Business Processes Modelling

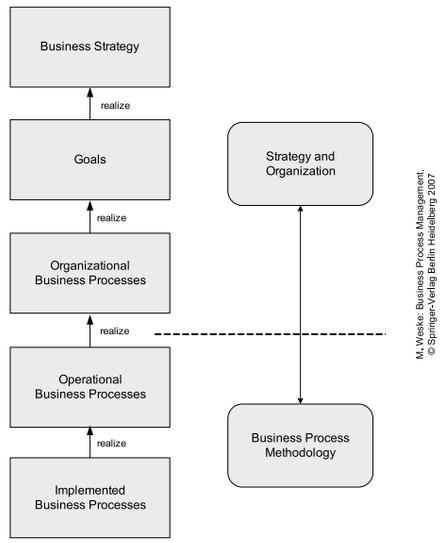
MPB (6 cfu, 295AA)

Roberto Bruni

http://www.di.unipi.it/~bruni

04 - Guidelines

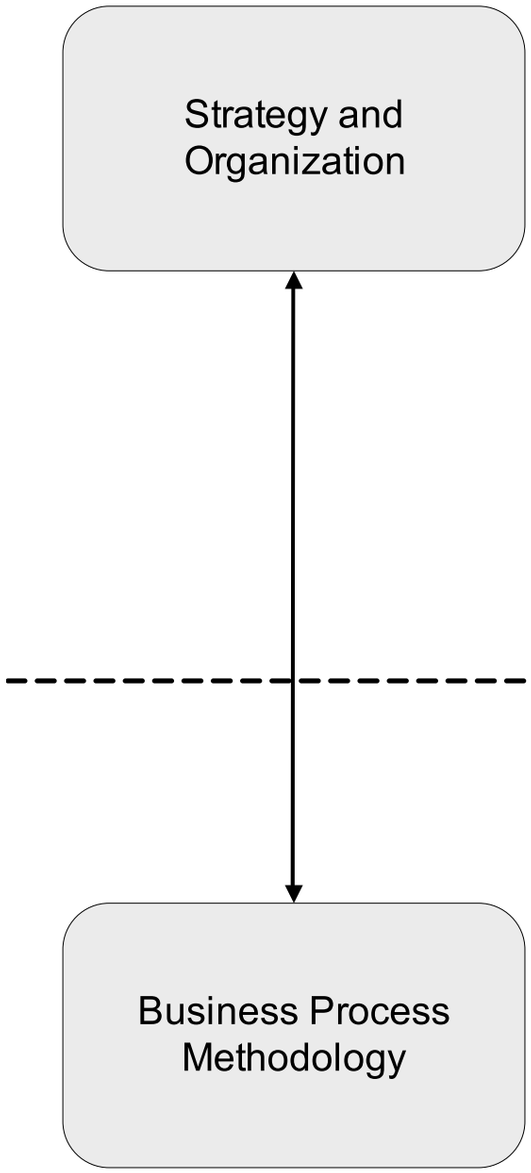
Objective



Coarse-grained guidelines for developing business process management solutions

Ch.1 of Workflow Management: Models, Methods, and Systems
Ch.1.3, 2, 8 of Business Process Management: Concepts, Languages, Architectures

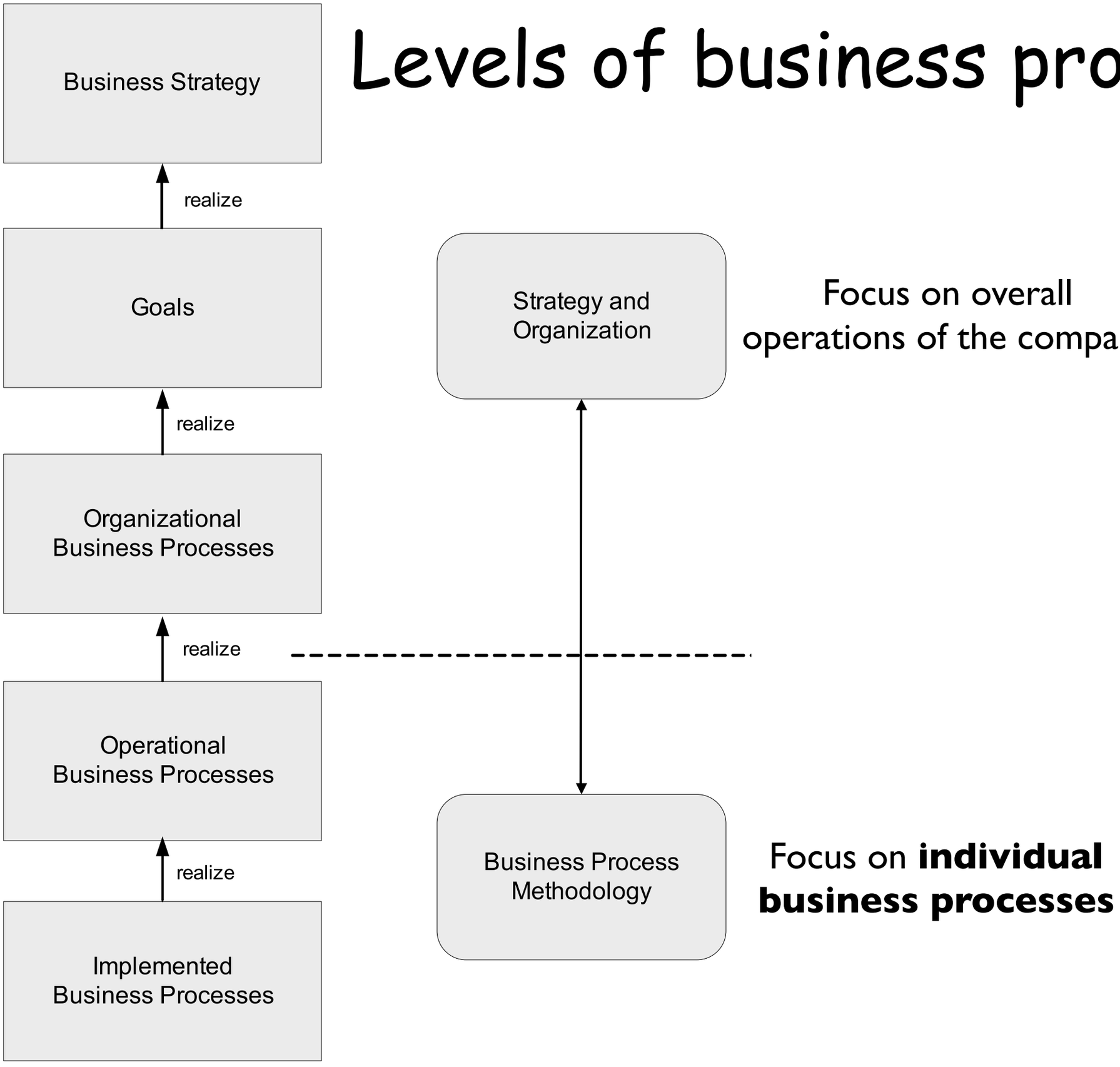
Levels of business processes



Focus on overall operations of the company

Focus on **individual business processes**

Levels of business processes



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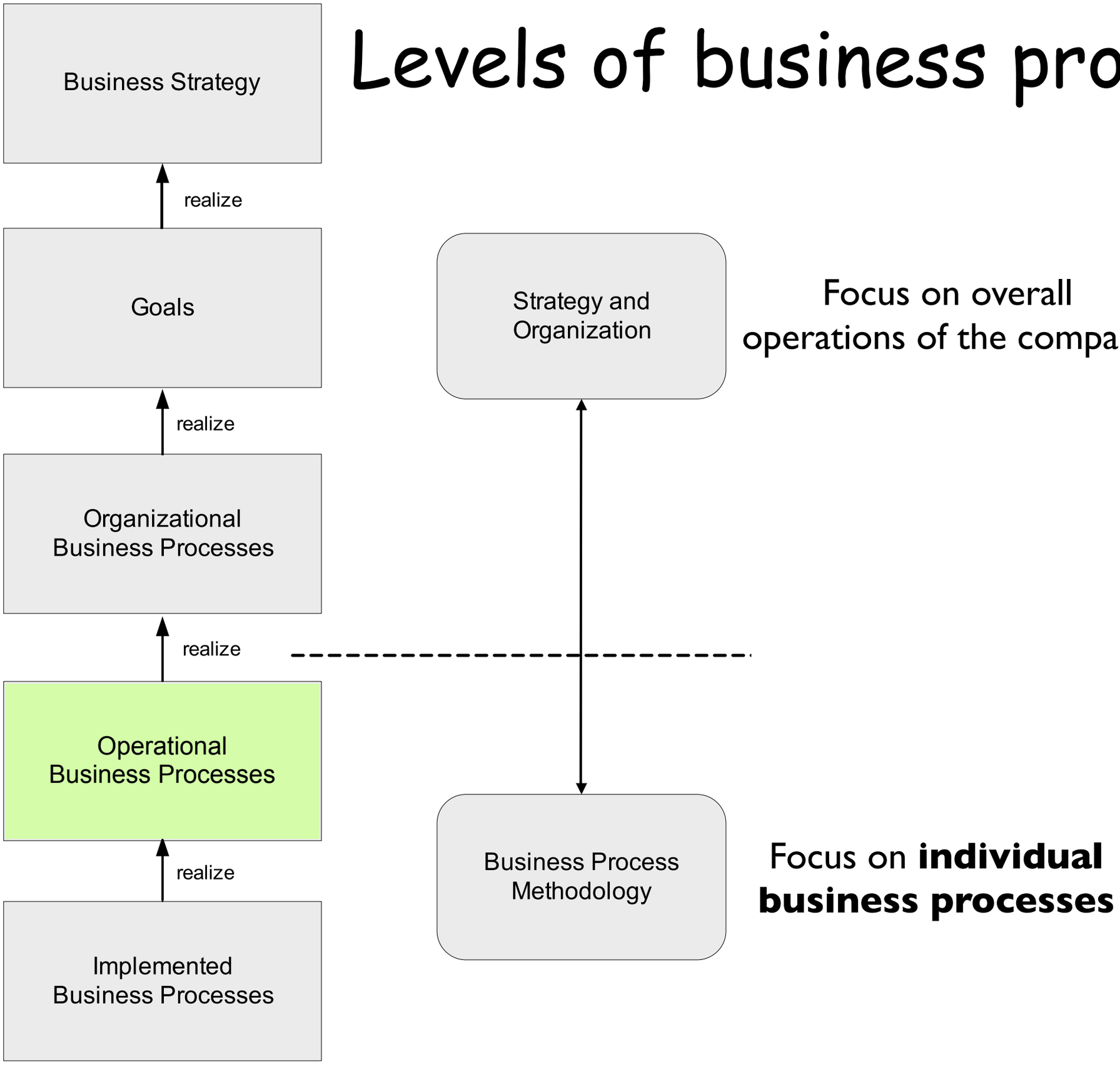

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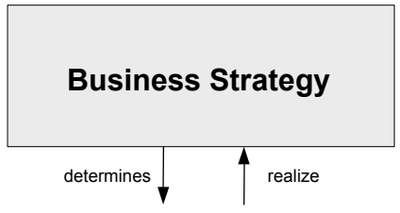


long-term company strategies
to develop sustainable success in the market

Some business strategies

Cost Leadership:
compete for the largest number of customers through price

Standardization:
generic goods or services sold at the lowest prices

Minimize costs to the customer
Minimize costs to the company
without decreasing profits

