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Enterprise Architecture Management

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Submission of Project Assignment

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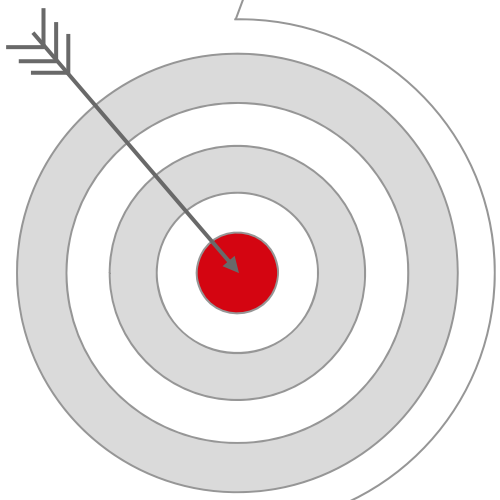
Due: July 12, 2024 23:59h

Artefacts:

- PDF with architecture or Archi file
- Source code of project (no libraries)

Introduction to EAM – Learning Objectives



Explaining the difference between Enterprise Architecture and Software Architecture

Knowing typical concerns addressed by Enterprise Architecture Management

Defining *Enterprise Architecture* and *Enterprise Architecture Management*

Drivers for EA – Dealing with Legacy IT

Insufficiently documented IT

Uncontrolled growth (merger and acquisition)

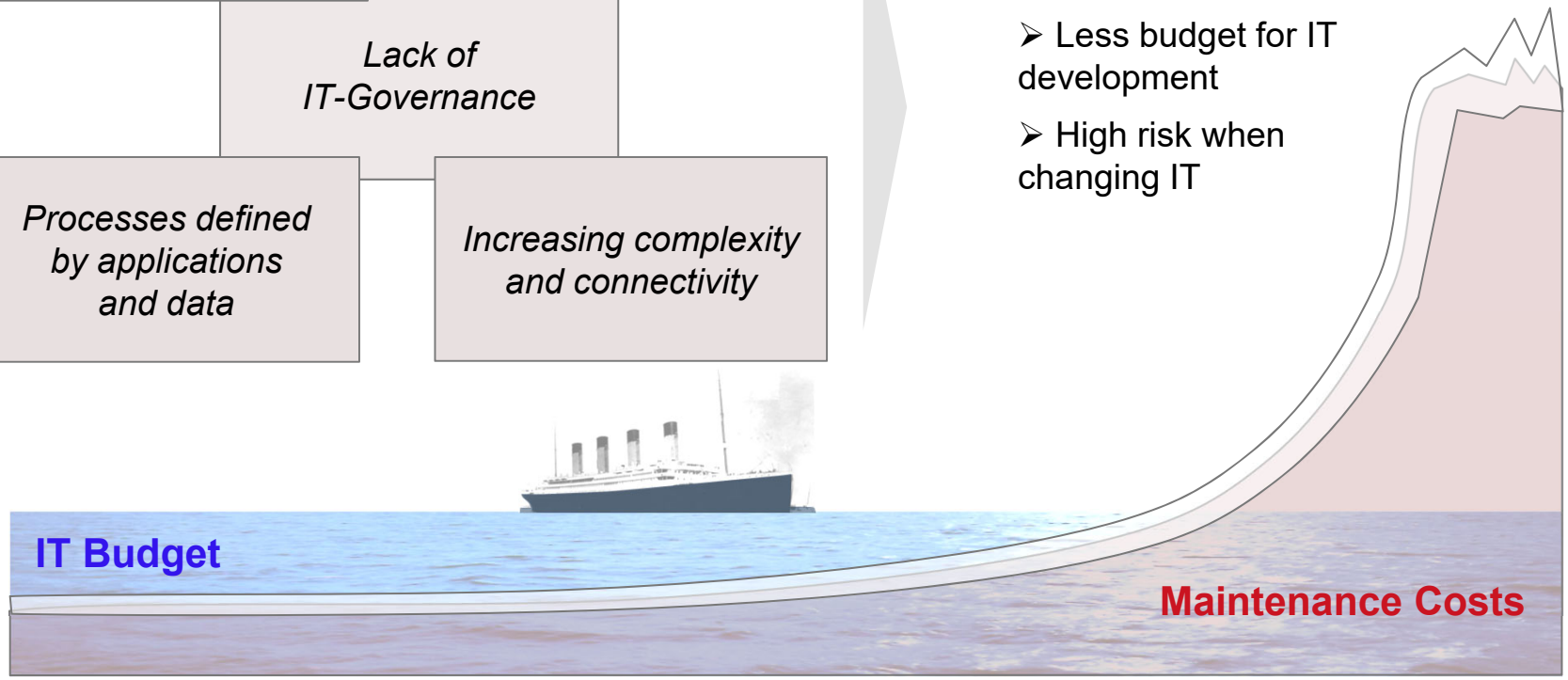
Lack of IT-Governance

Processes defined by applications and data

Increasing complexity and connectivity

CONSEQUENCES

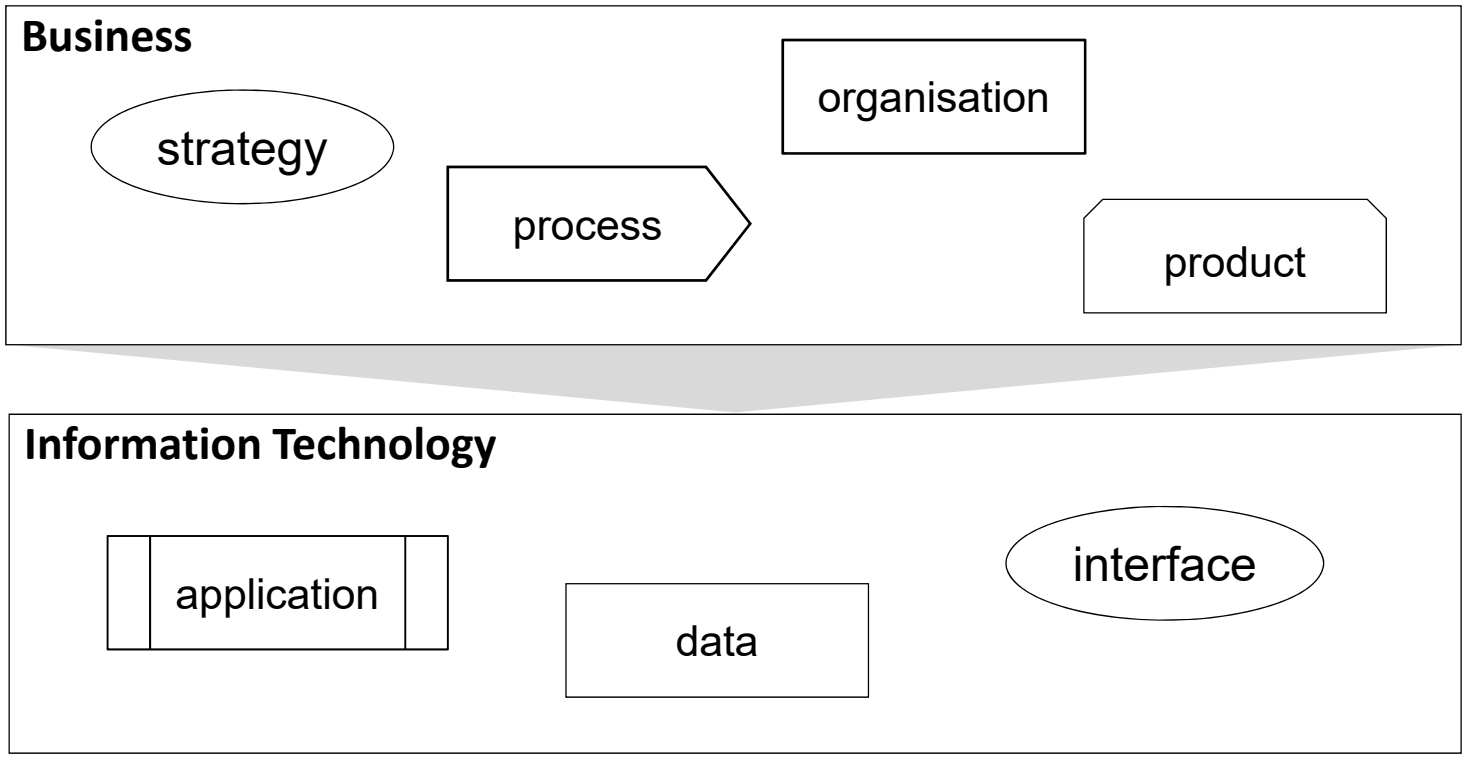
- Inefficient operational processes
- Less budget for IT development
- High risk when changing IT



