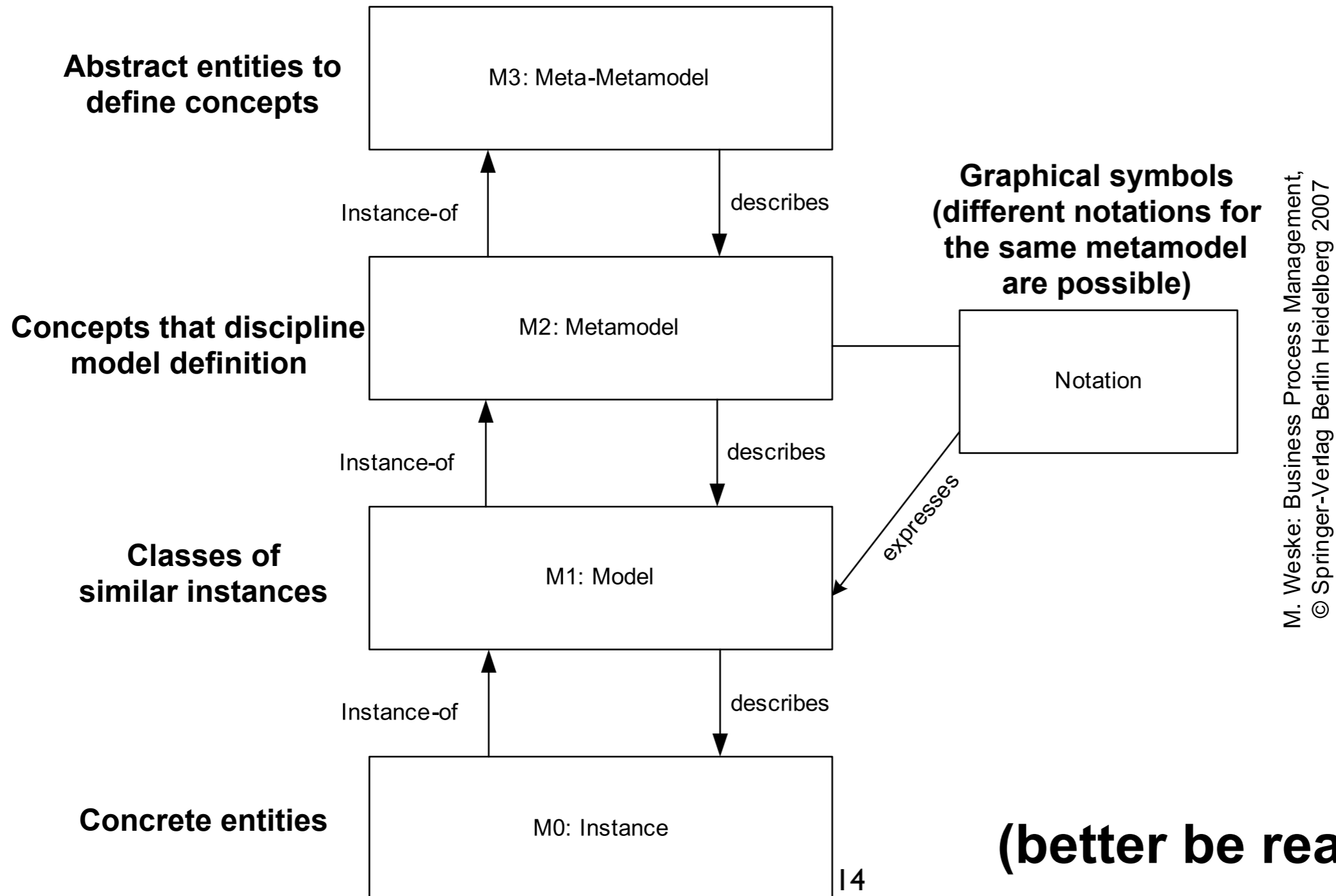
JavaScript (JS):
user interactions

Abstractions

Horizontal: separation at different modeling levels

Aggregation: separation at different granularity levels
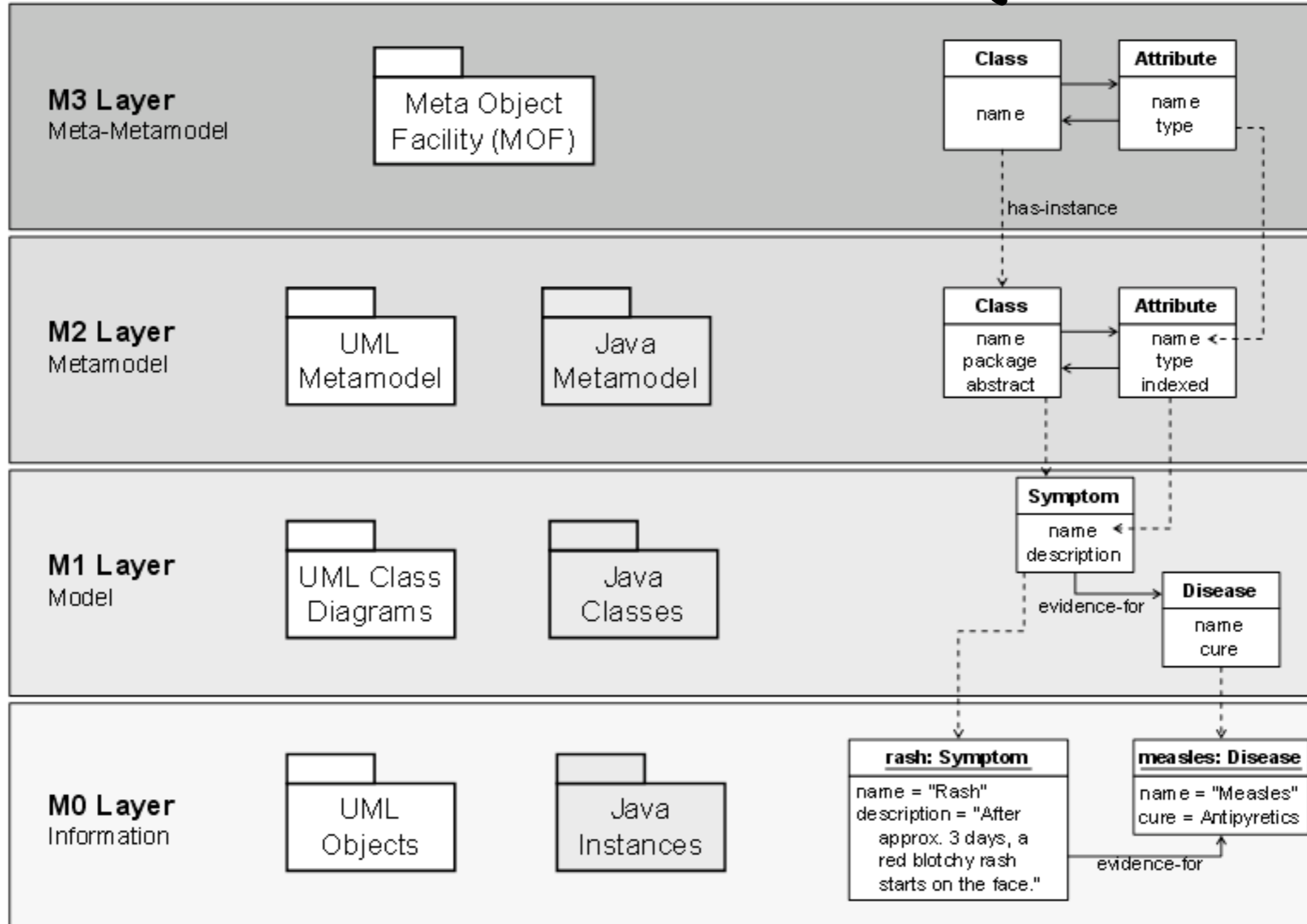
Vertical: separation at different subdomains