Focus Strategy:
serve a limited group of customers better than competitors

Specialization:
concentrate on particular classes of customers, products, geographical area

Invest on aggressive marketing

Differentiation Strategy:
set products apart from the competition

Leading scientific research:
highly skilled and creative product development team

Invest on innovation
Invest on marketing

Levels of business processes

long-term company strategies
to develop sustainable success in the market

define **operational goals** that
contribute to the realization of the business strategy

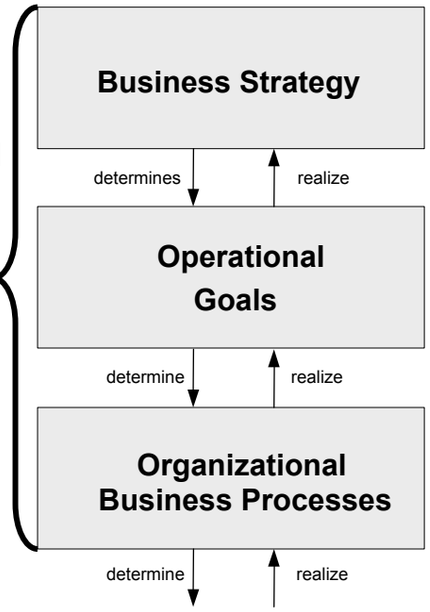
Operational goals

Efficiency (time dimension):
e.g., improve delivery time

Profitability (cost dimension):
e.g., limit expenses to increase revenues

Customer Service (quality dimension):
e.g., improve response time to customer complaints

Levels of business processes



long-term company strategies
to develop sustainable success in the market

define operational goals that
contribute to the realization of the business strategy

high-level **processes in textual form**:
input, output, expected results, dependencies

Organizational process

Top-level: Form-based description of organizational business process (black-box view, internal structure not shown)

Process Name: Product Development Process	**Responsible Process Manager:** Dr. Myers
From: Requirements **To:** Rollout	**Type:** Development Project
Process Inputs: Requirements Document, Project Plan, Budget Plan, Prototyps	**Supplier Processes:** Product Planning Process, Innovation Process
Process Results: Integrated and completely tested innovative product with complete documentation	**Customer Processes:** Order Management Process, After-Sales Service Process

Intra-organization process

No interaction with business processes performed by other parties (single organization processes)

Primary focus:
streamlining of internal processes,
eliminating activities that do not provide values,
allocating activities to persons who are competent and skilled enough

Orchestration!

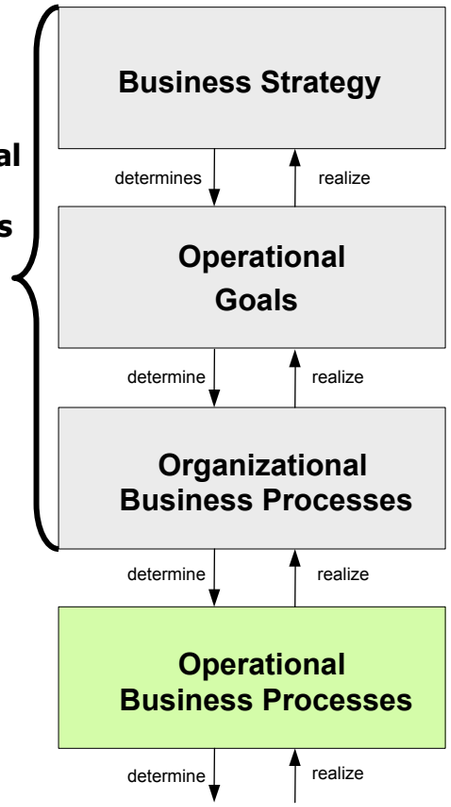
Inter-organization process

Business-to-business process
(multiple organizations)

Primary focus:
communication aspects,
legal matters,
interoperability of heterogeneous SW infrastructures

Collaborations and Choreographies!

Levels of business processes



Informal & semiformal techniques: plain text + diagrams + forms-based

BPM level

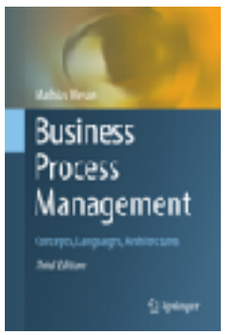
long-term company strategies
to develop sustainable success in the market

define operational goals that
contribute to the realization of the business strategy

high-level processes in textual form:
input, output, expected results, dependencies

activities and relationships are specified,
but implementation aspects are disregarded

Business process



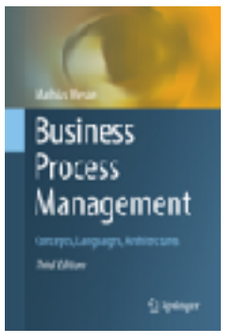
Definition: a **business process** consists of a set of activities that are performed in coordination in an organizational and technical environment.

These activities jointly realize a business goal.

Each business process is enacted by a single organization, but it may interact with business processes performed by other organizations.

- Weske

Business process management



Definition: **business process management** includes concepts, methods, and techniques to support the design, administration, configuration, enactment, and analysis of business processes.

- Weske

We need **explicit representation** of business processes, their **activities** and the **execution constraints** between them

Business processes can then be subject to **analysis**, **improvement**, and **enactment**

Guidelines

Gather information (in textual format):
about the business process environment, including:
project goals, project team and legislative regulations

Classify data:
prepare a domain ontology to fix a common understanding of terms and concepts in the application domain

Validate findings:
Represent the (textual) gathered information as
business process model(s), as a communication basis
with stakeholders to collect feedback and to improve the organizational and technical environments (new skills and platforms required)

Refine artifacts:
repeat the above as many times as needed

Who is the customer?

Each business process starts and ends with a customer who requests a product and who receives the product as a result of the business process

remind that a customer can be internal to the organization, e.g. a department

Who is the owner?

Each business process is assigned a process owner,
who is responsible for the process

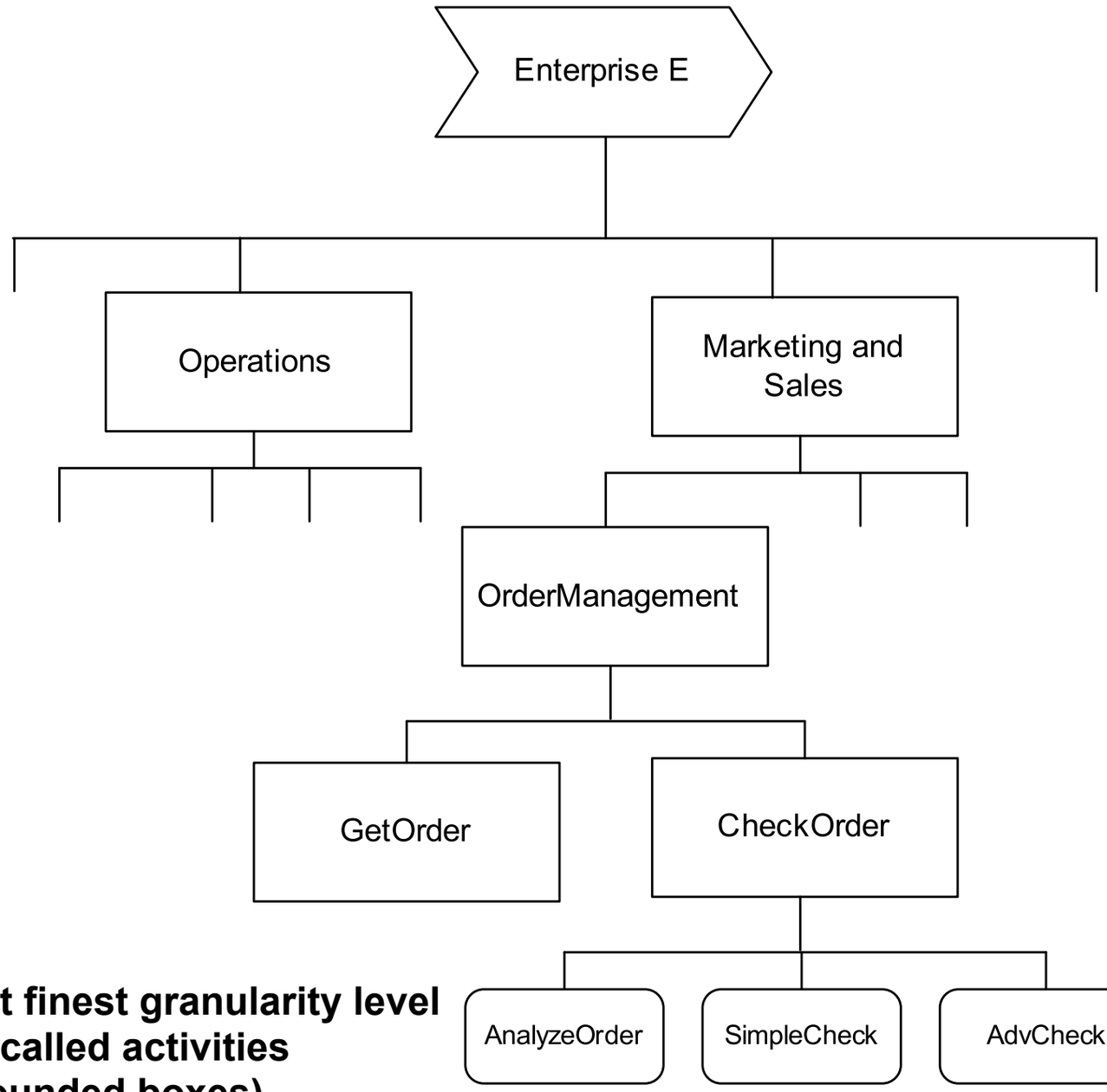
the owner is in charge of making sure
that process instances are conducted correctly,
that business goals are met, and
that process performances are measured and improved

Which tasks and roles?