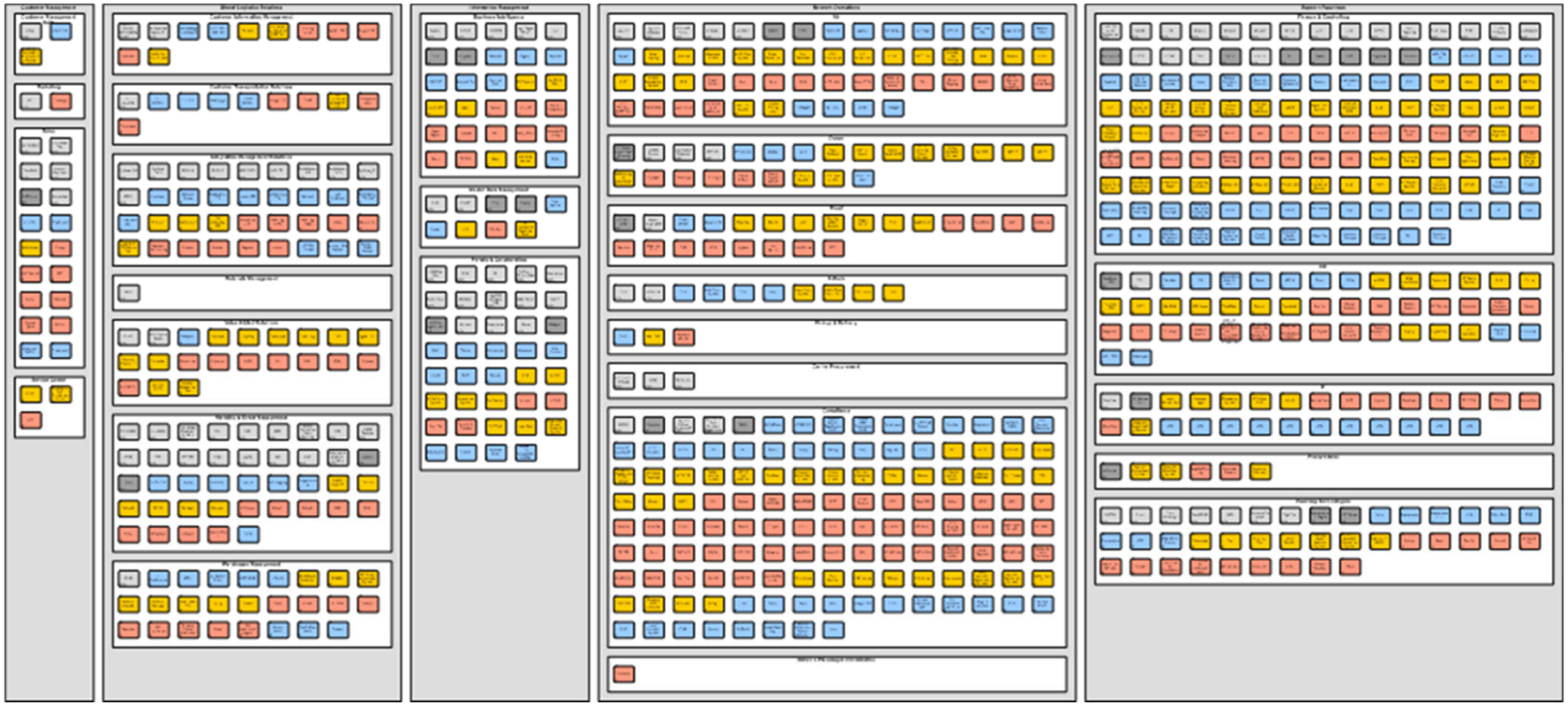
Source: Daniel Hülckenbeck, Dangelmayer & Seemann

Enterprise Architecture Management – Basic Idea

Enterprise Architecture Management (EAM) aims at aligning corporate Information Technology with business needs in a holistic way.

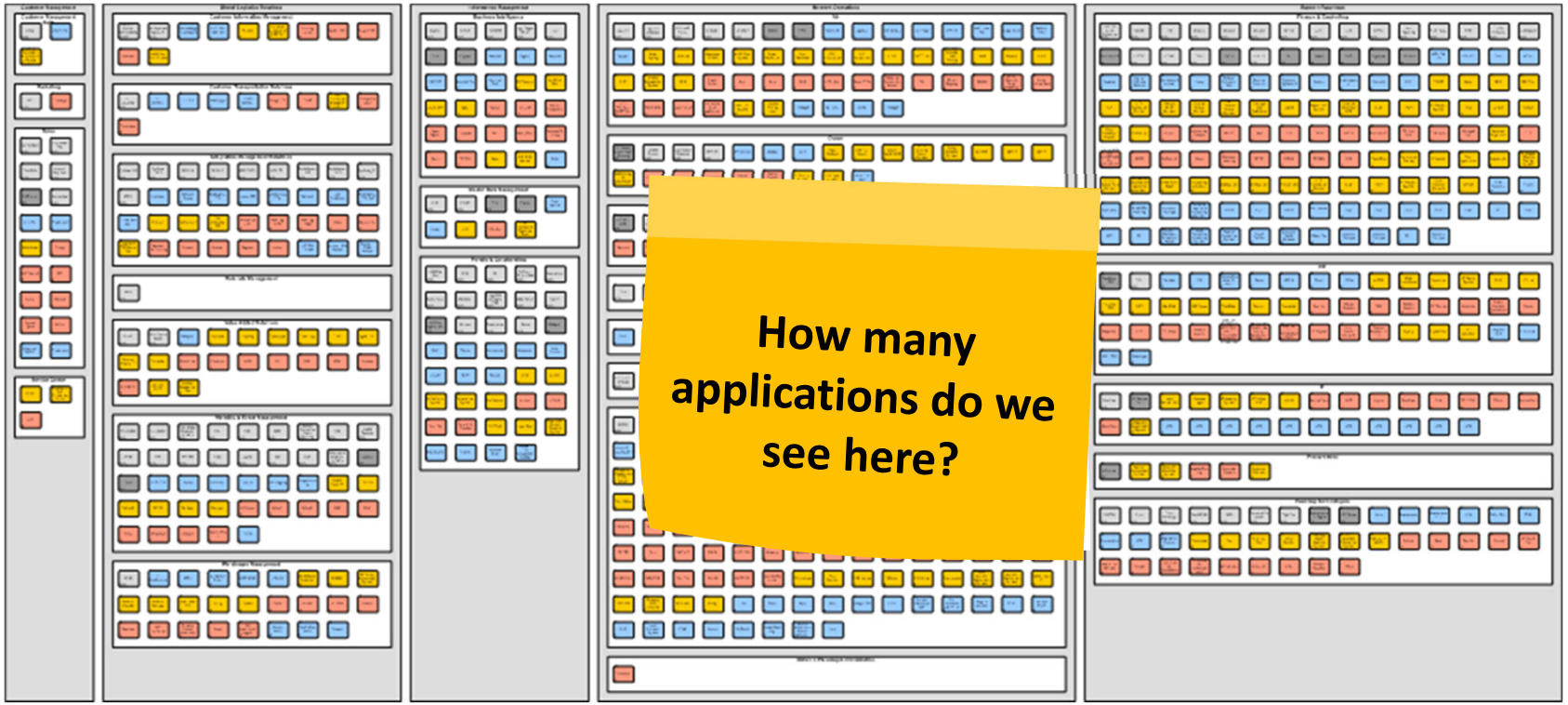


Drivers for EAM – Complexity of IT



Applications: global regional Icon APPA Icon EMEA Icon AM

Drivers for EAM – Complexity of IT



Example Case – Master Data Management

Customer MDM

- Customer master data spread over
  - 55 software systems
  - 5 core business applications
- Business issues
  - Failures during operations and invoicing
  - No reporting (biggest customer: “misc”)
- Technical issues
  - Data inconsistencies
  - >300 interfaces

- **No consistent** view on customer data

Consequences

- Regular cost
  - ????
- MDM project
  - 2 years
  - Core team 6 people (1M)
  - 15 external consultants (6M)
  - Plus travel and workshops
- Result
  - MDM service center
  - 80 staff members (24/7)

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Example Case – Effort for Consolidation

Merger and Acquisition

- A global company was growing by acquiring and integrating competitors
- 5 different core business applications
  - Redundant master data
  - Interrupted transactions
- Technical issues
  - Systems out-dated
  - Hard to maintain
  - Redundant training and support
  - >1000 interfaces to other applications

- **No coherent** business processes

Consequences

- Regular cost
  - Hosting: 600,000 per annum and system
  - Maintenance: 1.5 Million per system and year
  - Plus support
  - 700,000 Euro effort
- Replacement
  - One global standard system
  - Process standardization
  - 5 years
  - 750 Million
  - Already third attempt! (failed)

Purpose of EAM – Survey Among Practitioners

- “Which IT applications do we own?”
- “Where can I find information about my IT application?”
- “Who is using this application?”
- “How can we save money in IT?”
- “Do we really need this new application?”
- “(When) Will adopting this standard help us with saving money?”
- “What is this application used for?”
- “How well are we supporting business?”
- “Which system directly contributes to our strategy?”
- “What happens if this application fails?”
- “Which systems are dealing with personal data?”
- “Which legal consequences may I face?”