Horizontal Abstraction
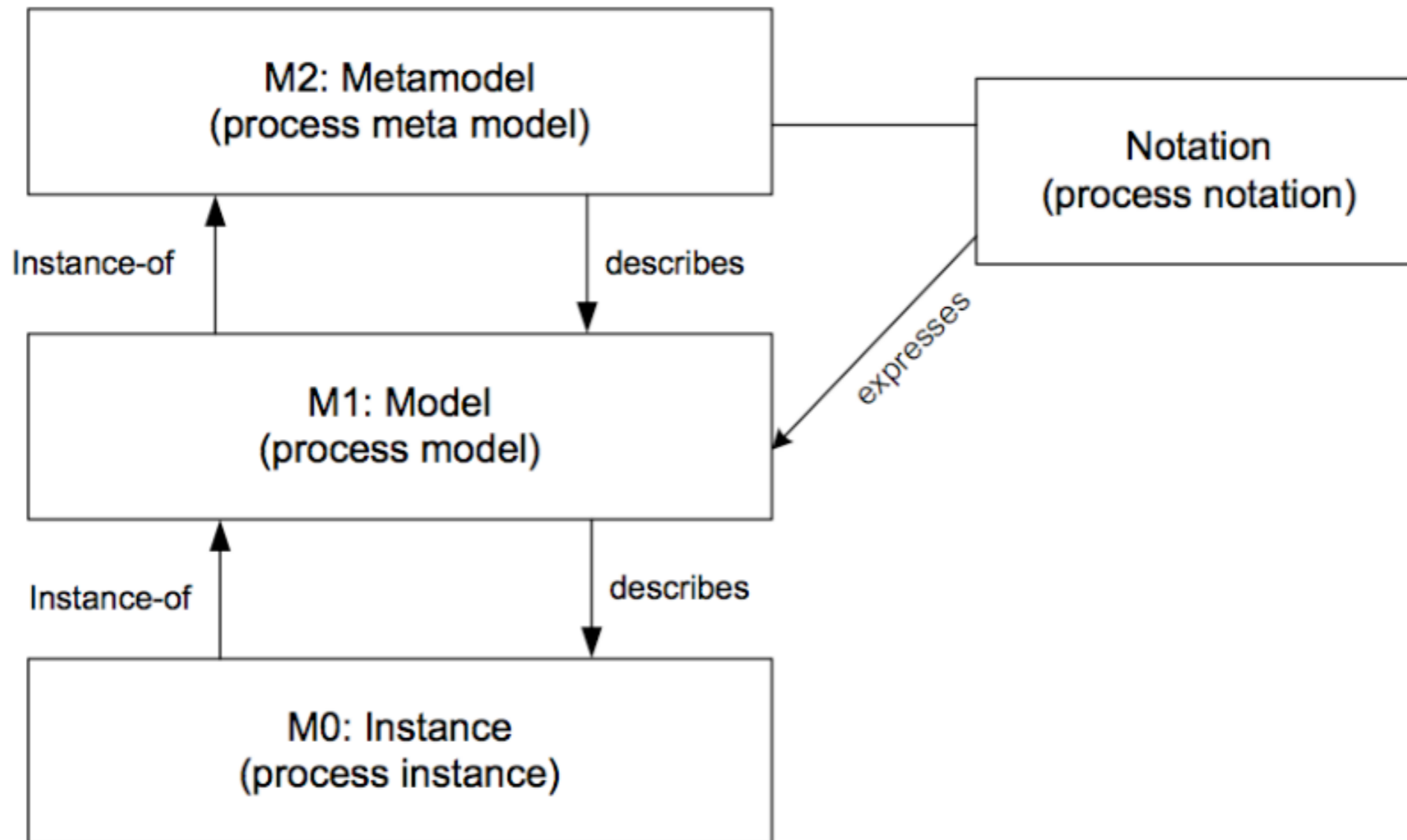
Horizontal abstraction (modeling levels)

Abstract entities to define concepts

M3: Meta-Metamodel

Instance-of

describes

Concepts that discipline model definition

M2: Metamodel

Graphical symbols (different notations for the same metamodel are possible)

Notation

Instance-of

describes

expresses

Classes of similar instances

M1: Model

Instance-of

describes

Concrete entities

M0: Instance

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(better be read bottom-up)

An example:
MOF metamodel (OMG)

Process models and process instances

A process metamodel (level M2)
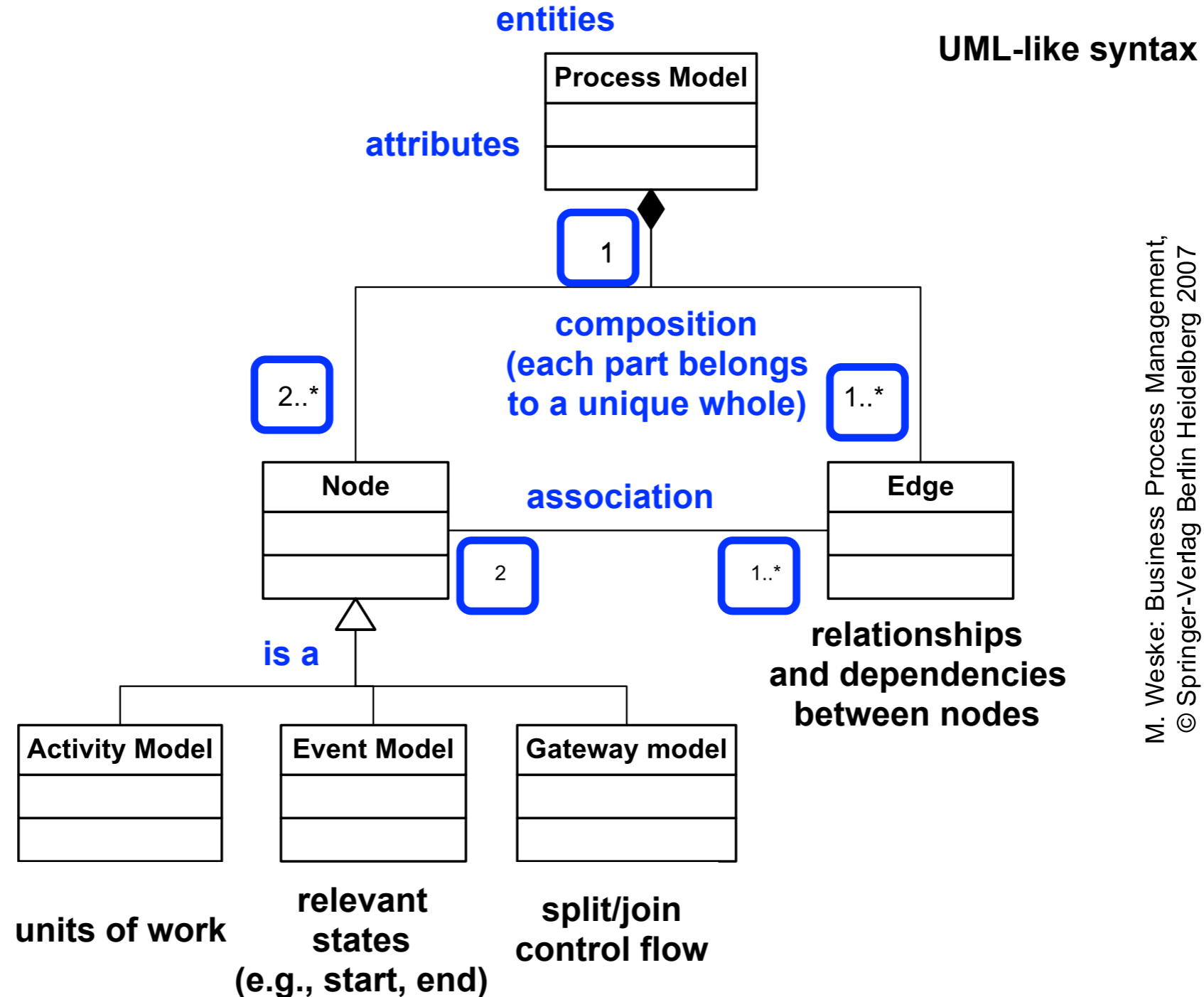
entities

Process Model

UML-like syntax

attributes

1

composition
(each part belongs
to a unique whole)