Each business process comprises
a set of activities needed to realize the business goals

each task may need some specific abilities (roles)
to be carried out

Functional decomposition



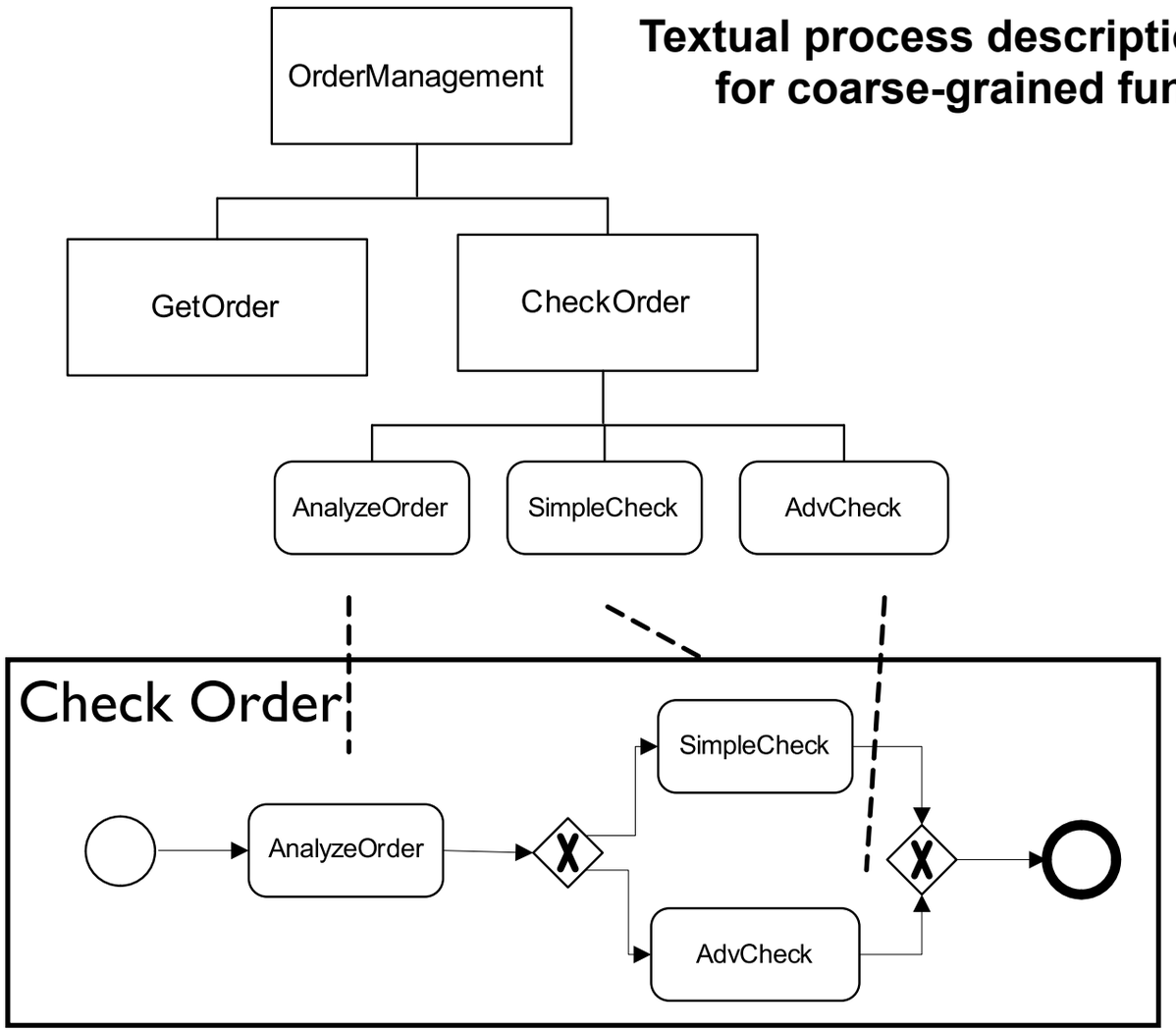
Functions at finest granularity level are called activities (rounded boxes)

Which dependencies?

Execution constraints are used to order activities in the business process in a way that enterprise resources are used efficiently and at the same time the business goals are met

(process orchestration language are used to express process execution constraints)

Structuring business processes



Textual process descriptions are ok for coarse-grained functions

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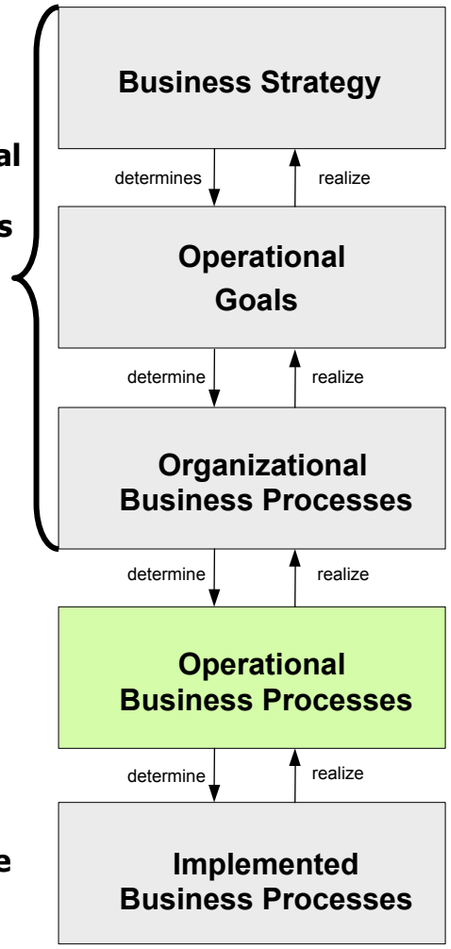
Operational business processes are ok for fine-grained functions

Levels of business processes



long-term company strategies
to develop sustainable success in the market

define operational goals that
contribute to the realization of the business strategy

high-level processes in textual form:
input, output, expected results, dependencies

activities and relationships are specified,
but implementation aspects are disregarded

executable/technical/organizational environments
(from written policies and procedures to enactment platforms)

Platform selection

Select the platform on which the business process will be enacted and possibly
enhance the process model with additional information to make it executable

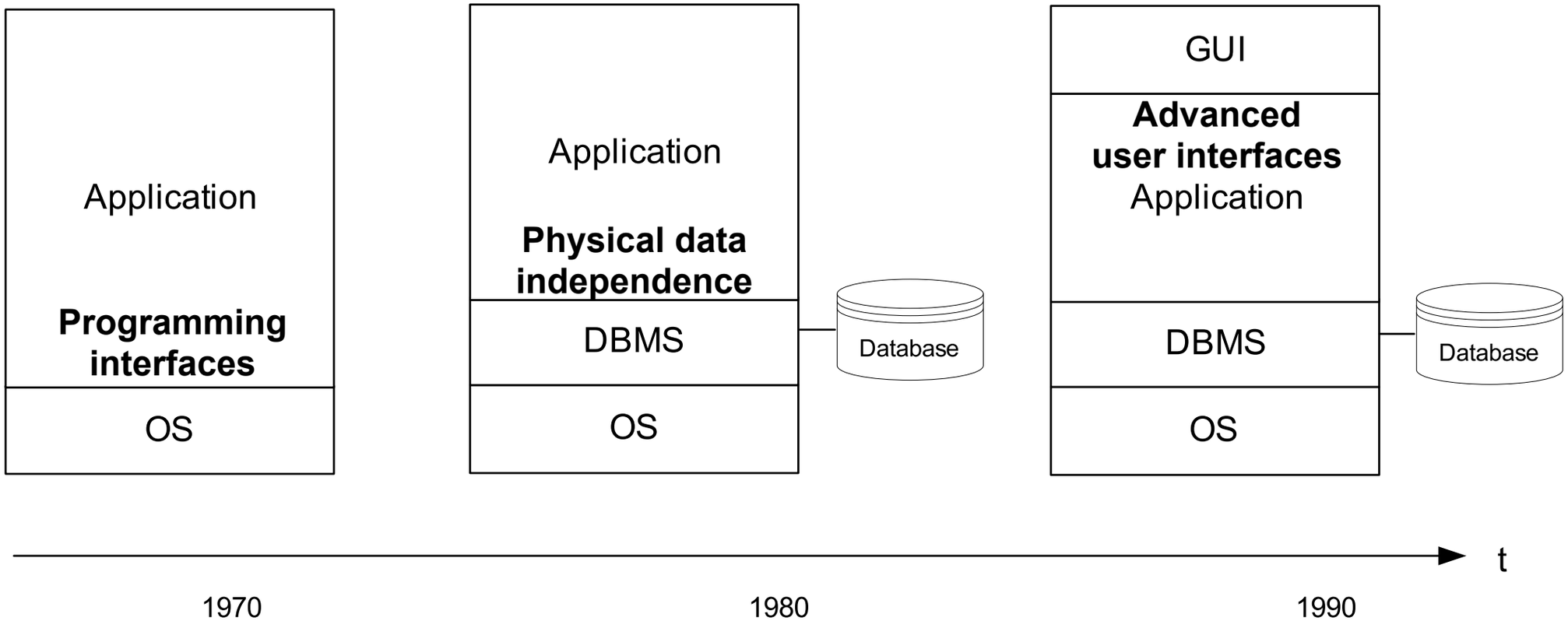
It can be a technological platform
but also a non-technical one
(e.g., written business policies, manual procedures, service-oriented architecture)

Software Architecture

Definition: A **software architecture** defines a structure that organizes the software elements and the resources of a software system.

Guiding principles:
Modularity and information hiding
(encapsulation, interfaces, reuse, maintainability, response to change)

Early (architectures)



Monolithic applications developed from scratch

Porting required redevelopment

Data dependency and consistency issues

Application code and (textual) user interfaces still entangled

Data management as a primary concern

Human interaction made easier

Enterprise Applications

OS + DBMS + GUI + Networking capabilities =
more and more elaborate information systems
could be engineered

Typically hosting enterprise applications
(customers, personnel, products, resources)

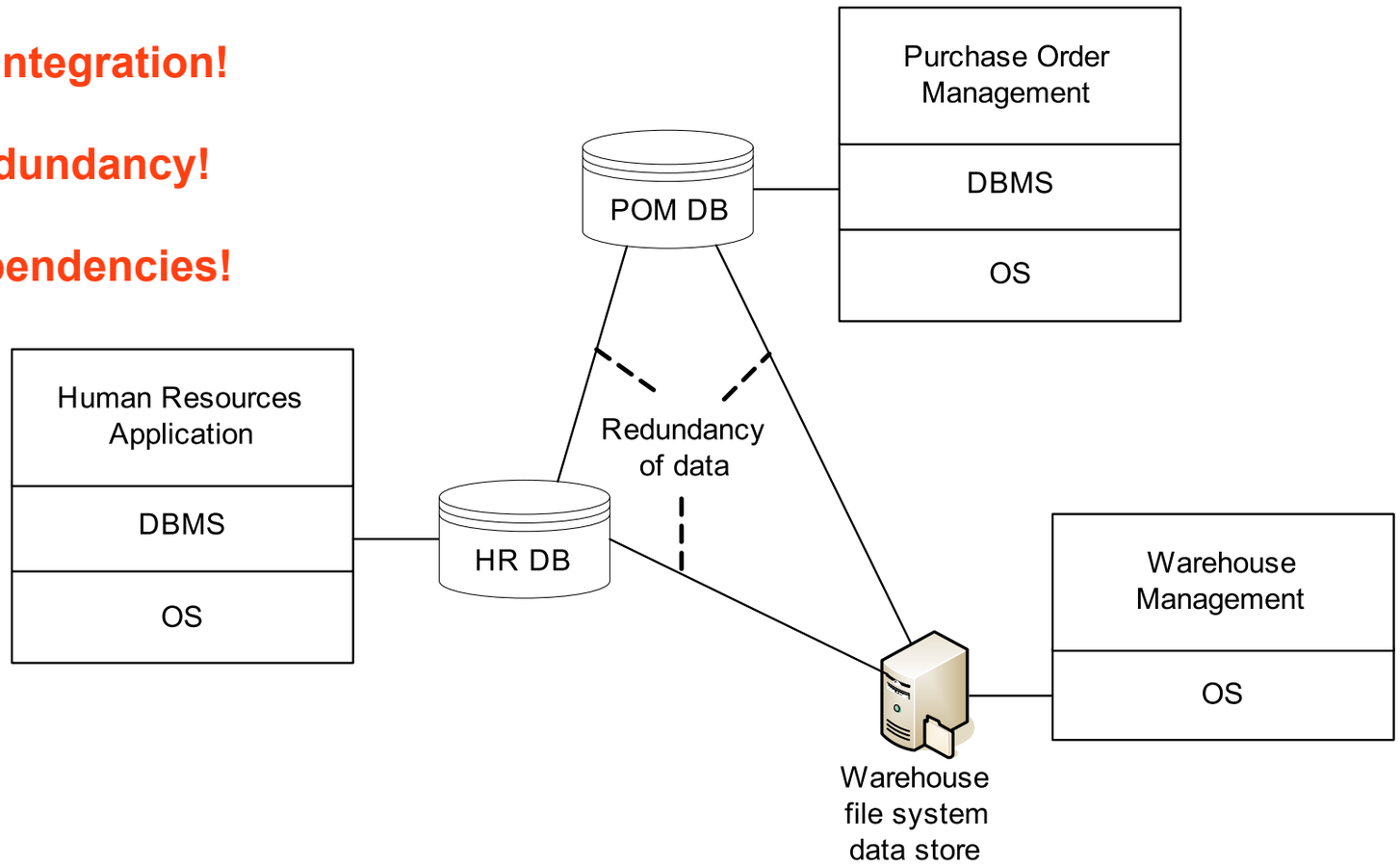
From individual to multiple information systems
(needs integration)

Individual enterprise application

Lack of Integration!