Source: Jung, J. et al. (eds.): *Why are Practitioners doing EAM?*

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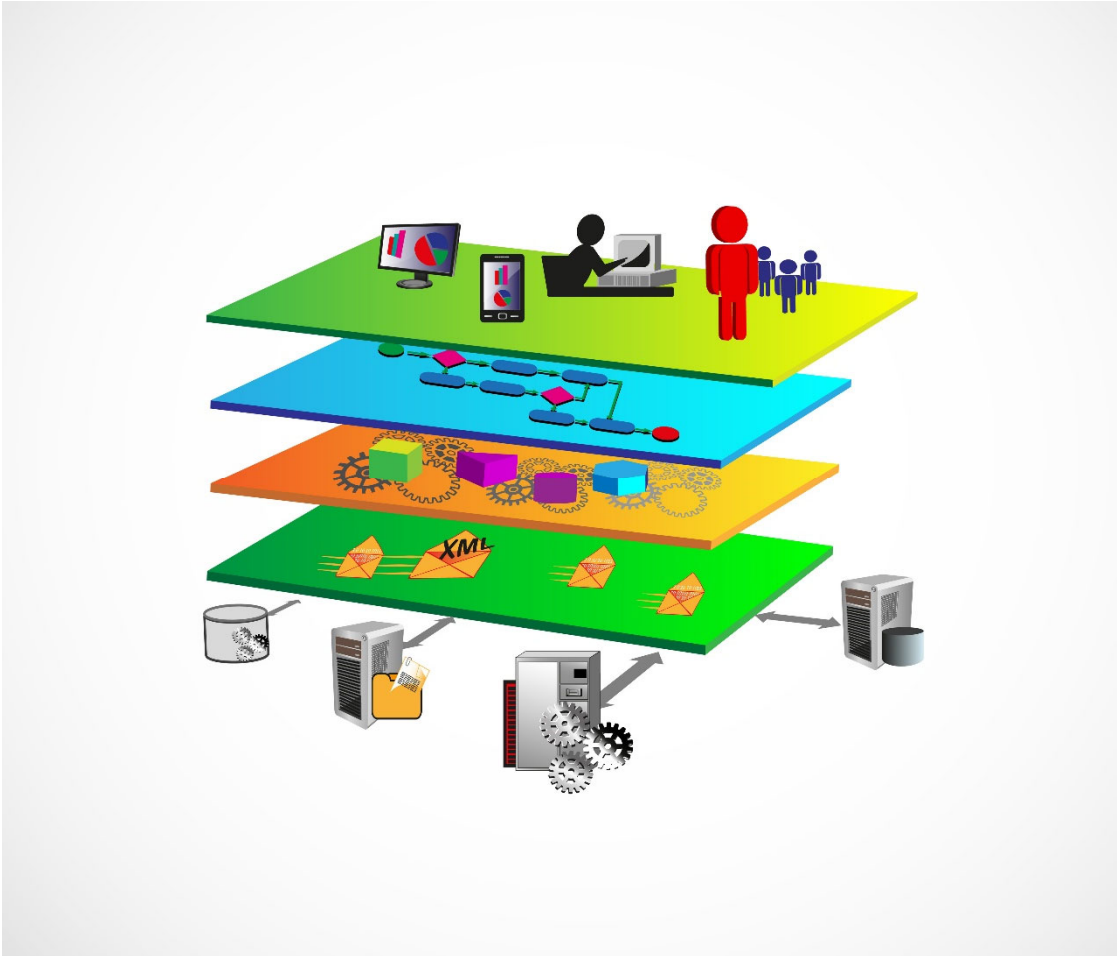
EAM is not just IT Management

- Holistic view on a company or an organisation
- Strong emphasis on business perspective
- Consequent management of IT against business needs

EAM – Separate Different Views

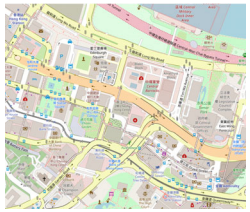


Enterprise Architecture – Definition

Enterprise Architecture (EA) is the representation of an organisation's IT landscape (structure and behaviour) together with its business environment.

EA incorporates the current use of IT in the organisation (as-is), a vision for future IT support (to-be) as well as a roadmap describing the transition from as-is to to-be.

EAM – Compared to Software Architecture

	Enterprise Architecture	Software Architecture
Metaphor	Town Planning  	Individual building  
Scope	Processes and software systems on corporate level	Individual software system
Zoom	▪ Corporate architecture (whole city) ▪ Individual organisational unit (district)	▪ Group of systems (block, campus) ▪ Single software system (building) ▪ Software component (roof, wing)
Detail	low / medium	high

EAM – Commonalities with Town Planning

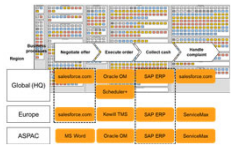
Complexity	■ Complex system of individually managed systems ■ Living and rather growing
People	■ Established, managed and financed by people ■ People are key element (and sometimes the problem)
Long-term	■ Long-term balance of interest needs to be achieved ■ Holistic and long-term vision is required
Heterogeneity	■ Managed core but evolutionary periphery ■ Individually managed sub-systems

Enterprise Architecture – Visualisation

Visualisations are used for presenting information about the enterprise architecture to stakeholders so that they can address their concerns.

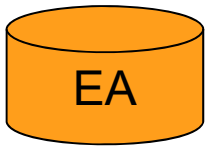
Concern

- Questions, issues, topics to be addressed by EA
- Concerns refer to a stakeholder (e.g. manager, architect)
- Mid- and long-term (CEO, CIO, management)



Viewpoint

- Visualisation of information from the repository (extract)
- Graphical representation (map, matrix, chart)
- Reporting (textual extract from repository)



Repository

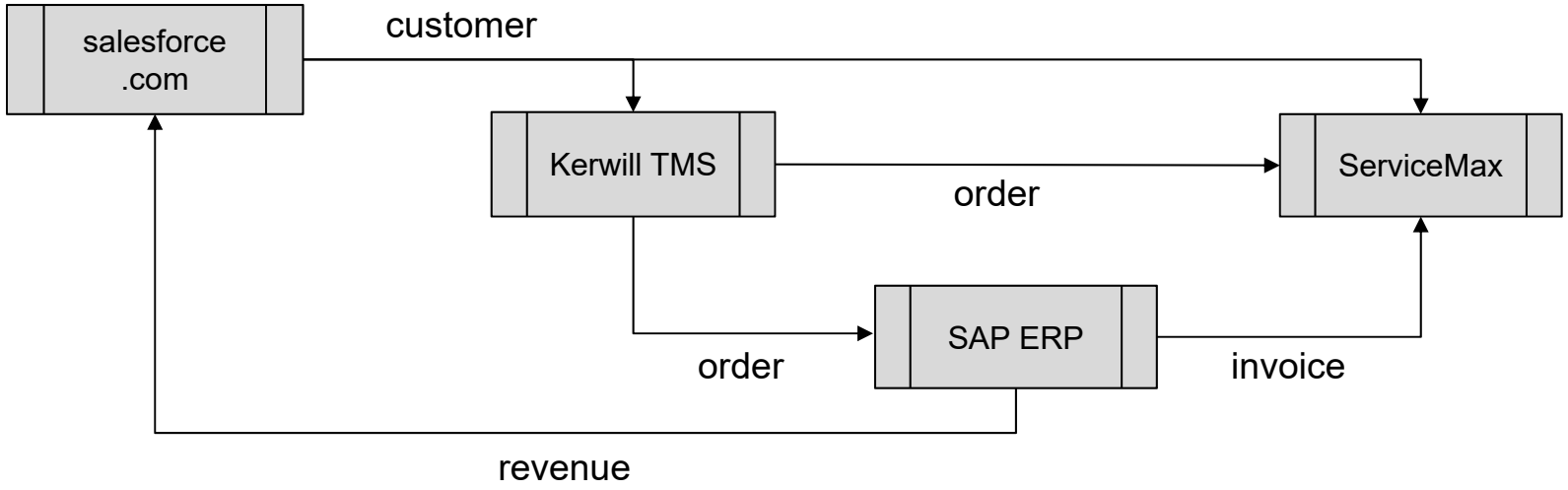
- Information about the business and IT applications
- Should be adapted to a company's needs
- Process required for maintaining information

Enterprise Architecture – Typical Concerns

	Example concerns
Cost	■ Which are the most expensive IT applications? ■ Where are we using redundant applications?
Quality	■ Which business processes are not (adequately) supported by IT applications? ■ In which extent are we using out-dated technology?
Risk / Compliance	■ Which business is affected if application X fails? ■ Which systems share sensitive data with others?
Strategy	■ Which systems are affected if we want to go for e-commerce? ■ Should we buy standard software or develop our own system?

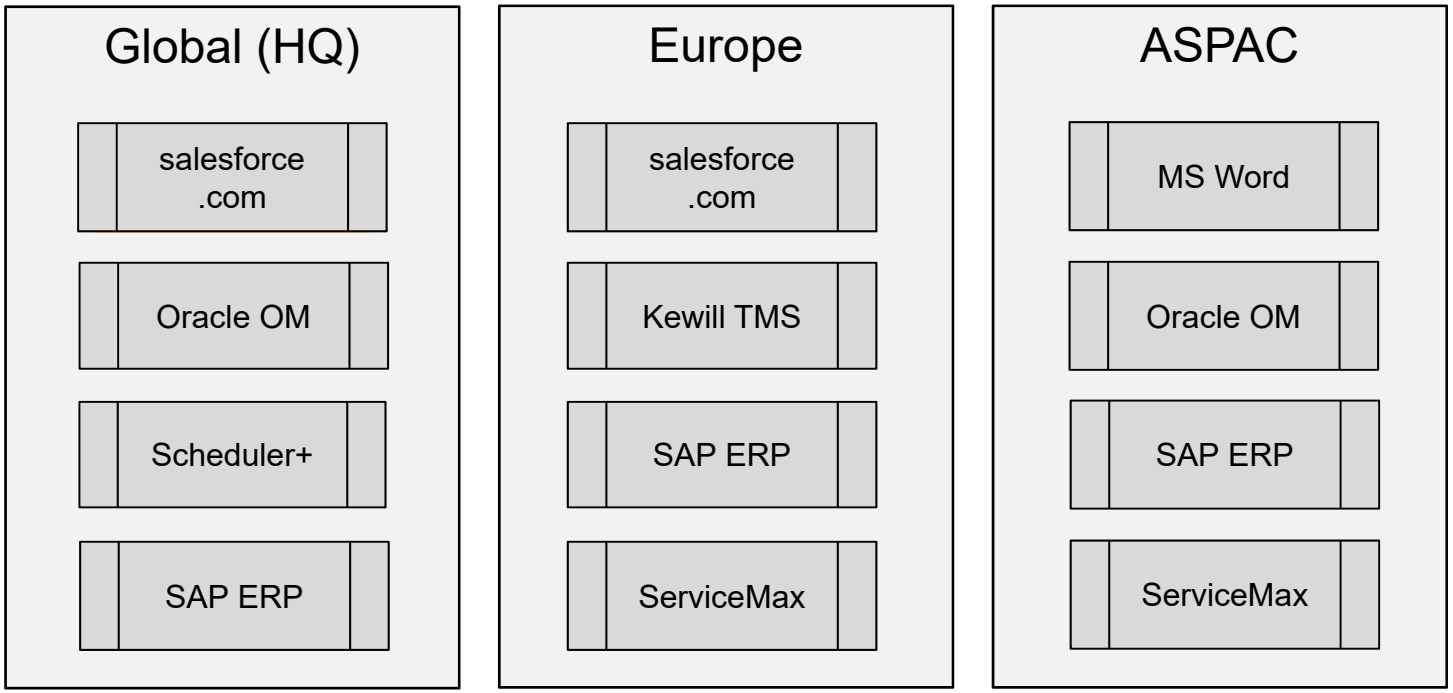
EA Viewpoint – Example Application Landscape