2..*

1..*

Node

association

Edge

2

1..*

is a

relationships
and dependencies
between nodes

Activity Model

Event Model

Gateway model

units of work

relevant
states
(e.g., start, end)

split/join
control flow

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Process models and process instances

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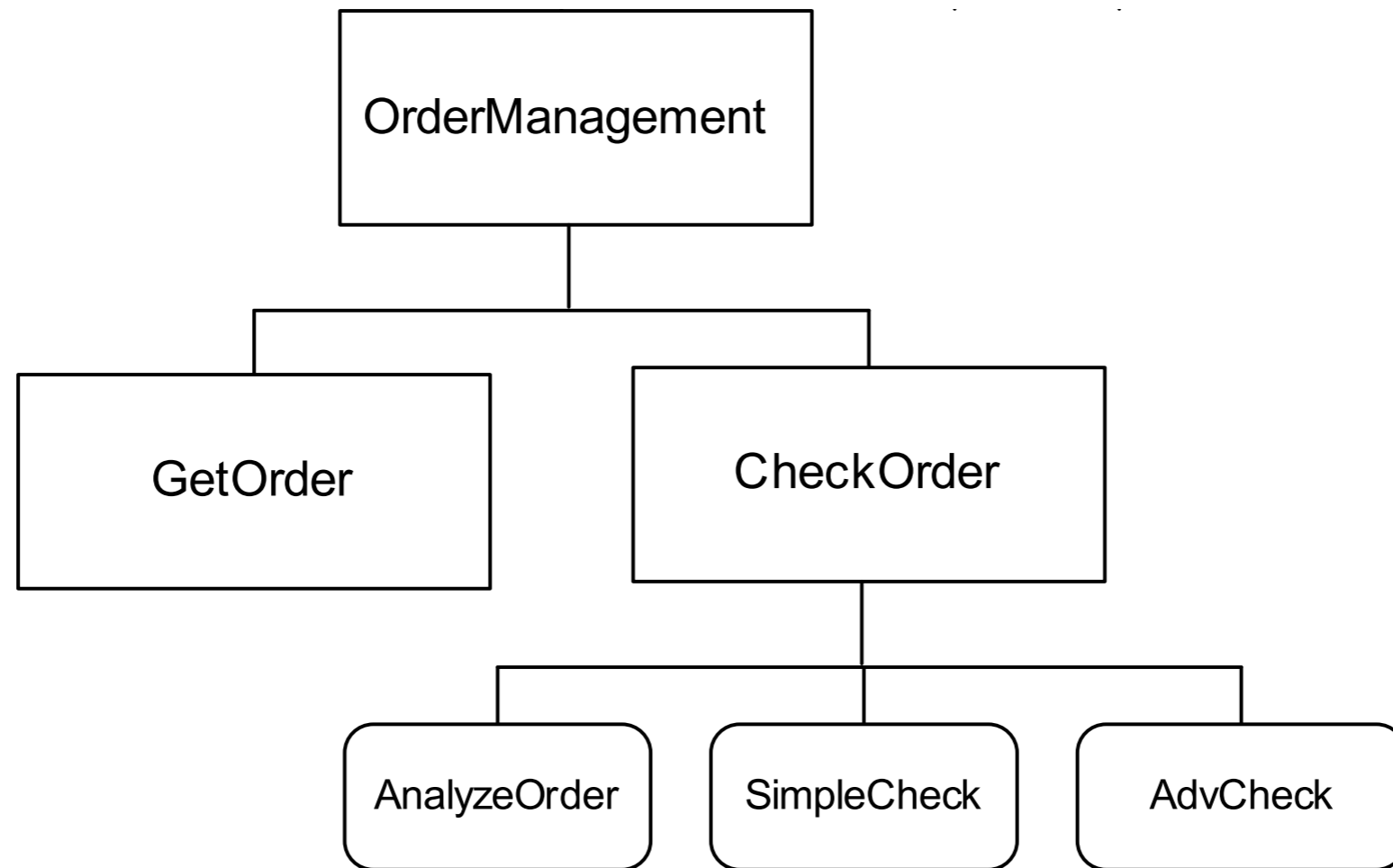© Springer-Verlag Berlin Heidelberg 2007

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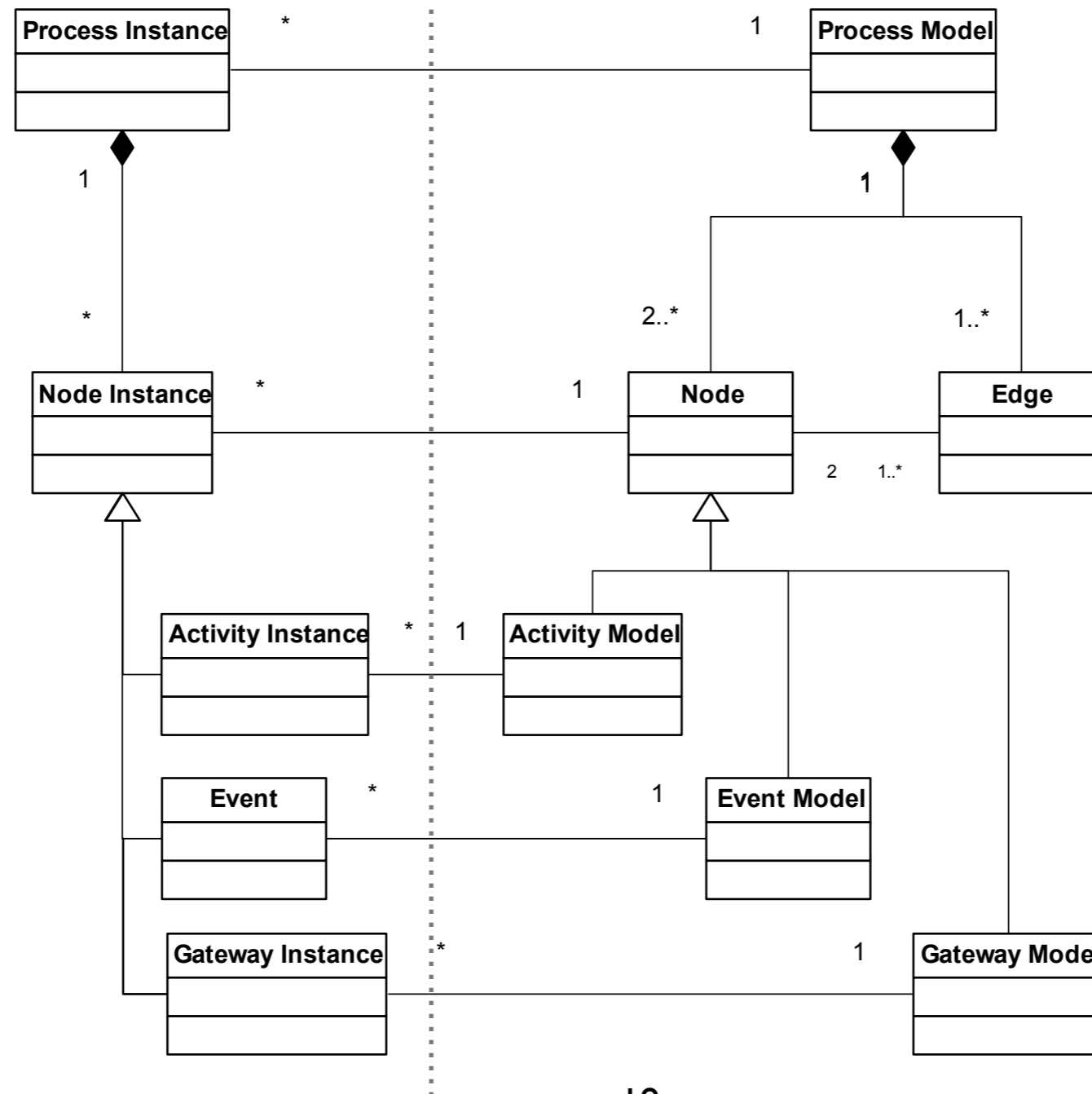
Aggregation Abstraction