Data redundancy!

Data dependencies!



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Consequences

Changes were hard to implement!

Hard to track data dependency and replication

Any modification of an application was a complex and error-prone activity, with domino effect
(e.g. change of customer address format)

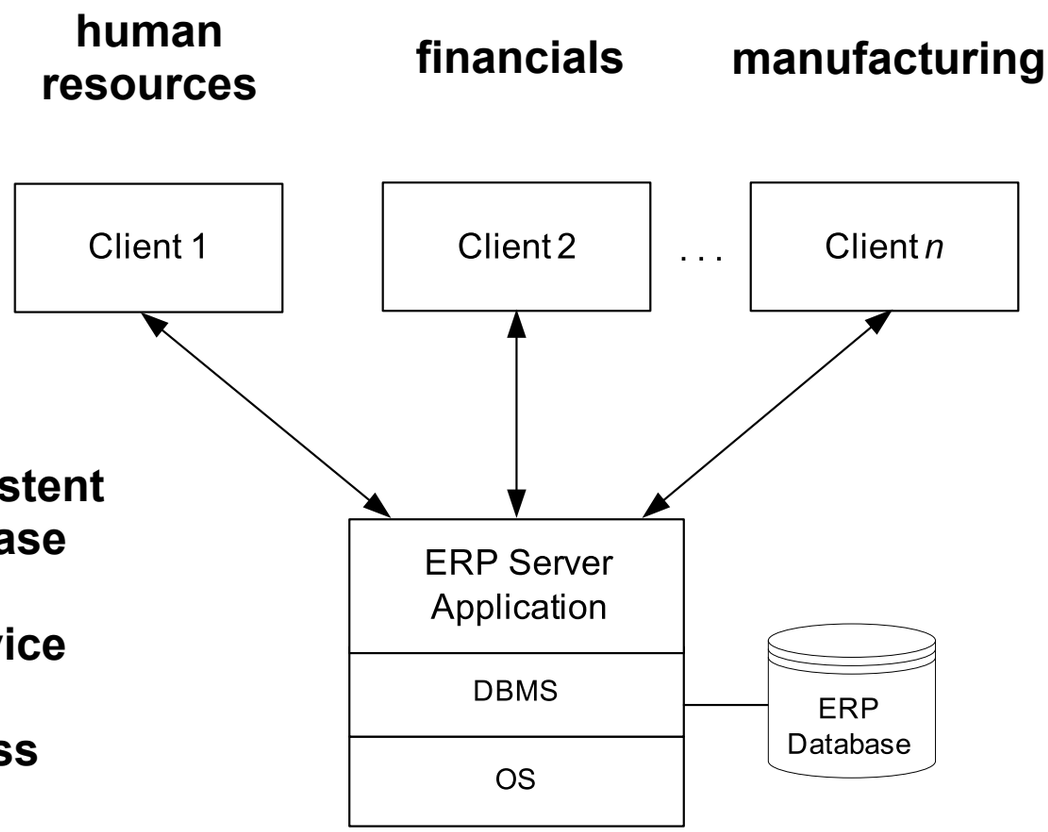
ERP

Enterprise Resource Planning (**ERP**) systems
to deal with the increasing complexity of changes

Basic idea

integrated database that spans most applications,
separated modules provide desired functionalities,
accessed by client applications

Enterprise resource planning systems



Integrated and consistent (centralized) database

Two-tier client-service

remote data access

ERP

CRM and SCM

New types of SW entered the market around 2000

Customer Relationship Management (**CRM**) systems
Supply Chain Management (**SCM**) systems

Goal

to support the planning, operation, and control of supply chains, including inventory management, warehouse management, management of suppliers and distributors, and demand planning

Problem: different vendors, separately developed

Siloed enterprise applications

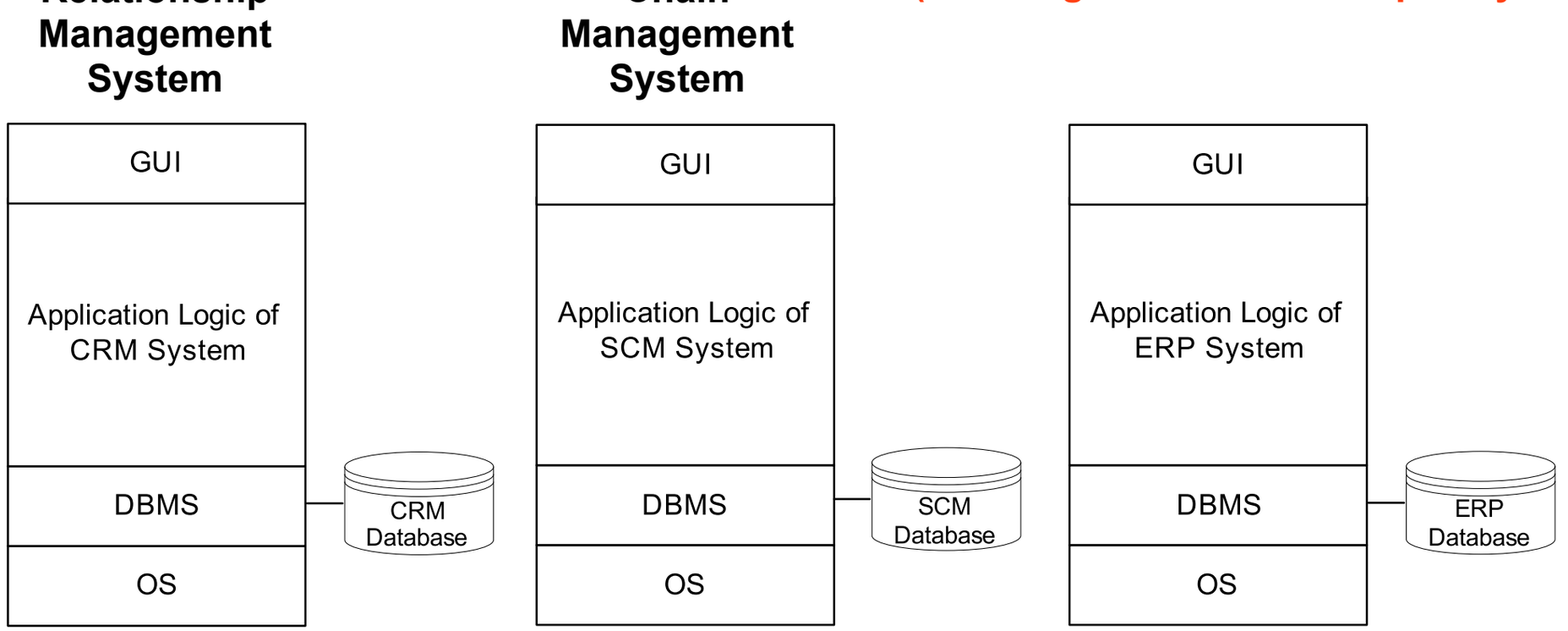
Lack of Integration!

Data redundancy!

Data dependencies!

Data Integration would provide valuable information

(on a larger scale and complexity than before)



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Connected on local network, but not logically integrated

Enterprise Application Integration

Definition: **Enterprise Application Integration** (**EAI**) is defined as the use of software and computer systems architectural principles to integrate a set of enterprise computer applications.

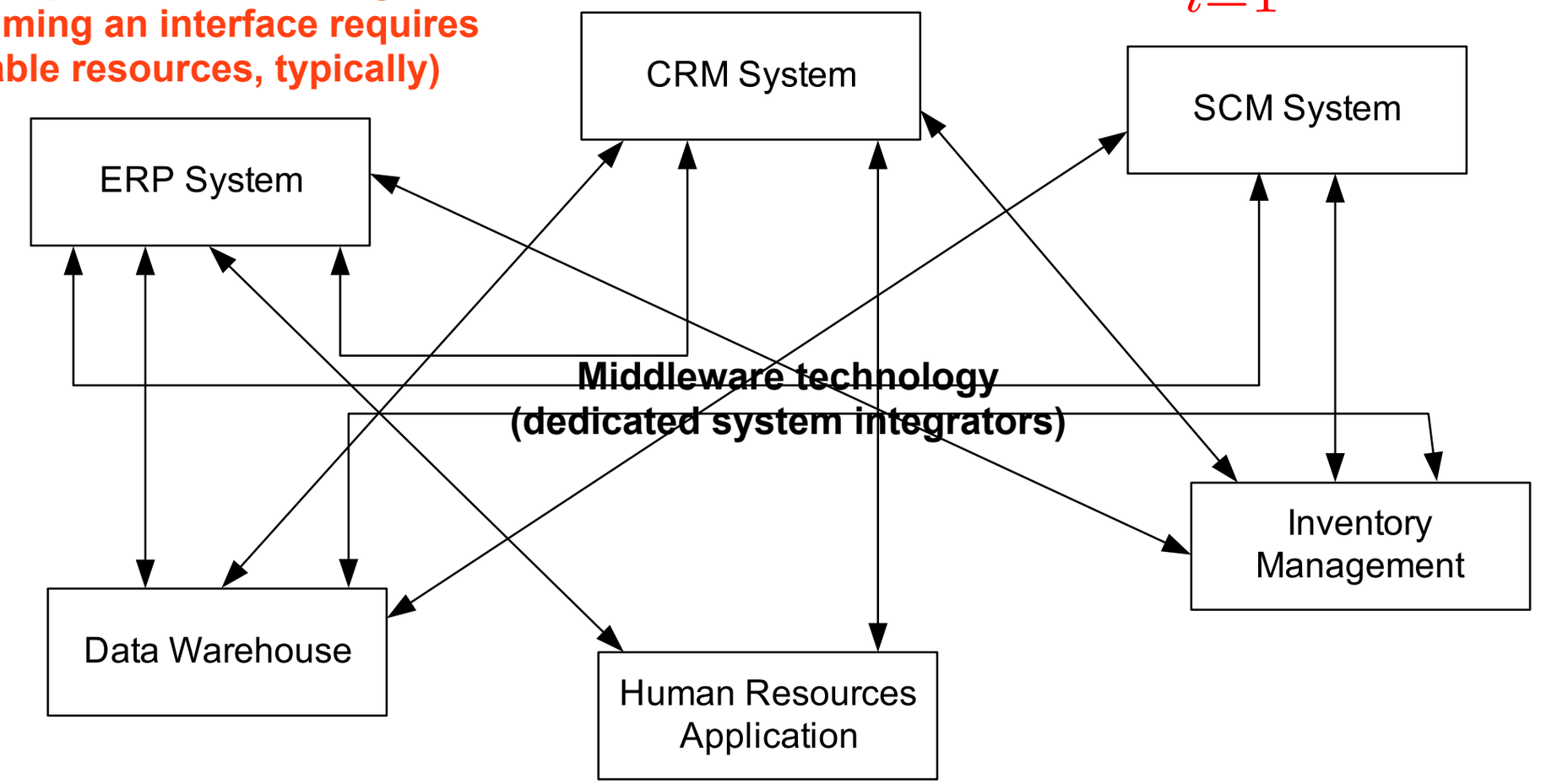
Point-to-point integration

N x N hard-wiring problem!