Dataflow between applications:



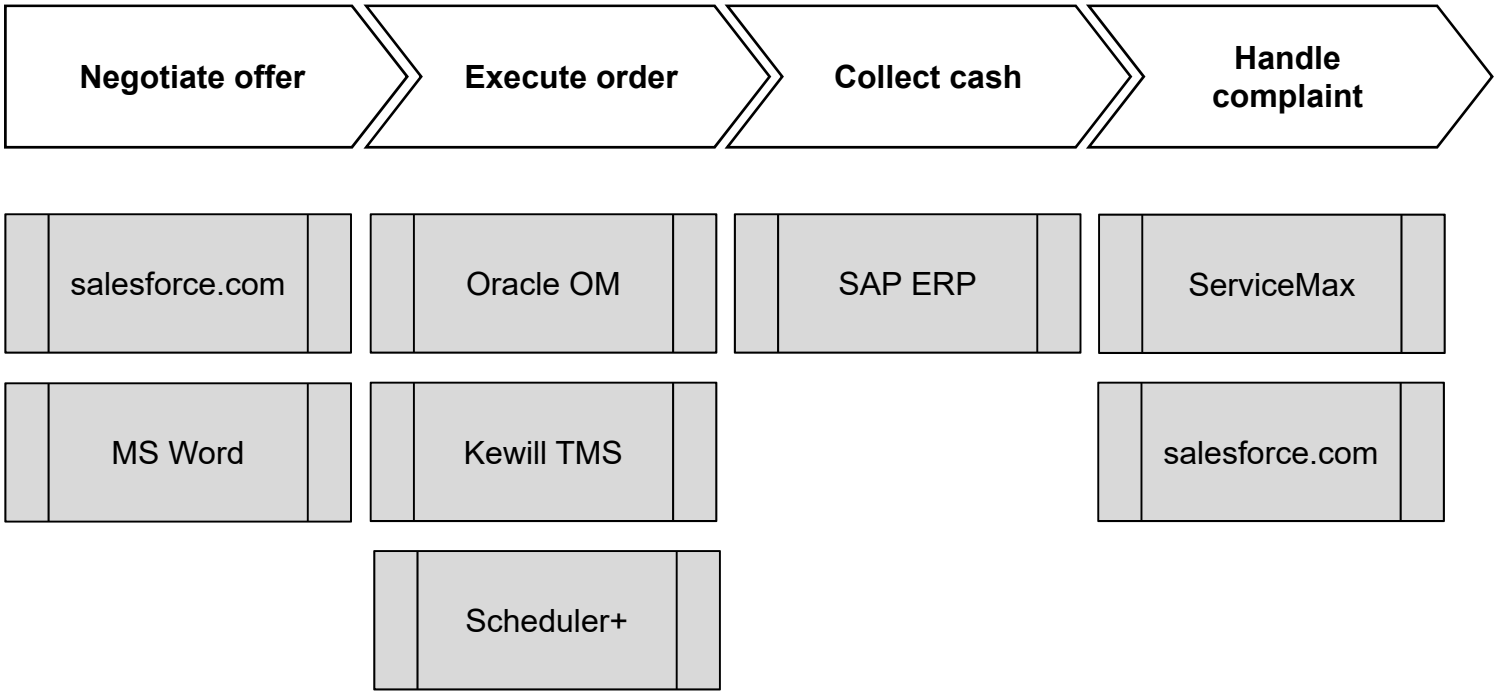
EA Viewpoint – Example Business Context

Applications used by an organisational unit:



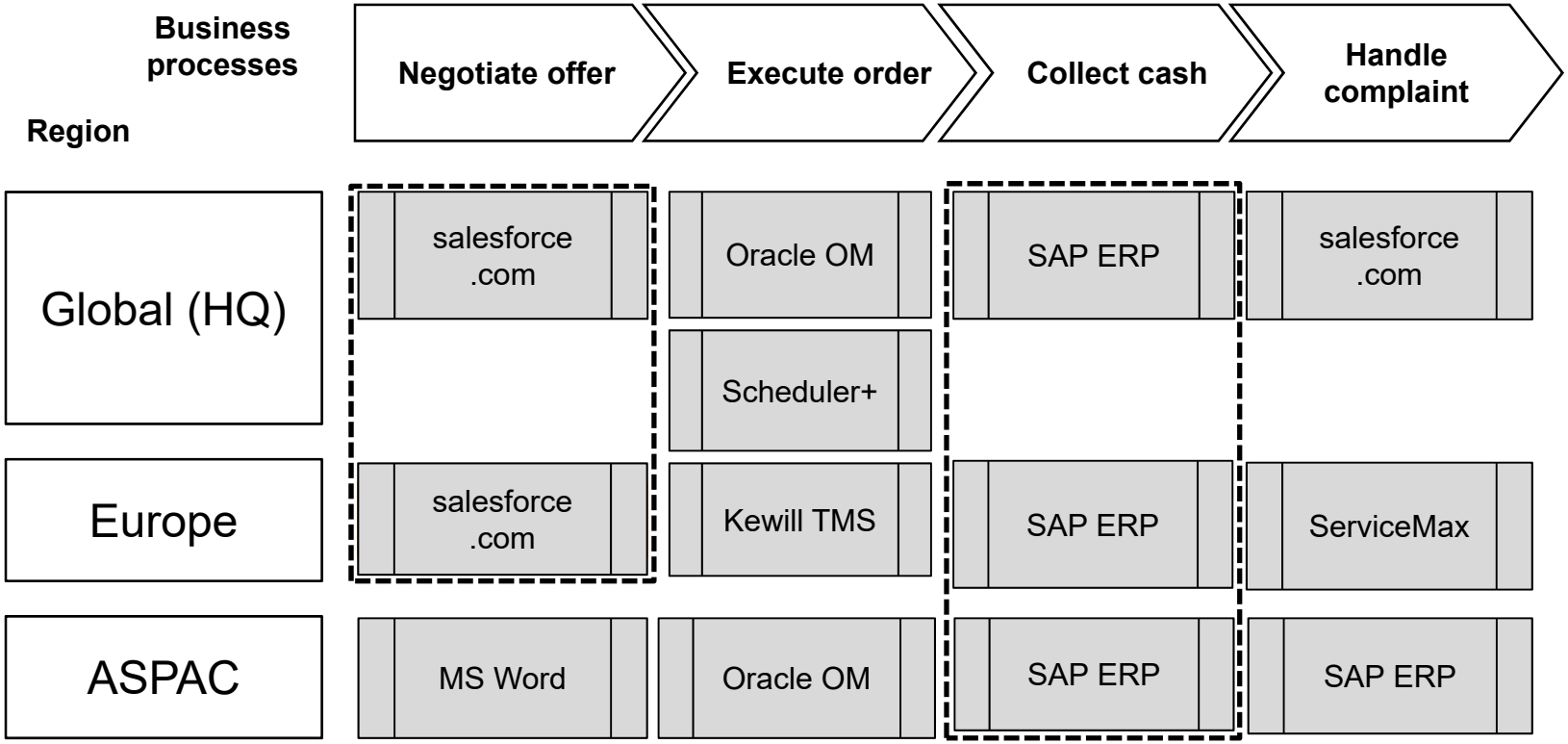
EA Viewpoint – Example Business Support

Processes supported by applications:



EA Viewpoint – Combined Example

Processes supported by applications per organisational unit:



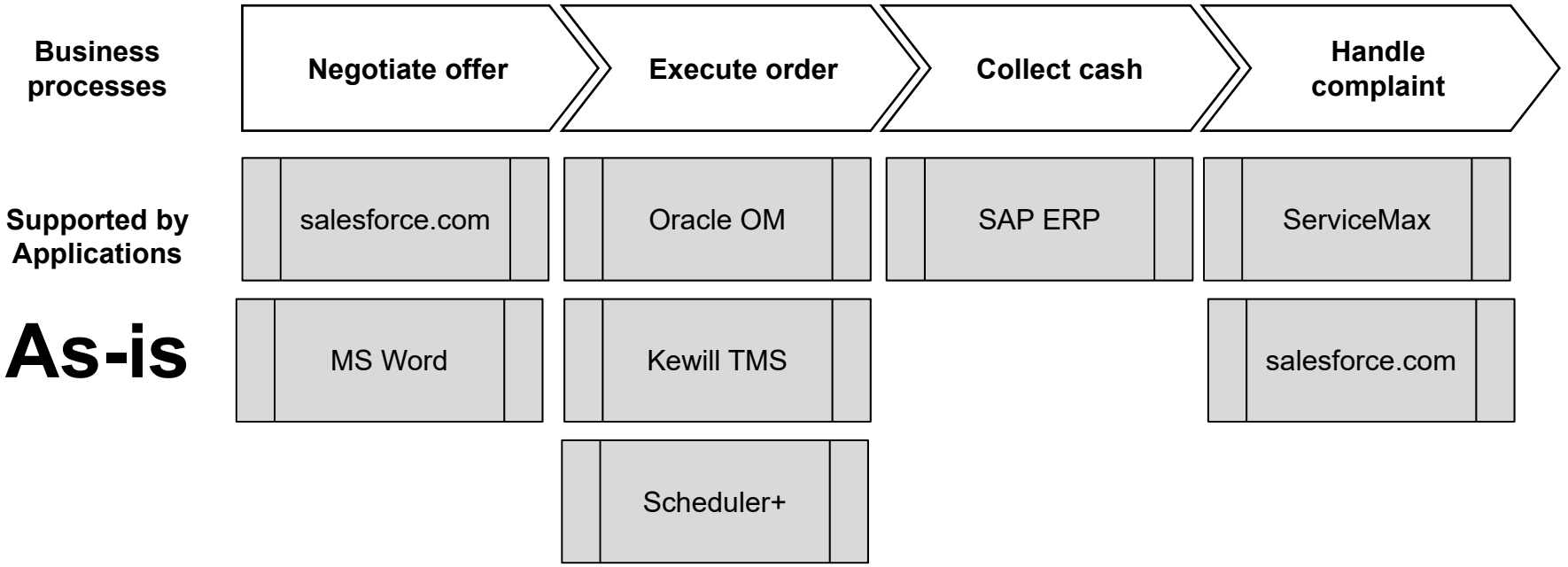
Enterprise Architecture Management – Definition

Enterprise Architecture Management (EAM) is a structured approach for establishing, maintaining and using EA in order to align IT with corporate objectives.

EAM defines methods and an organisational structure for enabling EA activities.

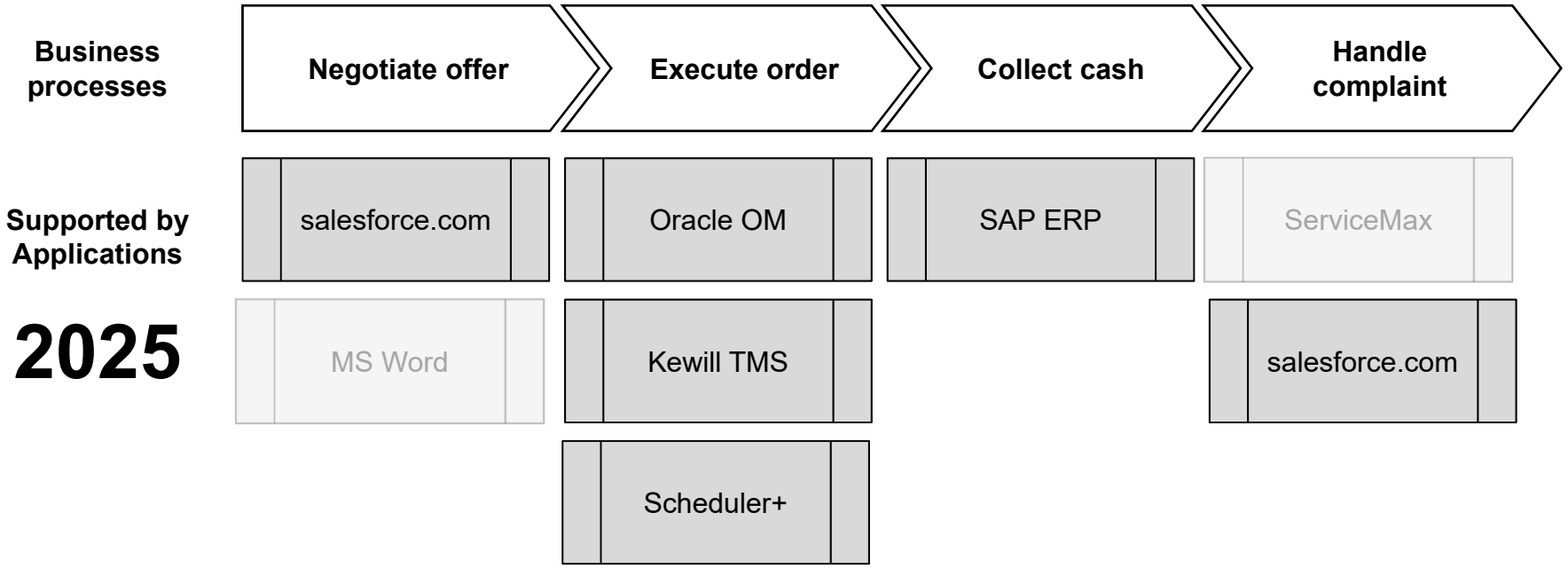
EA Viewpoint – Example Roadmap 2

Current application support for business processes:



EA Viewpoint – Example Roadmap 2

Current application support for business processes:



Enterprise Architecture – Architectural Layers

EAM approaches usually divide Enterprise Architecture into several layers. Although each approach has a different set of layers, the share common concepts.

Layer	Description	Examples
Business architecture	Depicts business-relevant concepts for aligning business needs with software applications in the application architecture.	process, strategy, goal
Application architecture	Depicts software systems (i.e. applications) required for supporting business processes as well as their interaction.	application, interface
Technology architecture	Depicts IT infrastructure required for running software systems in a corporate environment so that processes are supported in any location.	hardware, network, location

Basic Enterprise Architecture – Further Reading

- Op't Land, M. et al.: *Enterprise Architecture: Creating Value by Informed Governance*. Springer, 2009
- Jung. J. et al. (eds.): *Why are Practitioners Doing EAM?* 2019
- Bente, S. et al.: Collaborative Enterprise Architecture: Enriching EA with Lean, Agile and Enterprise 2.0 Practices. Morgan Kaufmann, 2012
- Kotusev, S.: The Practice of Enterprise Architecture: A Modern Approach to Business and IT Alignment. SK Publishing, 2018

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Enterprise Architecture Management Business Capabilities

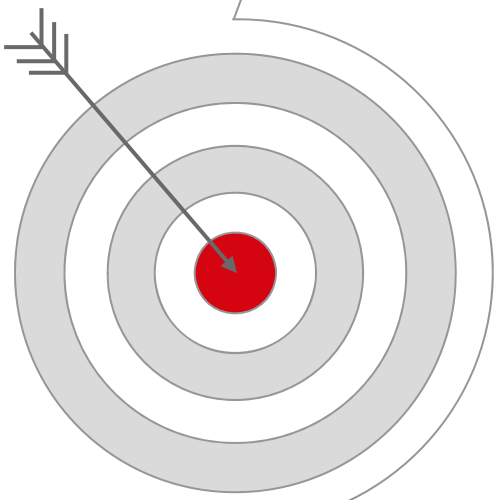
Henan Normal University, 2023

Prof. Dr. Jürgen Jung,
Frankfurt University of Applied Sciences

Agenda

- Introduction to Enterprise Architecture
- **Understanding Business Architecture**
- Developing Application Architecture
- Analysing Enterprise Architecture
- Managing Enterprise Architecture
- Applying Frameworks

Business Architecture – Learning Objectives



Explaining the difference between business processes and capabilities

Creating a capability map

Identifying business objects for a given enterprise

Summarising major business architecture concepts

Business Process – Motivation

Business process

Business processes are a means for structuring (work) activities in an organisation

The execution of a business process

- Takes time (start and end)
- Requires resources
- Occurs in a business context
- Is associated with cost

Process map

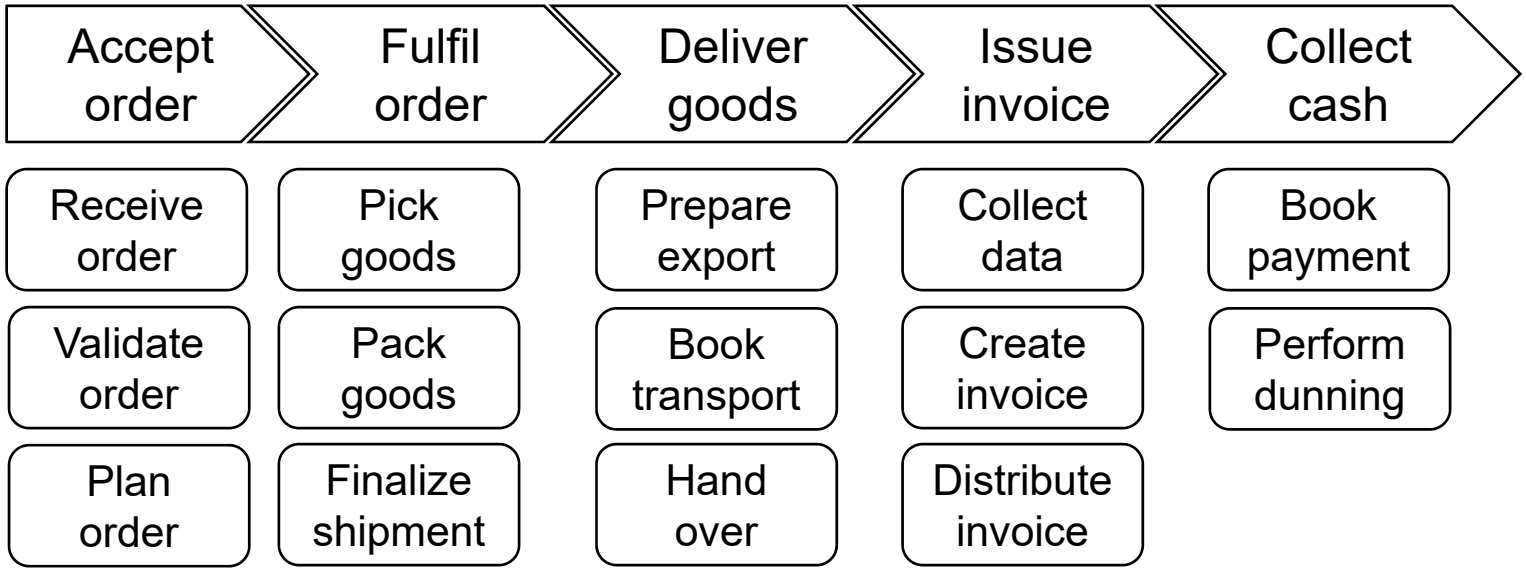
Process maps document business processes for communicating them among stakeholders