Aggregation abstraction

Multiple elements of a lower level of granularity can be grouped and represented by a single artifact at the higher level of granularity

Different from horizontal abstraction, where all entities lie at the same level of granularity
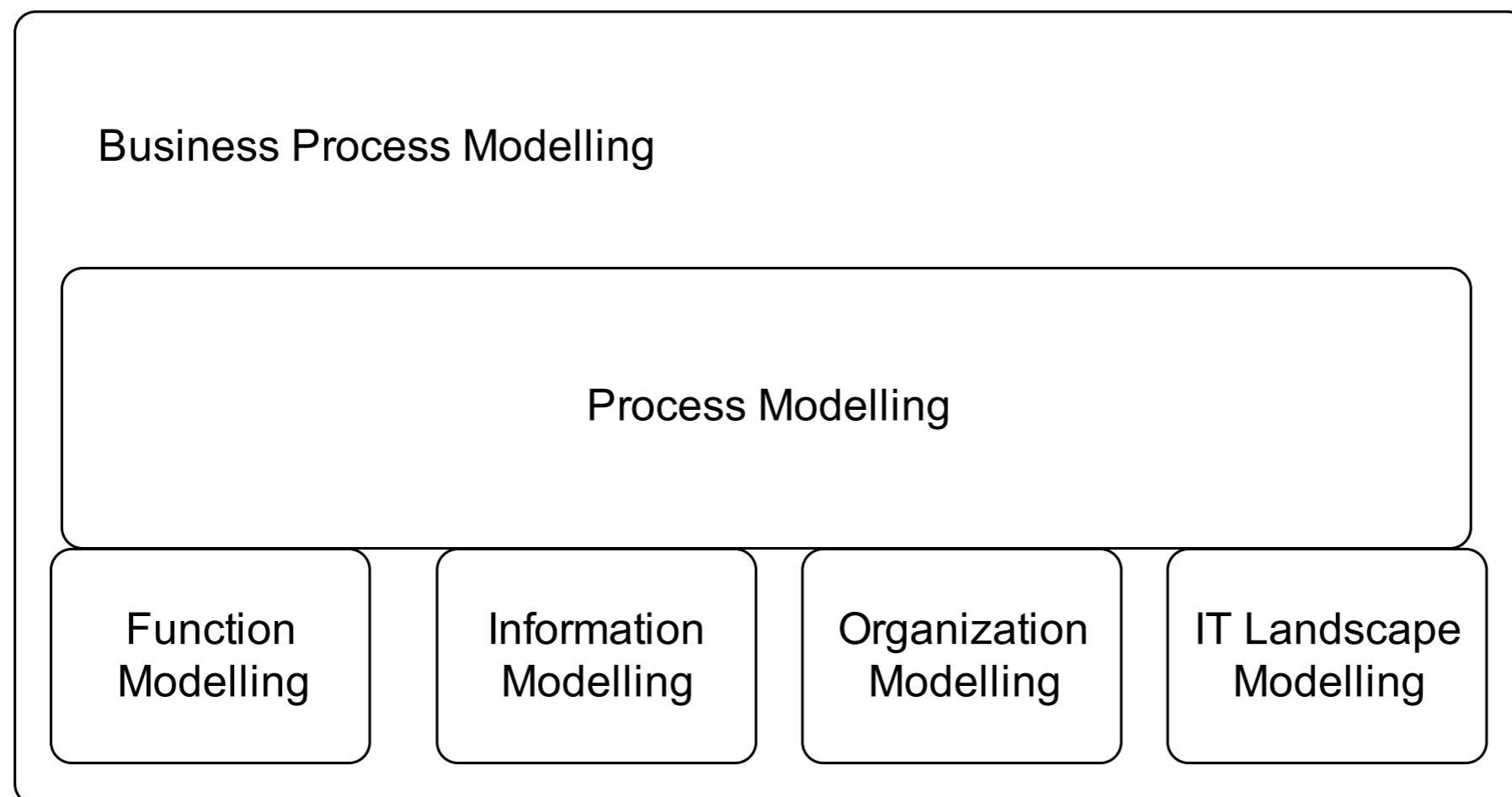
A sample aggregation

Vertical Abstraction

Vertical abstraction (domain separation)

BPM includes multiple modelling domains, integrated by Process Modelling

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |

Function models

Units of work enacted by processes
(at different levels of granularity)

Informal description, textual documents
(coarse-grain business level)

Formal description, function specifications
(fine-grain software layer)

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |
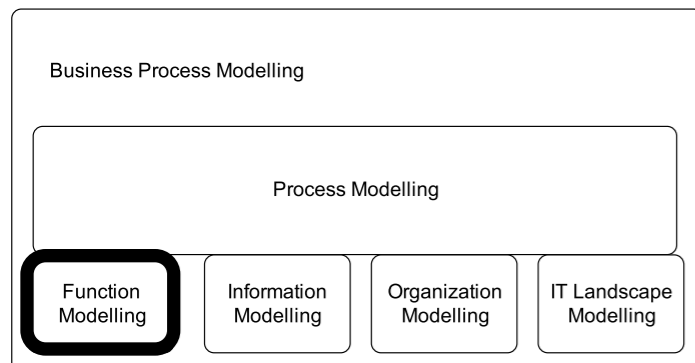
Value systems

Companies have goals to fulfill

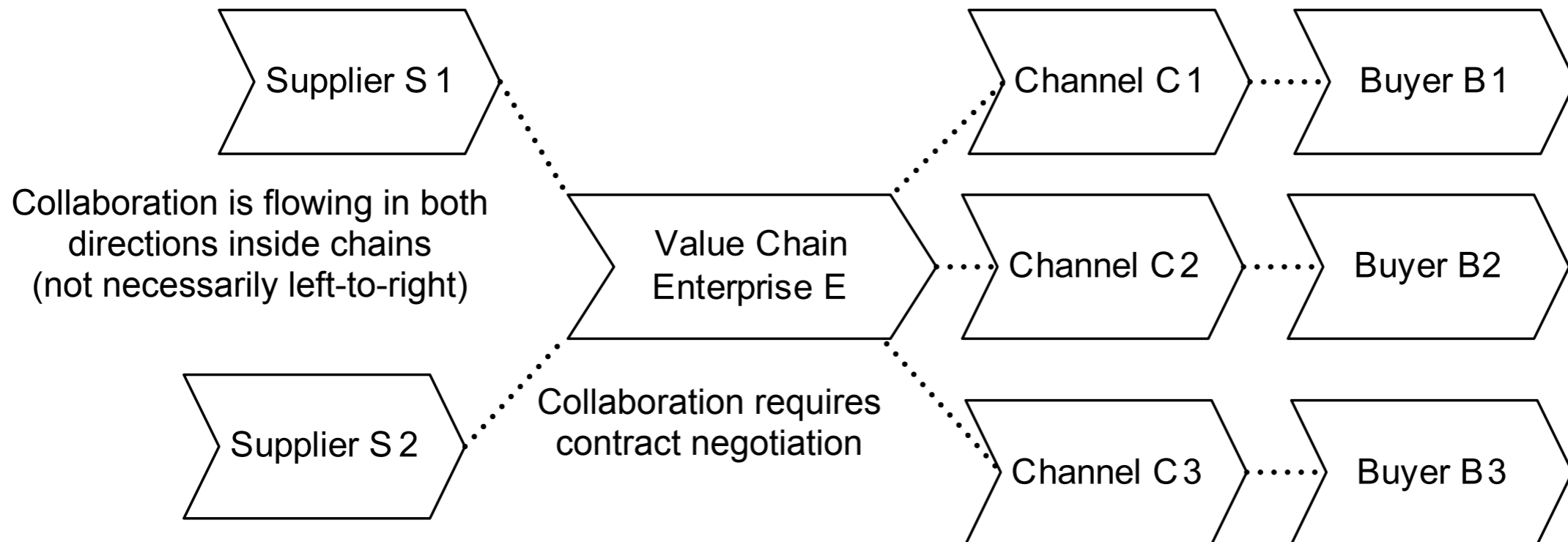To reach their goals, companies cooperate