Too many interfaces to develop!

Does not respond well to changes! (Reprogramming an interface requires considerable resources, typically)

$$\sum_{i=1}^{N-1} i = \frac{N(N-1)}{2}$$



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EAI implementation pitfalls

70% of all EAI projects fail!
Most of these failures are not due to technical difficulties, but due to management issues:

Constant change

Shortage of EAI experts

Competing standards

Loss of detail: Information unimportant at an earlier stage may become crucial later

Data protectionism

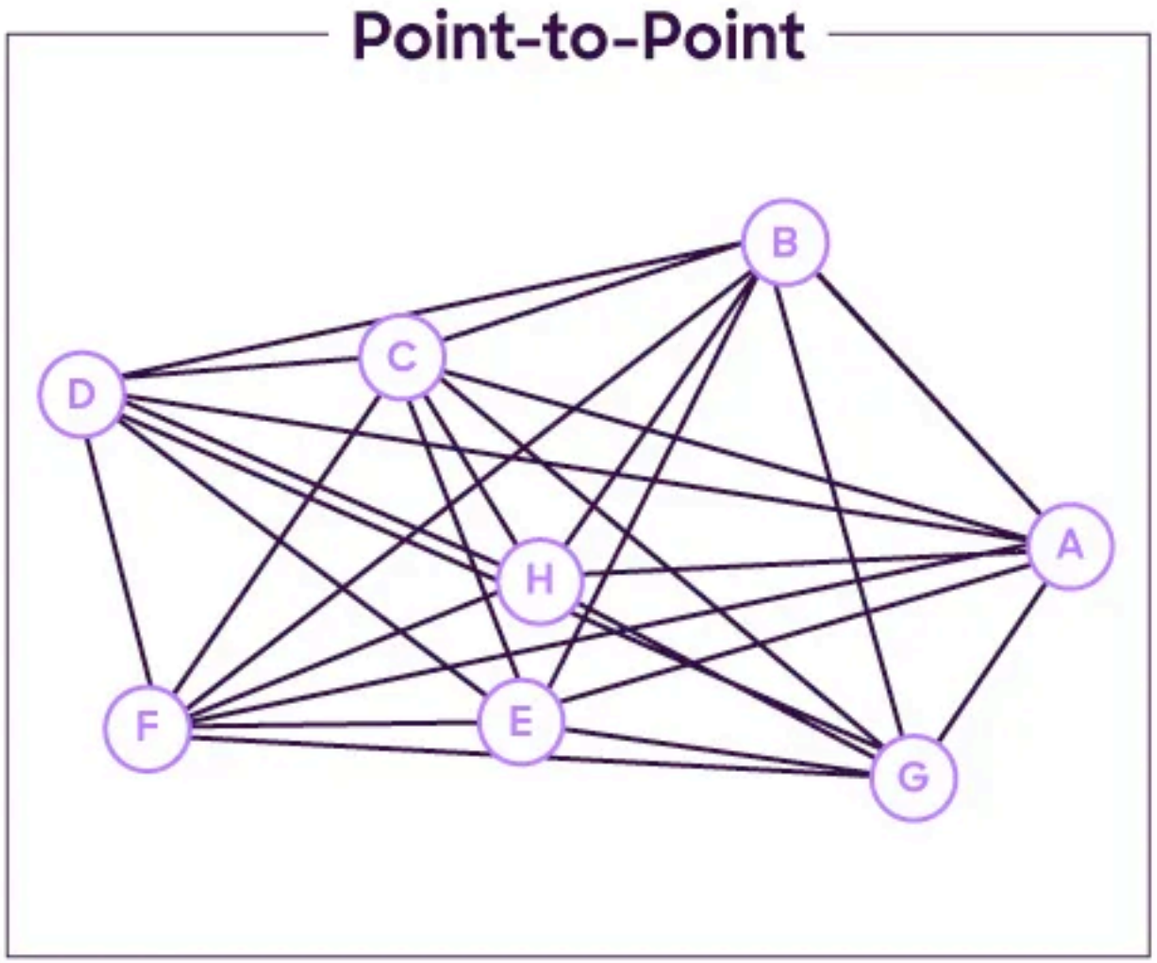
Hub-and-Spoke

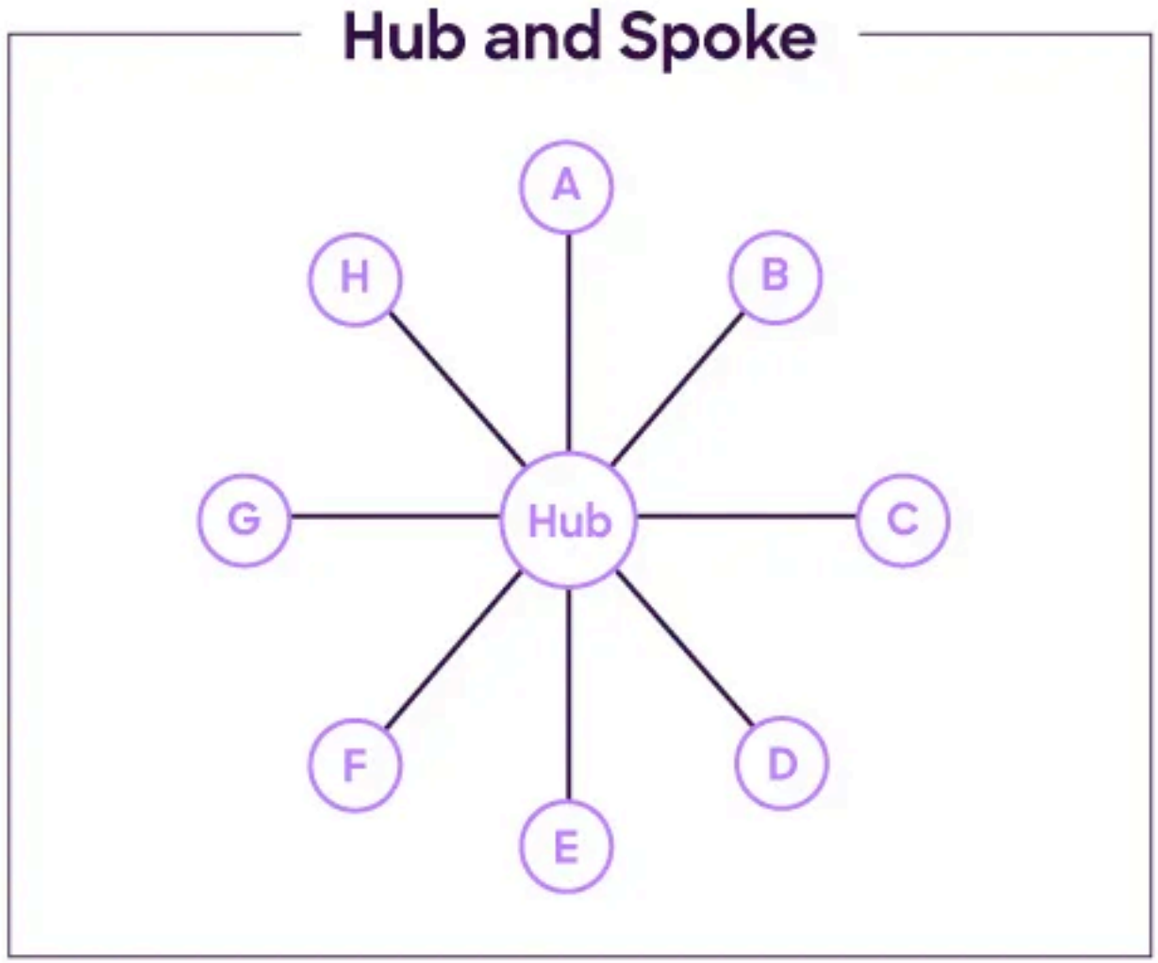
The **Hub-and-Spoke** paradigm is based on a central hub and a number of spokes attached to it

The Application Integration middleware represents the hub, and the applications to be integrated represents the spokes

Interactions between any two applications must pass through the hub

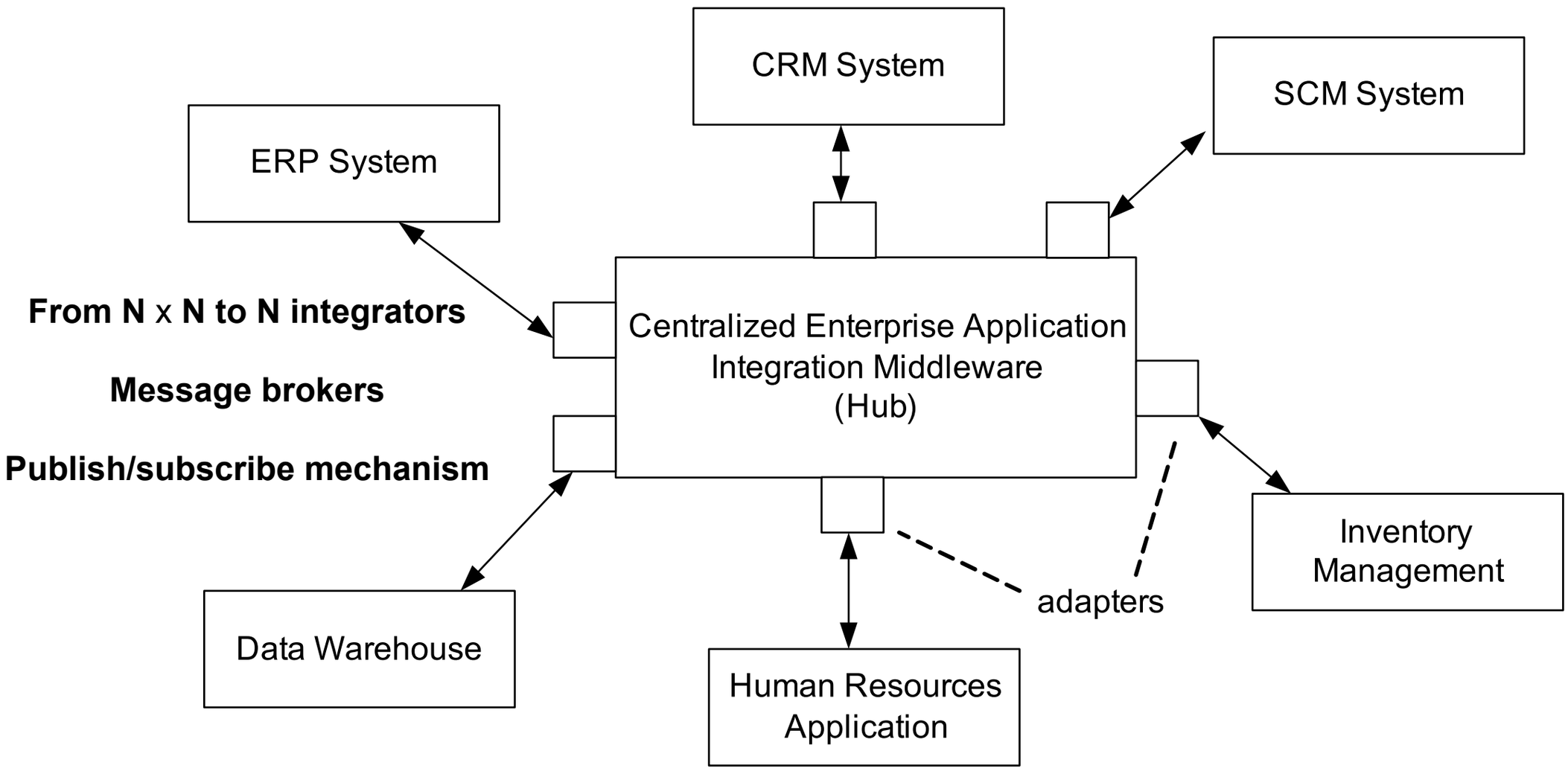
Hub-and-Spoke





Hub-and-spoke integration

Configuration and management of adapters and message brokers can become cumbersome