Process maps usually foster

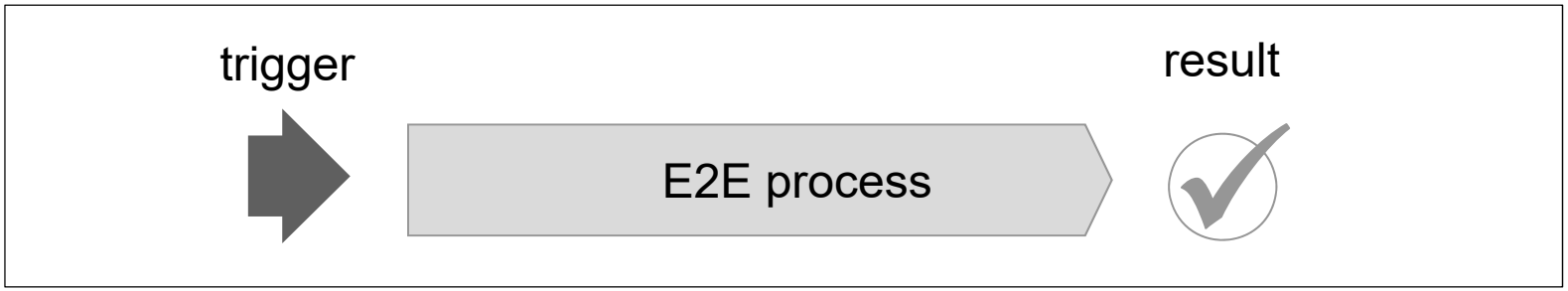
- Transparency by documenting flows
- Business process management
- Process improvement
- Operationalisation (automation)

Process Maps – Example *Order-to-Cash*

- Order-to-Cash covers all steps from receiving a new customer order until payment.
- The process map shows 5 main process steps and the major activities for each



Business Process – End-to-end (E2E) Processes



Customer-centric	■ The process starts and ends with the customer ■ The result needs to provide a value for the customer
Cross-functional	■ Breaking barriers within a company (no silo thinking) ■ Can even run across several companies
Value-add	■ Strict focus on value-adding activities ■ Describing *happy path* rather than complete incident handling
Adaptive	■ An E2E process is not defined once and then binding forever ■ It needs to be adjusted according to changes in the context

Business Process – Typical E2E Processes

E2E process	Classical view
C2C Contact-to-Contract	Marketing, sales and contract negotiation
O2C Order-to-Cash	Order fulfilment and cash collection
R2C Request-to-Close	Customer service, request handling
C2P Concept-to-Product	Product and service development
R2P Requirement-to-Pay	Purchasing and payment handling
S2V Strategy-to-Value	Strategic planning and management

Business Process – Typical E2E Processes

E2E process	Classical view
C2C Contact-to-Contract	Marketing, sales and contract negotiation
O2C Order-to-Cash	cash collection
R2C Request-to-Close	equest handling
C2P Concept-to-Product	development
R2P Requirement-to-Pay	Purchasing and payment handling
S2V Strategy-to-Value	Strategic planning and management

Can you determine trigger and result for each of them?

Process Maps & Models – Challenges

Process maps are often not available

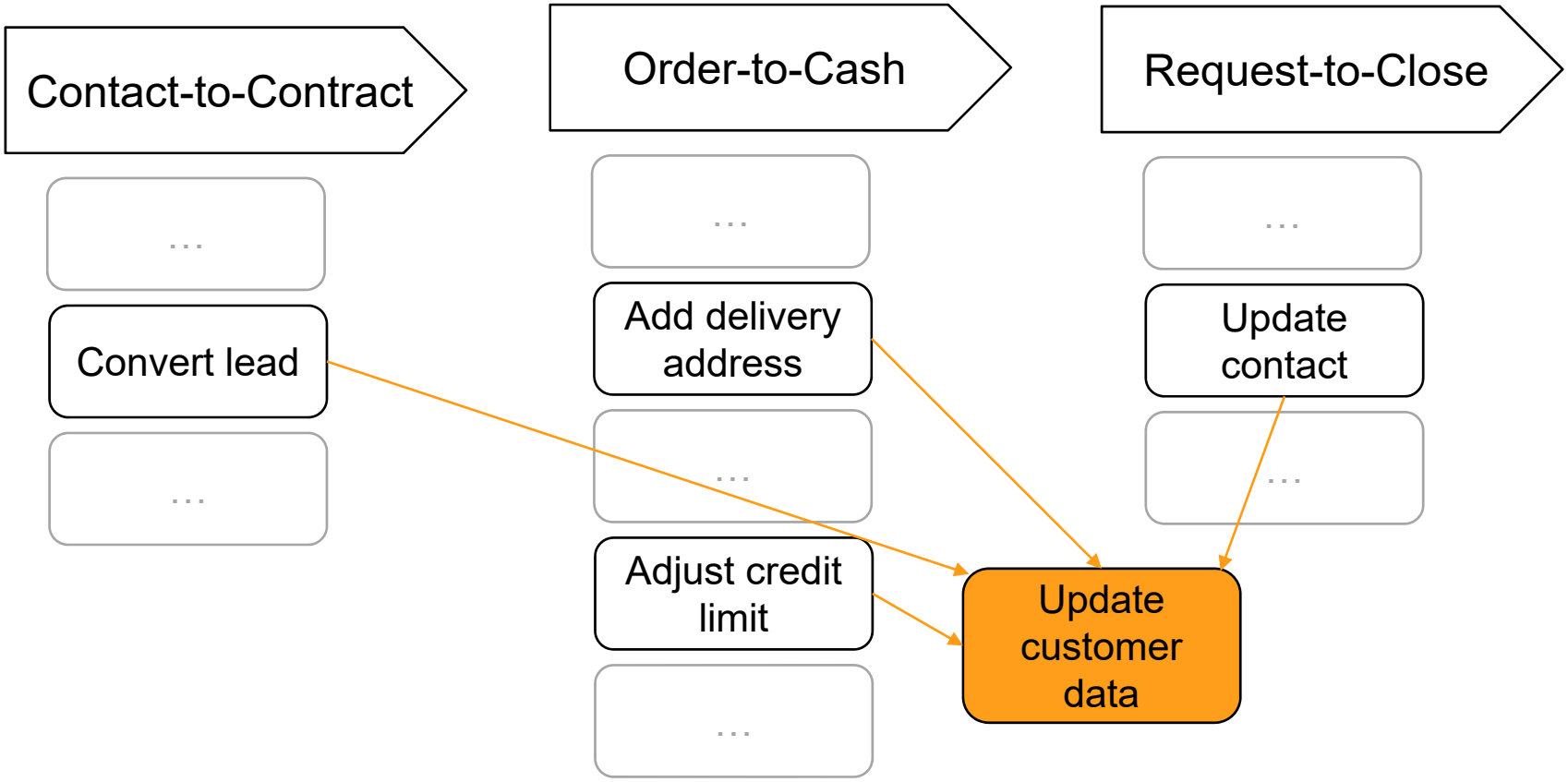
- No need for (detailed) maps
- Initial effort too high
- Existing maps not updated
- No ownership for process maps
- Resistance against transparency

Process maps and models tend to contain too much information

- Detailed steps and activities
- Information irrelevant for EAM (e.g. decisions, events)
- Redundant activities

Functional view for EAM

Process Maps & Models – Redundancies Example

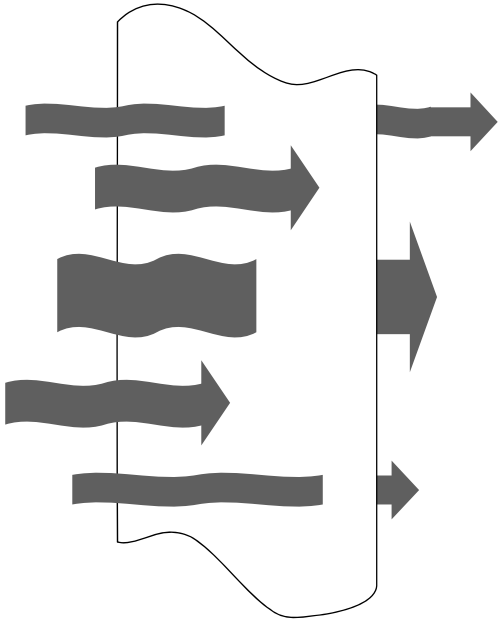


Process Maps & Models – Level of Detail

The **challenge** in EAM is **aggregating** information so that it can be used for making **mid- to long-term decisions** about the business and supporting IT applications.

Process

- Detailed steps as work instructions for people
- Actors and responsibilities
- Control flow (order for execution of activities)
- Resources and utilisation
- Business rules (if … then …)
- Detailed data models
- Events with details
- …..