Value chains were developed by Michael Porter
to relate high-level business functions

The value chains of cooperating companies form a
value system

Value systems can provide an immediate
understanding of ``how a company operates''

Value systems

Informal, high-level business functions decomposition
produce a
Value system
made of
Value chains
centred at the enterprise E under consideration

Supplier S 1

Channel C 1 ····· Buyer B 1

Collaboration is flowing in both
directions inside chains
(not necessarily left-to-right)

Value Chain
Enterprise E

····· Channel C 2 ····· Buyer B 2

Supplier S 2

Collaboration requires
contract negotiation

Channel C 3 ····· Buyer B 3

Ecology of value chains

``gaining and sustaining competitive advantage depends on understanding not only a firm's value chain but how the firm fits in the overall value system"

- Porter

High-level business functions

The value chain of a company has a rich internal structure, consisting of a set of coarse-grained business functions
(e.g. Order management, Human resources)

High-level business functions can be decomposed into finer-grained functions
(this is called **functional decomposition**)
(e.g. from ``Order management'' to ``storing'' and ``checking'' orders)

Activity models and activity instances
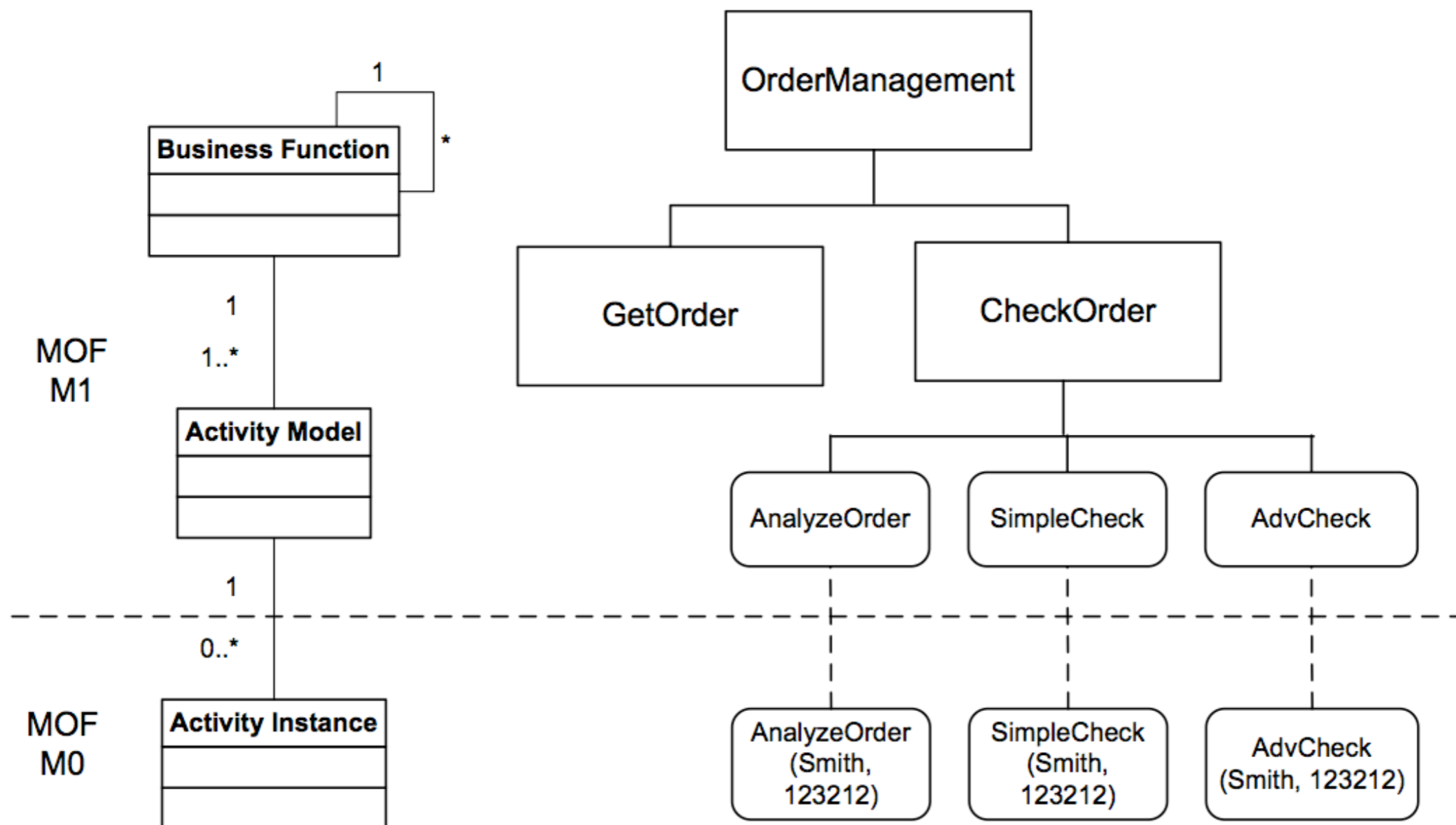
Value chains and processes

Porter was not able to identify the role of processes within value chains

However, process-orientation can fit very well with value-chains and functional decomposition
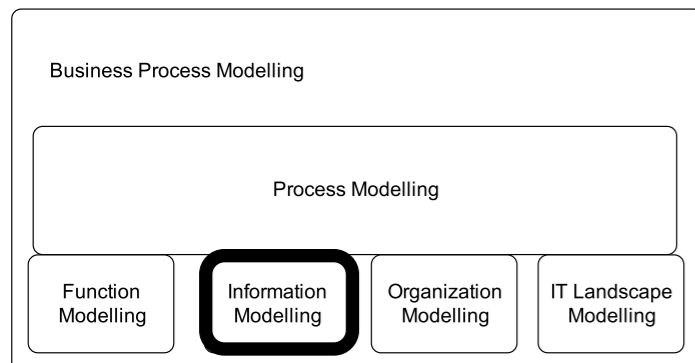(see Lecture 5)