From N x N to N integrators

Message brokers

Publish/subscribe mechanism

Workflow management coalition (WfMC)

Founded in the ‘90s by vendors, users, academia: fix standard for Wf representation and execution

http://www.wfmc.org

Workflow

Definition: a **workflow** is the automation of a business process, in whole or in part,

during which documents, information, or tasks are passed from one participant to another for action,

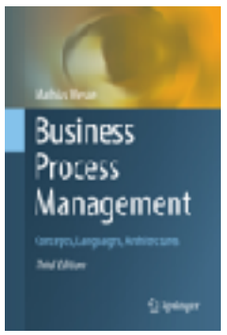
according to a set of procedural rules

Workflow management system

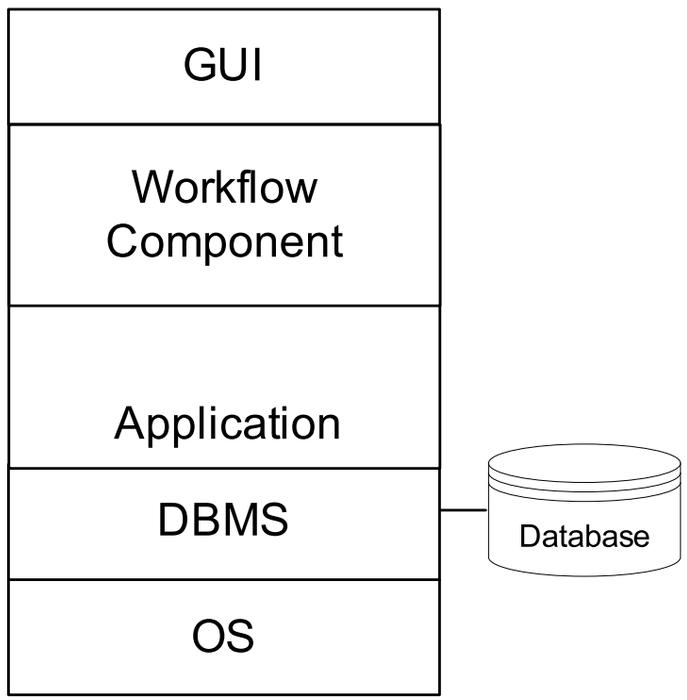
Definition: a **workflow management system** is a software system that defines, creates, and manages Wfs execution,

running on one or more workflow engines,
able to interpret the workflow definition,
able to interact with workflow participants, and
able to invoke the use of IT tools and applications

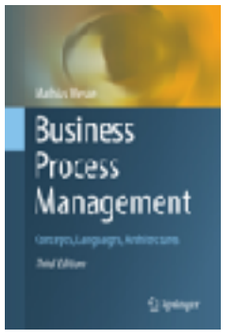
Workflow component



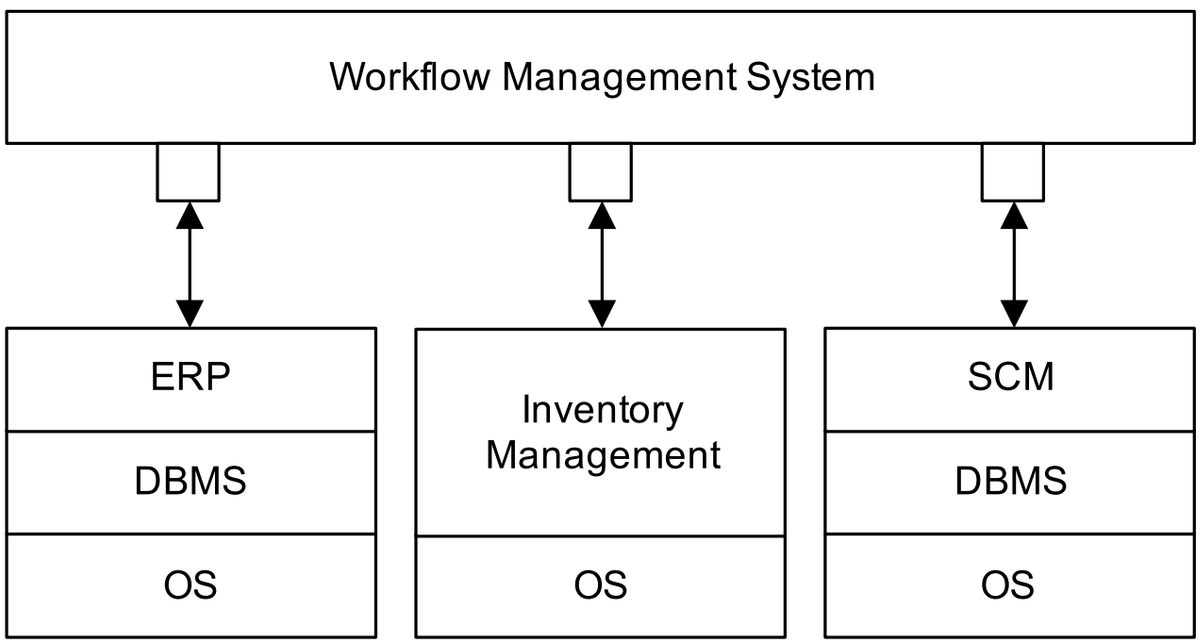
Definition: a **single-application workflow** consists of activities and their causal and temporal ordering that are realized by one common application system.



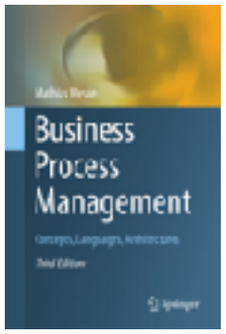
Multiple-application workflow system



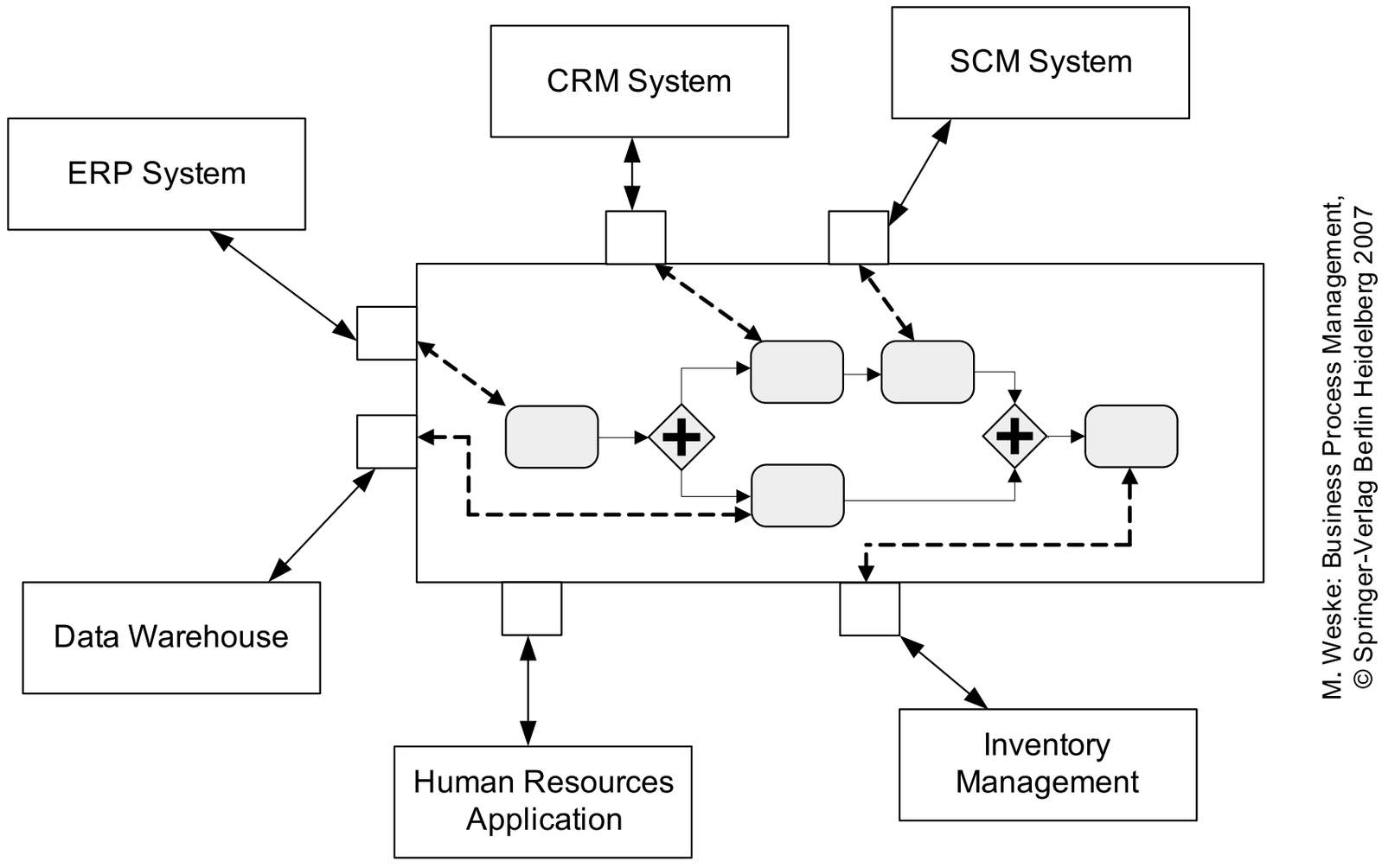
Definition: a **multiple-application workflow** contains activities that are realized by multiple application systems, providing an integration of these systems.



System workflow



Definition: a **system workflow** consists of activities that are implemented by software systems without any user involvement.