EAM concepts (excerpt)

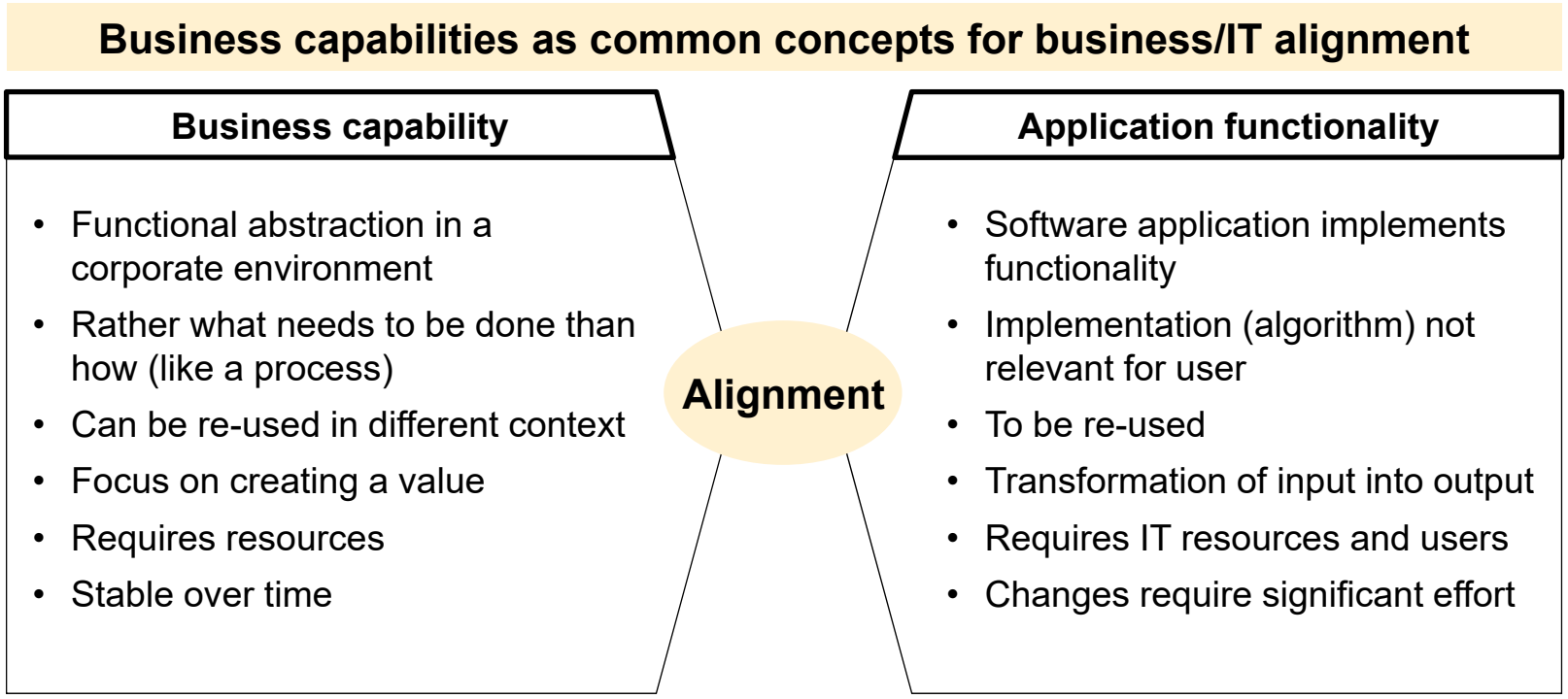
- Business capabilities
- Organisational units
- Interfaces between applications and organisations
- Strategic resources
- Objectives, KPI and drivers
- High-level business objects

Business Capability – Definition

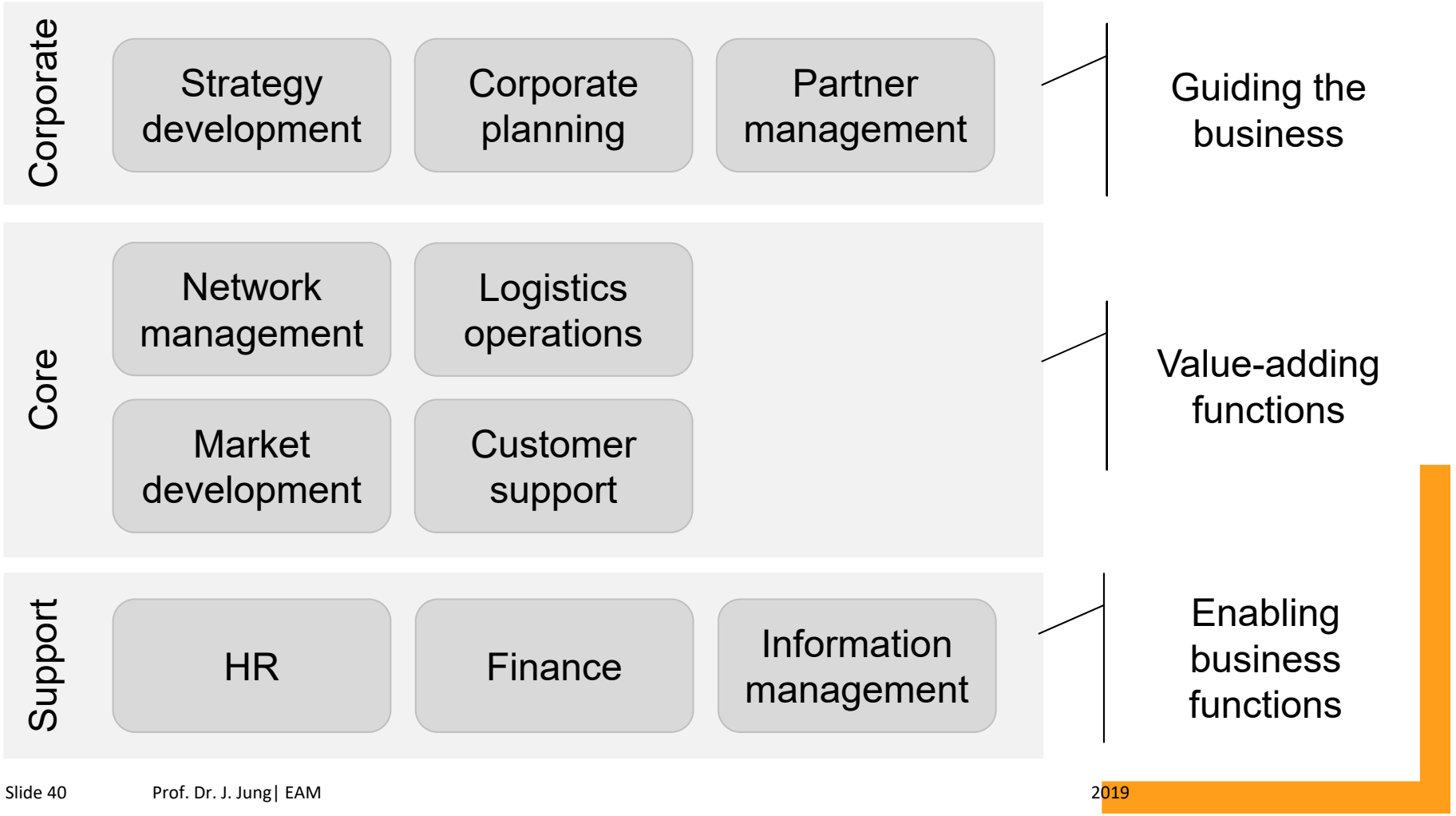
A **business capability** (or just **capability**) is a functional abstraction within the business architecture and represents *what* the business is doing instead of providing details about how activities are performed.

A capability (directly or indirectly) relates to the business model and supports achieving the business strategy.