Key factor:
the granularity of business processes must be in line with the particular goals associated with the supported business function
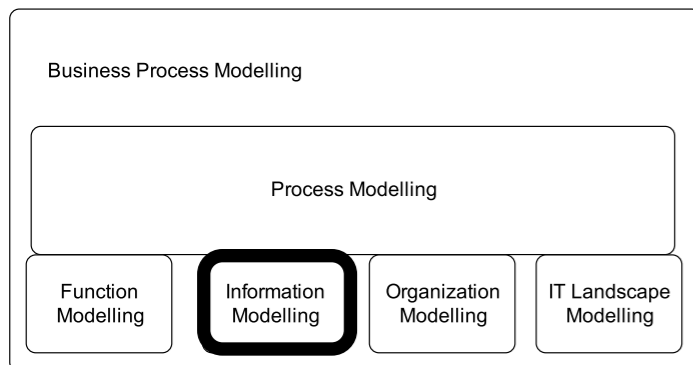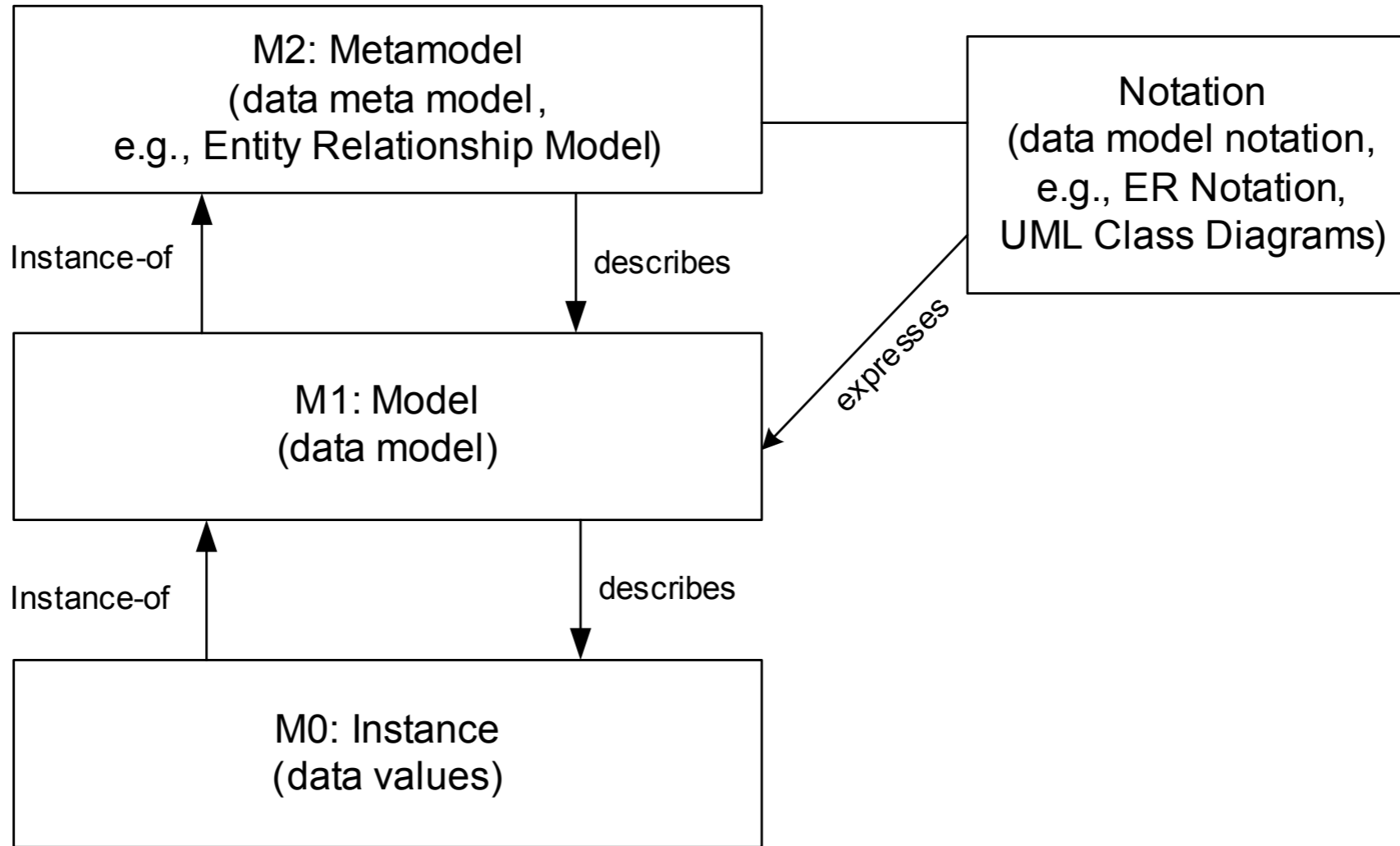
Information models

Data representation is crucial:
all decisions made during a business process
depends on data values

Data dependencies between activities
are also important
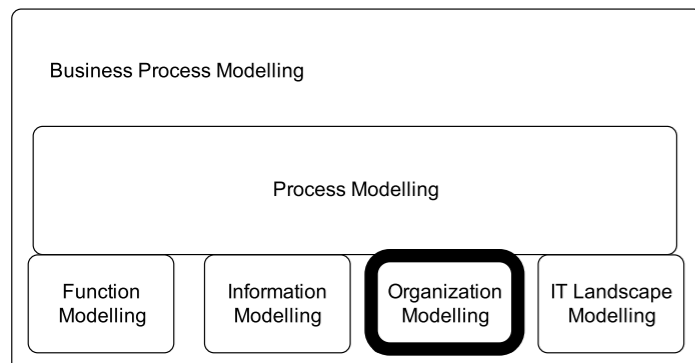(ensure data-availability, reduce waiting time)

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |

Data models

M2: Metamodel
(data meta model,
e.g., Entity Relationship Model)

Notation
(data model notation,
e.g., ER Notation,
UML Class Diagrams)

Instance-of

describes

M1: Model
(data model)

expresses

Instance-of

describes

M0: Instance
(data values)

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Business Process Modelling

Process Modelling

Function
Modelling

Information
Modelling

Organization
Modelling

IT Landscape
Modelling

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Organizational models

Organizational structure must be represented

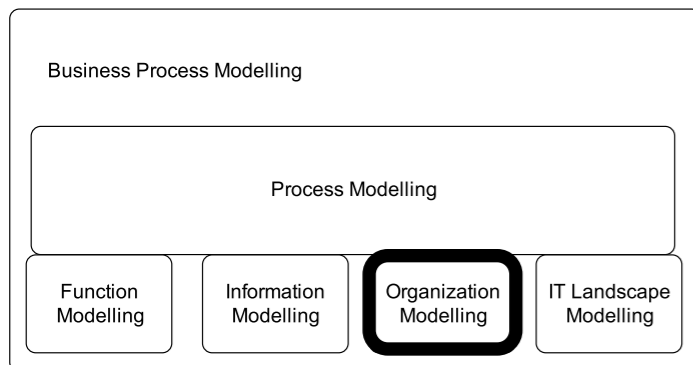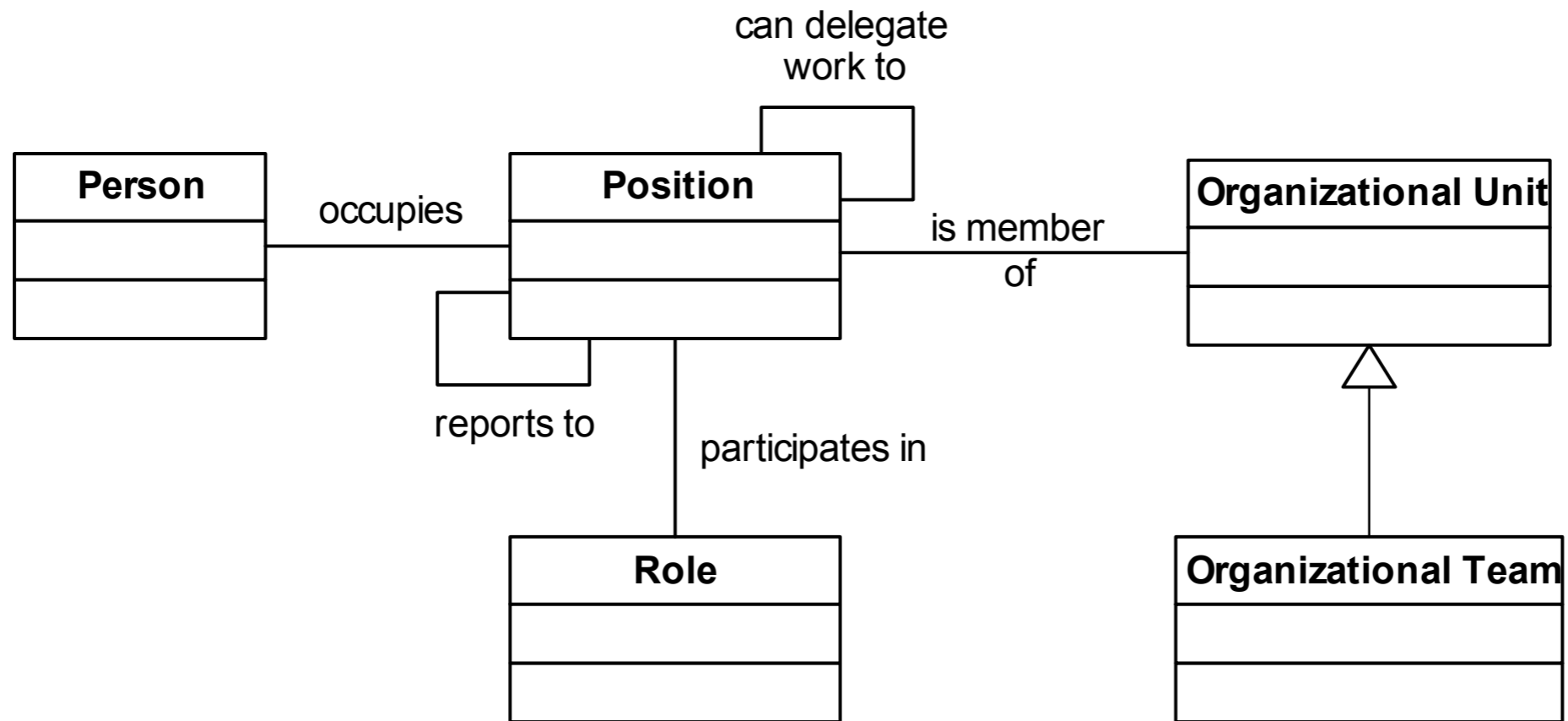Activities must be associated
to specific roles or departments