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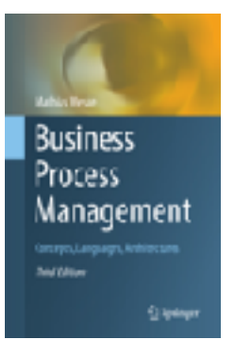
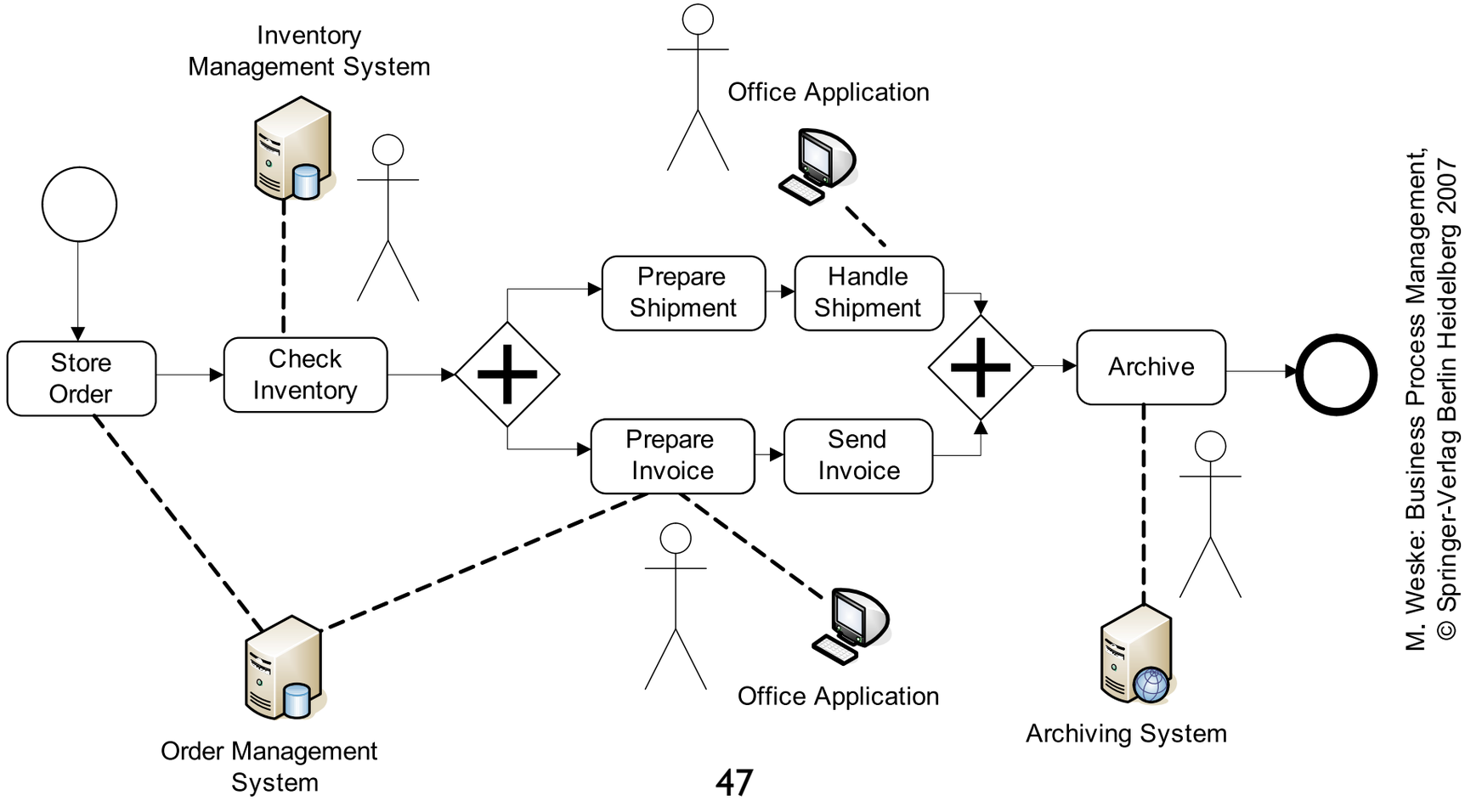
Human interaction workflow



Definition: Workflows in which humans are actively involved and interact with information systems are called **human interaction workflows**.



Human collaboration

When tasks performed by humans are present, it is not sufficient to equip workers with adequate software:

their collaboration must be supported:
shared data repositories and work handover can speed-up office procedure considerably

Goal: support automation by driving the human activities according to the process model

Benefits: reduce idle periods
avoid redundant work
improve human/machine work integration

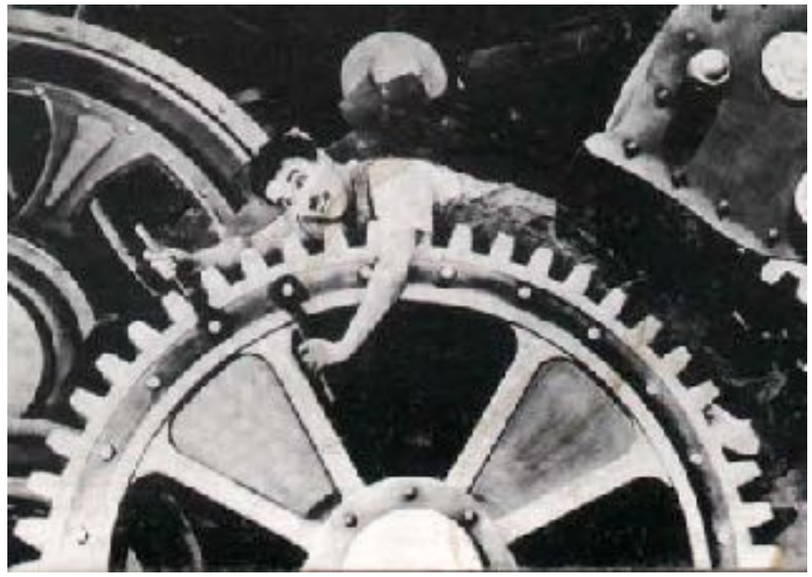
Some limitations

Problems with knowledge workers:

User acceptance issues

(Metropolis, 1927)

Machine burdening of workers

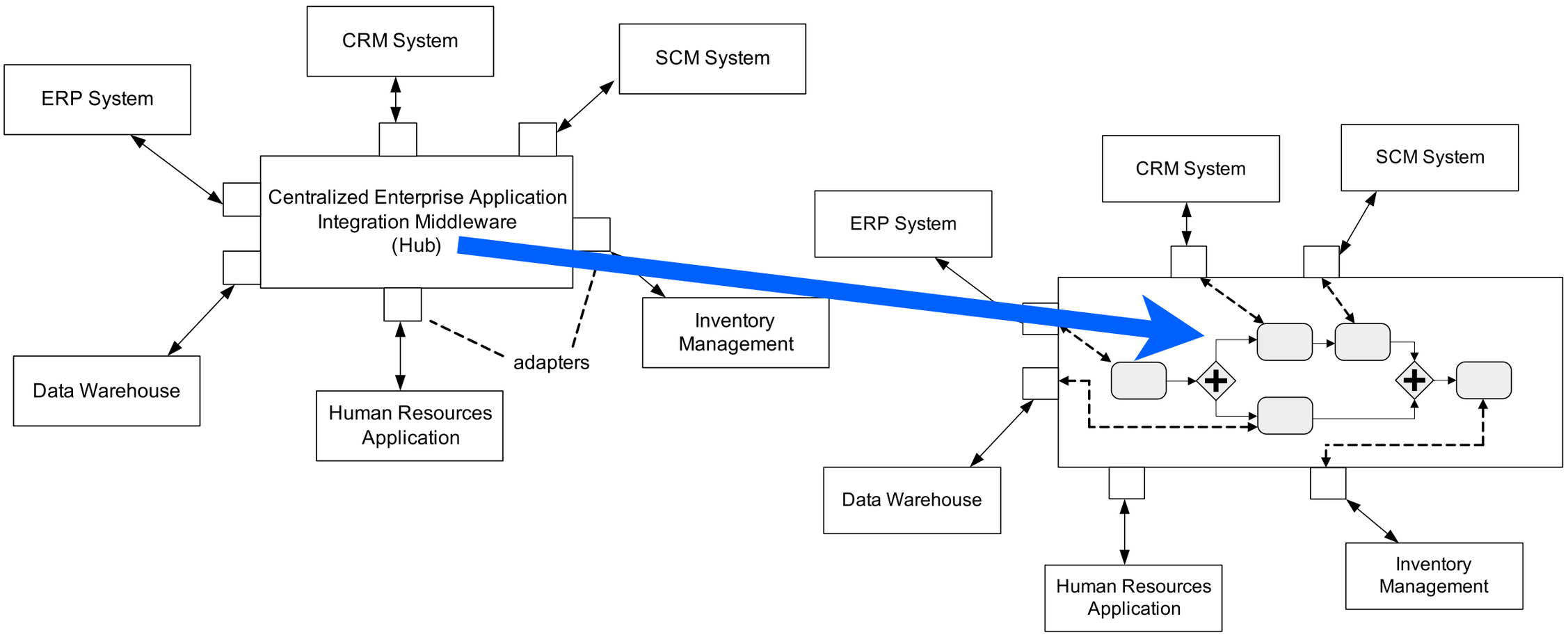


(Modern Times, 1936)

Little room for creativity and flexibility

(Metropolis, 1927)

Workflows fit well with hub-and-spokes EAI



Enterprise service computing

Main idea:

Business functionalities exposed as services

Services are equipped with usage information

Customers can find services and use them

Services

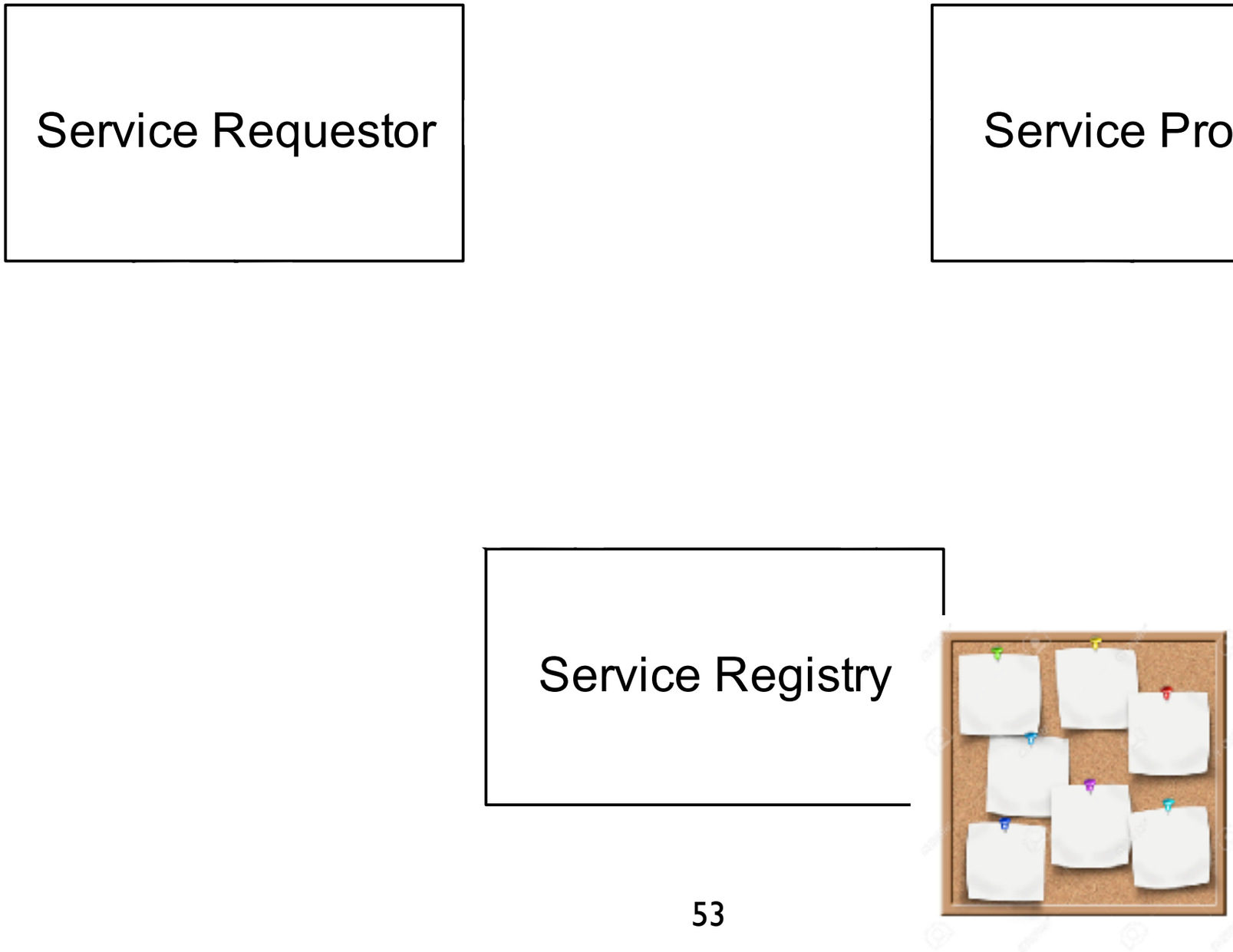
Definition: **Services** are loosely-coupled computing tasks that can be dynamically **discovered** and **invoked** over the network.