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | **Organization Modelling** | IT Landscape Modelling |

Organizational models

M2: Metamodel
(organization meta model)

Notation
(organization model
notation, e.g.,
Organization Chart)

Instance-of

describes

expresses

M1: Model
(organization model)

Instance-of

describes

M0: Instance
(persons, e.g.,
knowledge workers, managers)

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Business Process Modelling

Process Modelling

Function
Modelling

Information
Modelling

Organization
Modelling

IT Landscape
Modelling

An organizational metamodel

can delegate
work to

| Person | | occupies | | Position | | is member of | | Organizational Unit |

reports to

participates in

| Role |

| Organizational Team |

Business Process Modelling

Process Modelling

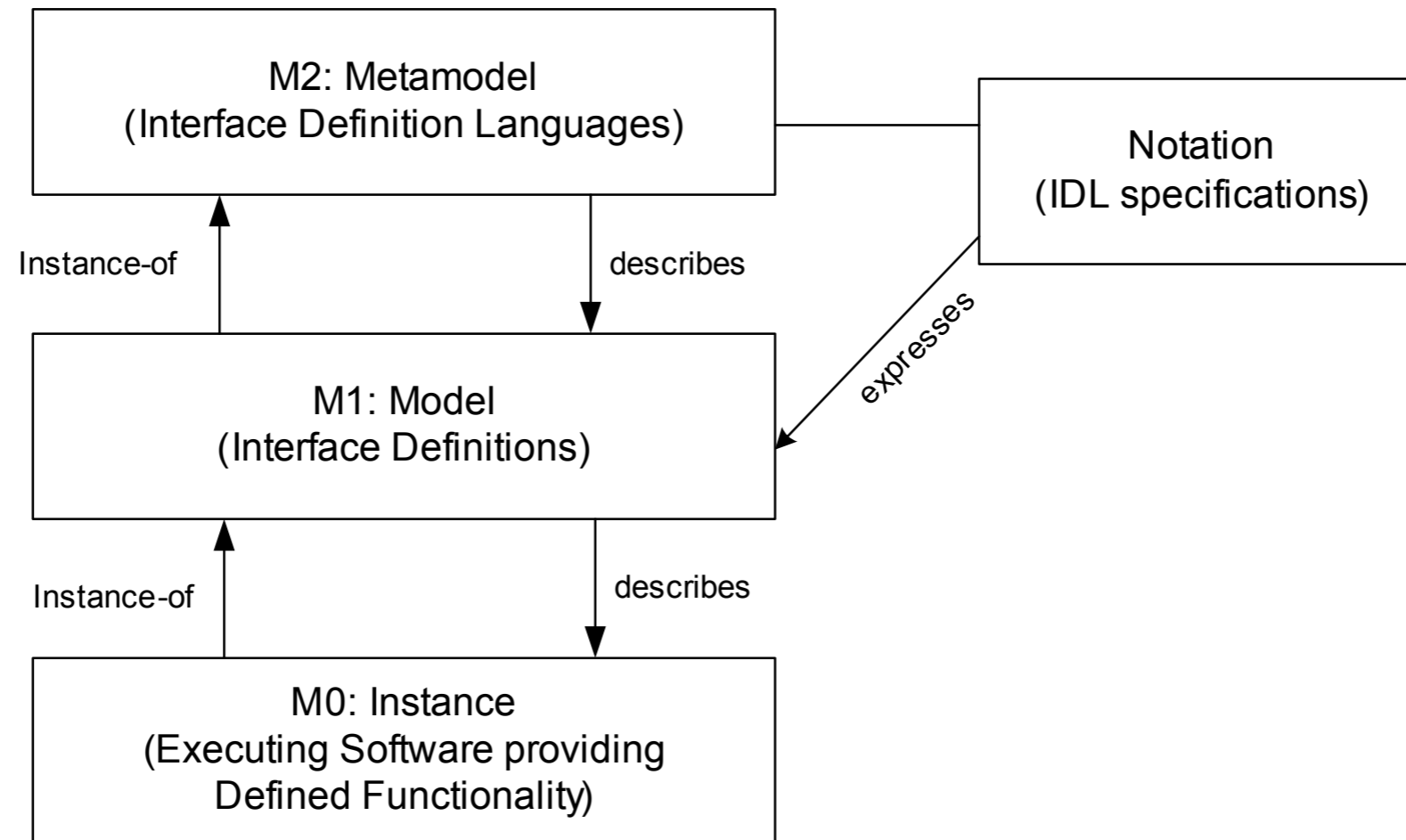| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |

IT landscape

Many activities in a business process are supported by information systems

Information systems and programming interfaces needs to be represented because they provide functionalities

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |
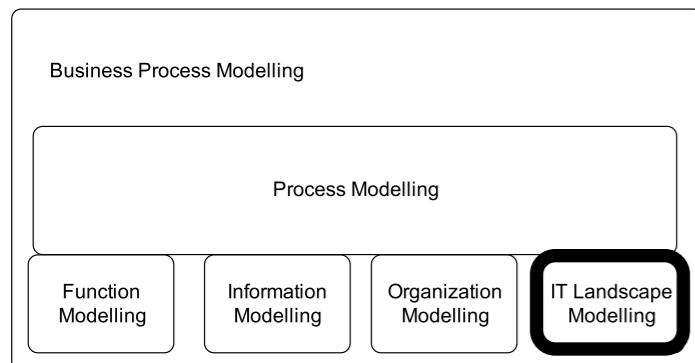
Interface Definition Languages

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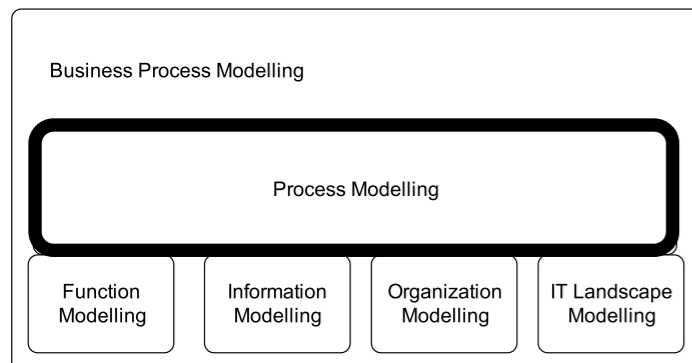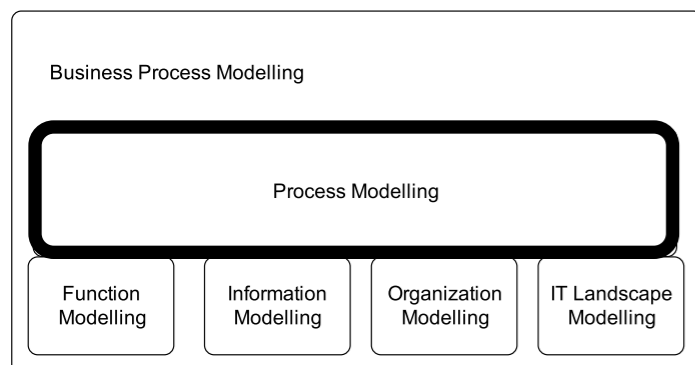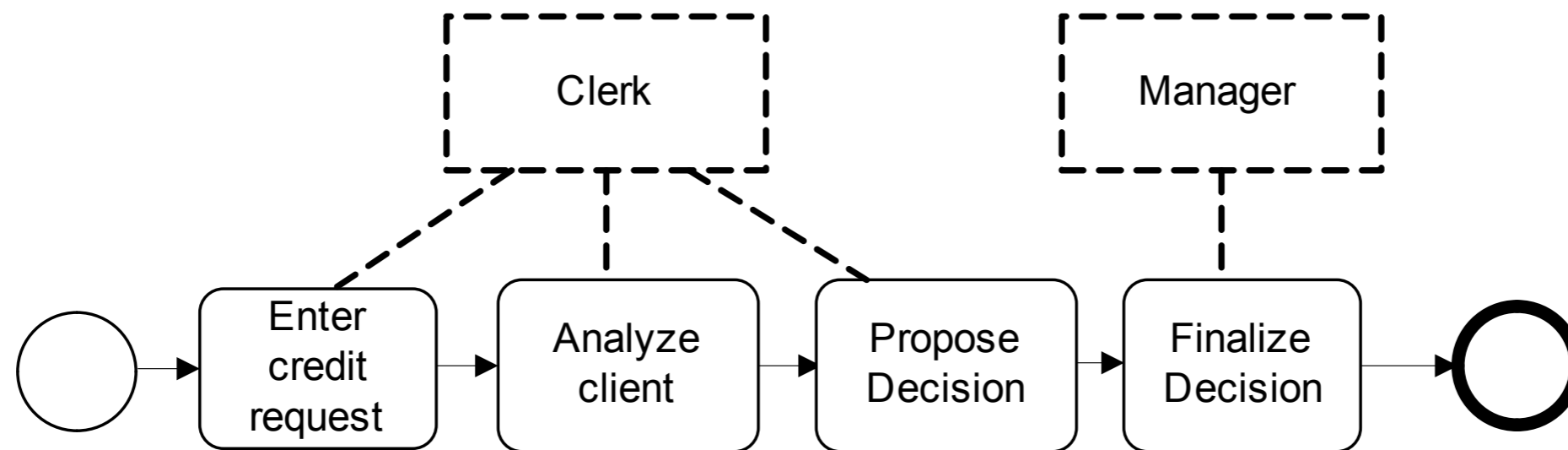© Springer-Verlag Berlin Heidelberg 2007
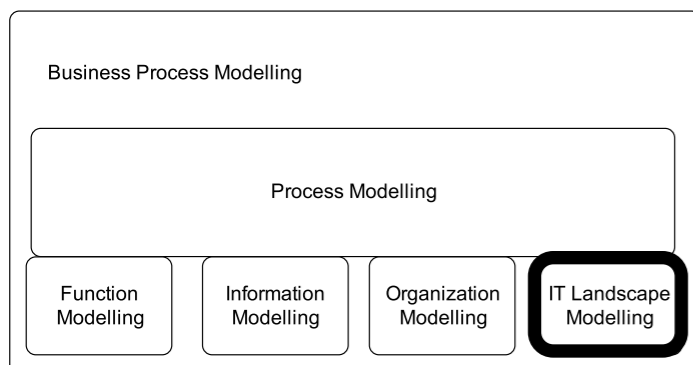
Process models

Define the glue between the subdomains

Relate functions and execution constraints

Relate data values with process instances
(e.g. the process of a credit approval may depend
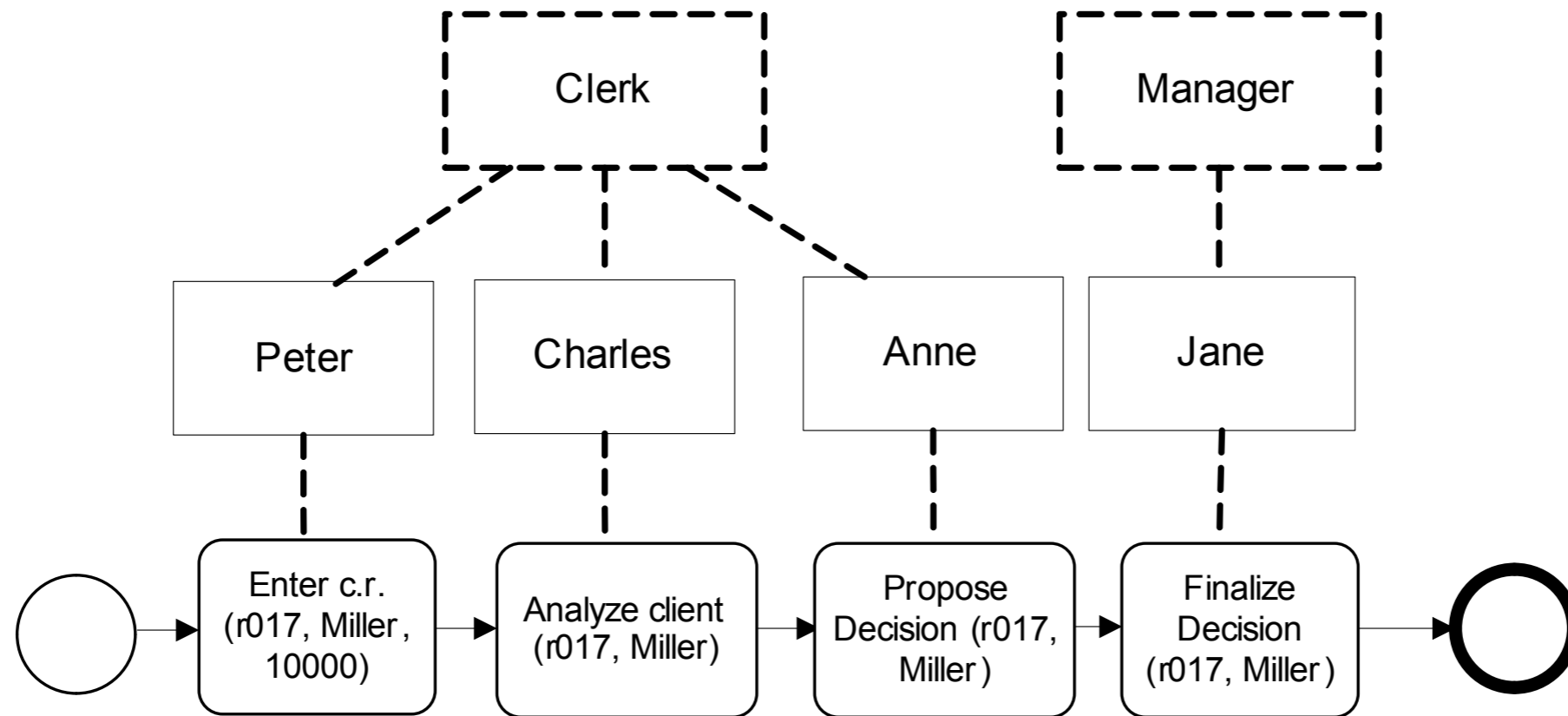on the requested amount)

Business Process Modelling

Process Modelling

| Function Modelling | Information Modelling | Organization Modelling | IT Landscape Modelling |

A process model with role information

A process instance with workers information