Each service comes with a **service description** that can be published in **service registries** by the **service provider**.

Service registries can be **queried** by **service requestors**.

Service descriptions provide a level of detail that facilitates service requestors to **bind** and **invoke** them.

Service-oriented architectures



Service-oriented architectures

Definition: **Service-oriented architectures** (**SOA**) are software architectures that provide an environment for describing and finding software services, and for binding to services.

Advantages of SOA

Reuse of functionality at coarse level of granularity

New applications can be built with less effort

Existing applications can be efficiently adapted to changing requirements

Reduced maintenance and development costs

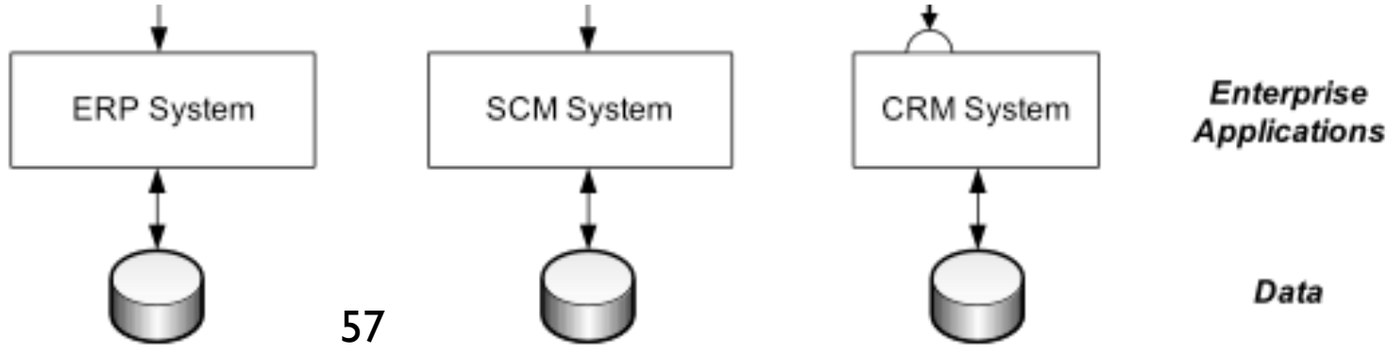
Products as services

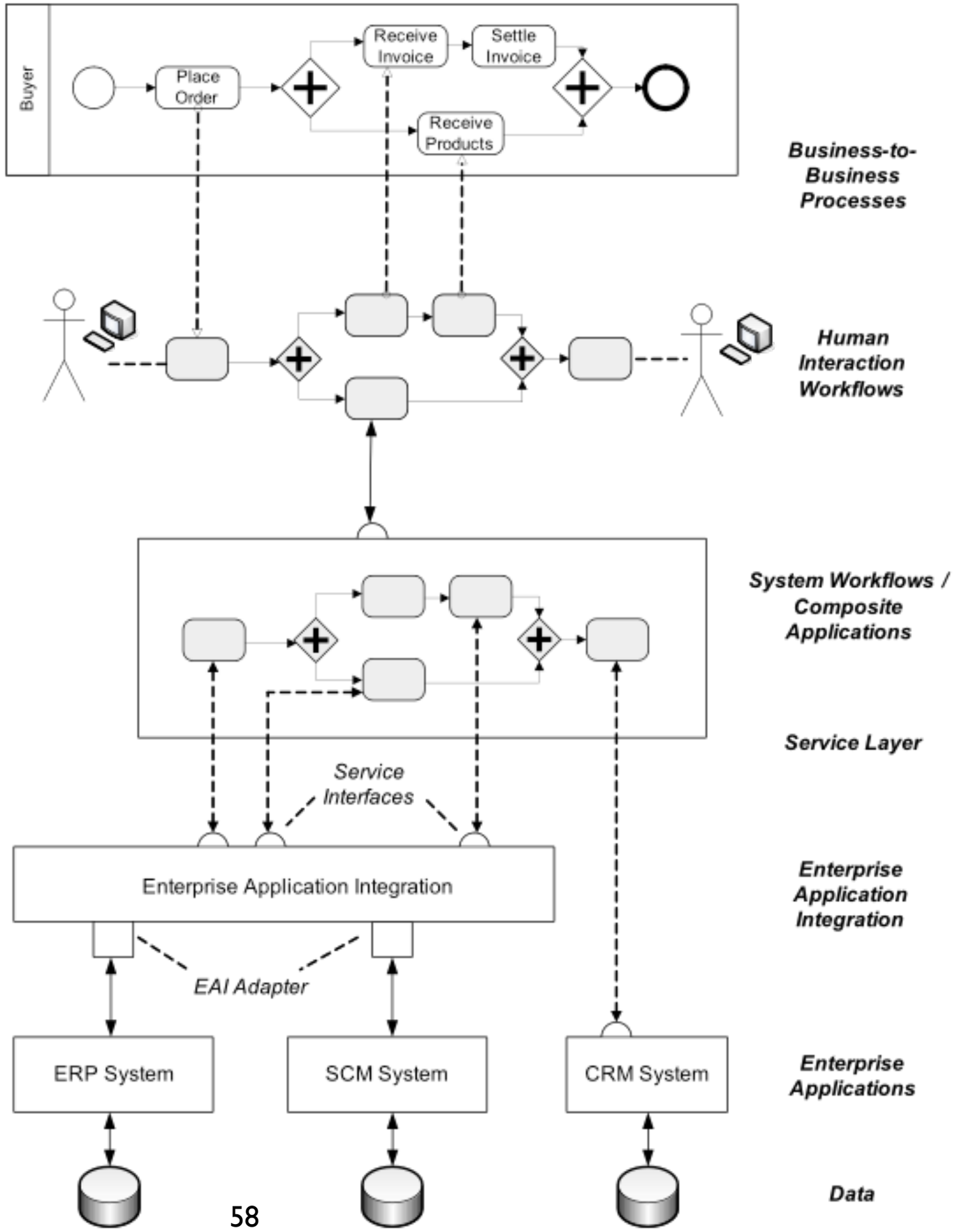
Corporations can be perceived by the set of services they provide

Services exposed to the market can be realized by:

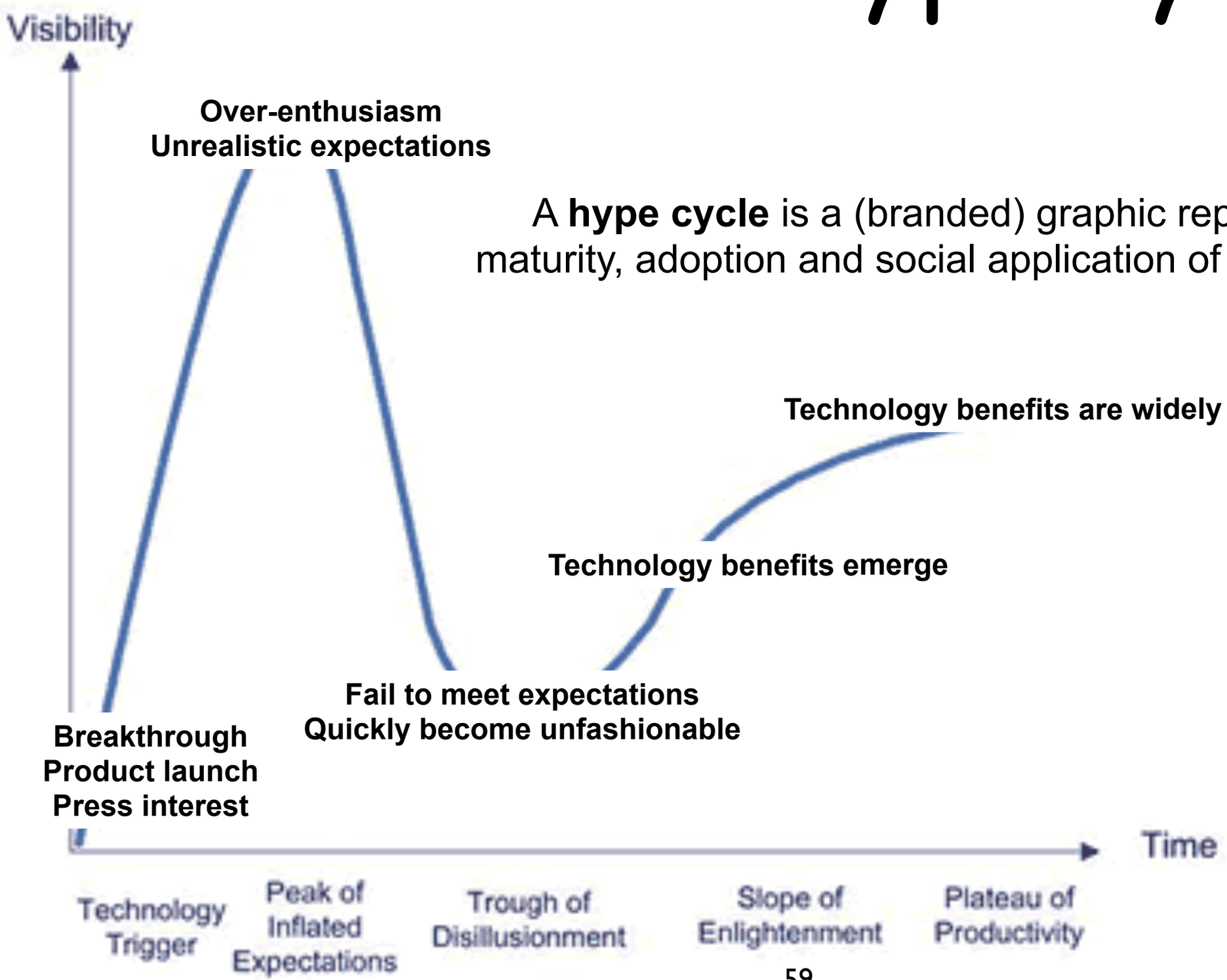
enterprise services (provided by the internal back-end application system)

third party services (integrated to provide better end-user experiences to the customer)





Gartner's hype cycle



A **hype cycle** is a (branded) graphic representation of the maturity, adoption and social application of specific technologies