Capability – Related to IT Applications



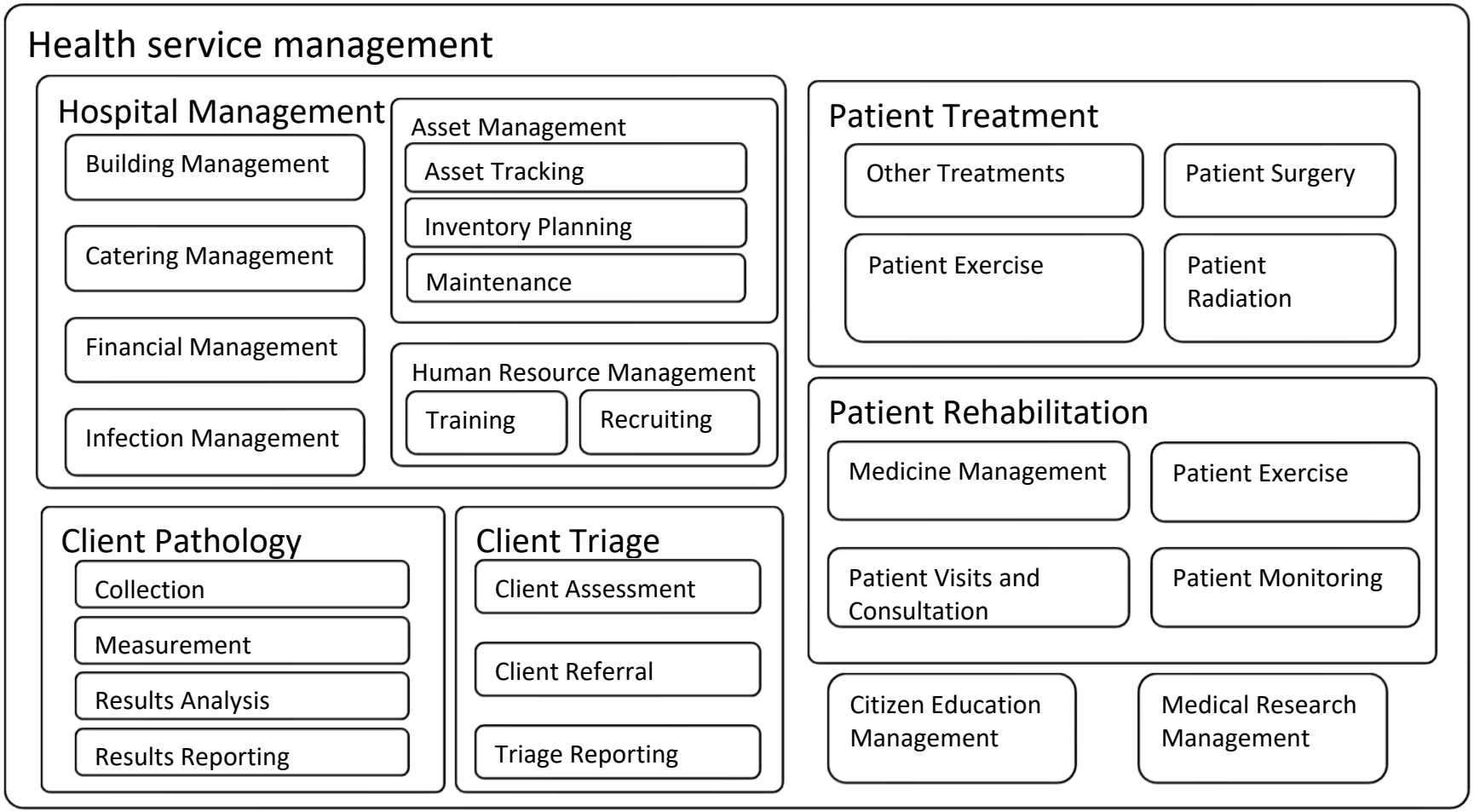
Capability – Example Capability Map



Capability – Required Properties

	Property	Explanation
1	Business-centric	Defining what a business does using business terms
2	Stable	Only changed if business model changes
3	Organisationally agnostic	Does not represent organisational structure
4	Technologically agnostic	Does not imply if and how supported by technology
5	Hierarchical	Capabilities can be decomposed (3 or 4 levels)

Example Capability Map – Health Industry



Capability – Sources for Capabilities

Source	Description	Examples
Business processes	• Consolidation of common steps in processes • But: Risk of replicating redundancies	Customer data management
Business objects	• Identify business-relevant concepts • Determine what needs to be done with them	Customer, order, invoice
Reference architecture	• Existing capability maps as reference • Process frameworks or reference processes	PCF by APQC

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Enterprise Architecture Management
Business Architecture

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Business Object – Definition

A **business object** (BO) is a static abstraction in the business architecture for representing an entity or concept of the company and relates to the business model.

Even though they are less detailed than a data type, business objects can be used as the basis for developing a data model in system development.

Business Object – Required Properties

Example business objects	Properties

Corporate
- Business strategy
- Budget
- Policy

Core
- Customer
- Customer order
- Transport service provider
- Booking
- Invoice

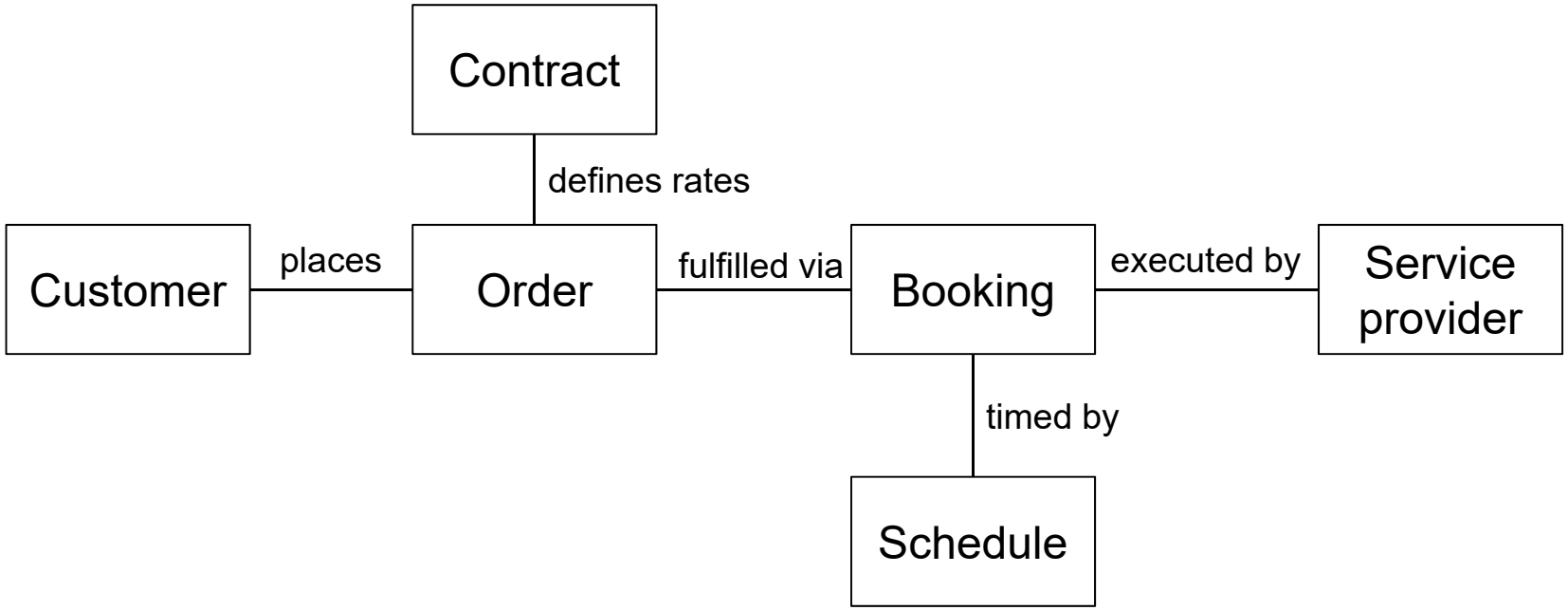
Support
- Facility
- Information

1. Business-centric
2. Long-term relevance
3. Organisationally agnostic
4. Technologically agnostic
5. Hierarchical

Business Objects – Business Object Model

A **business object model** (BOM) shows business objects as well as their relationships.

Example:

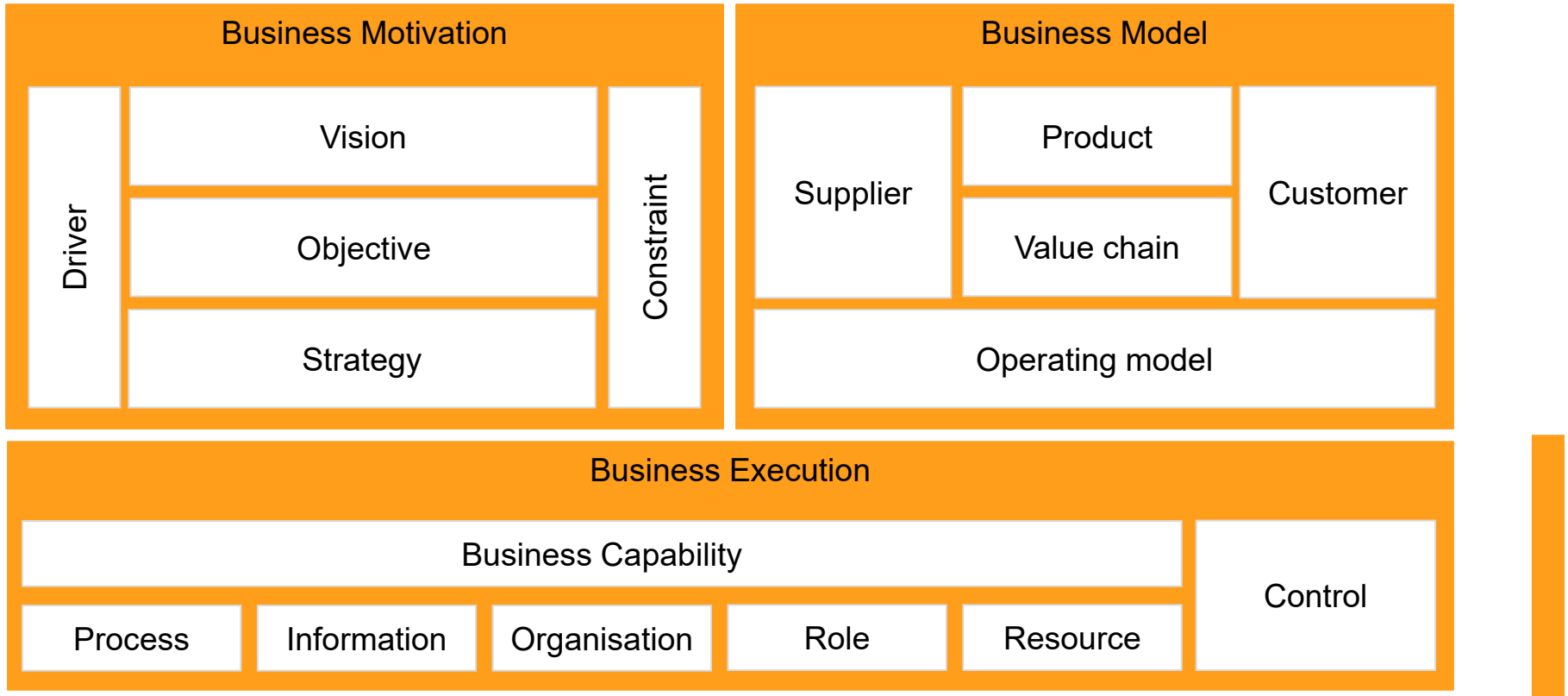


Business Object – In- and Output of Capabilities

"Transport planning requires a transport order from a customer and will create a flight booking for an airline based on their schedule."

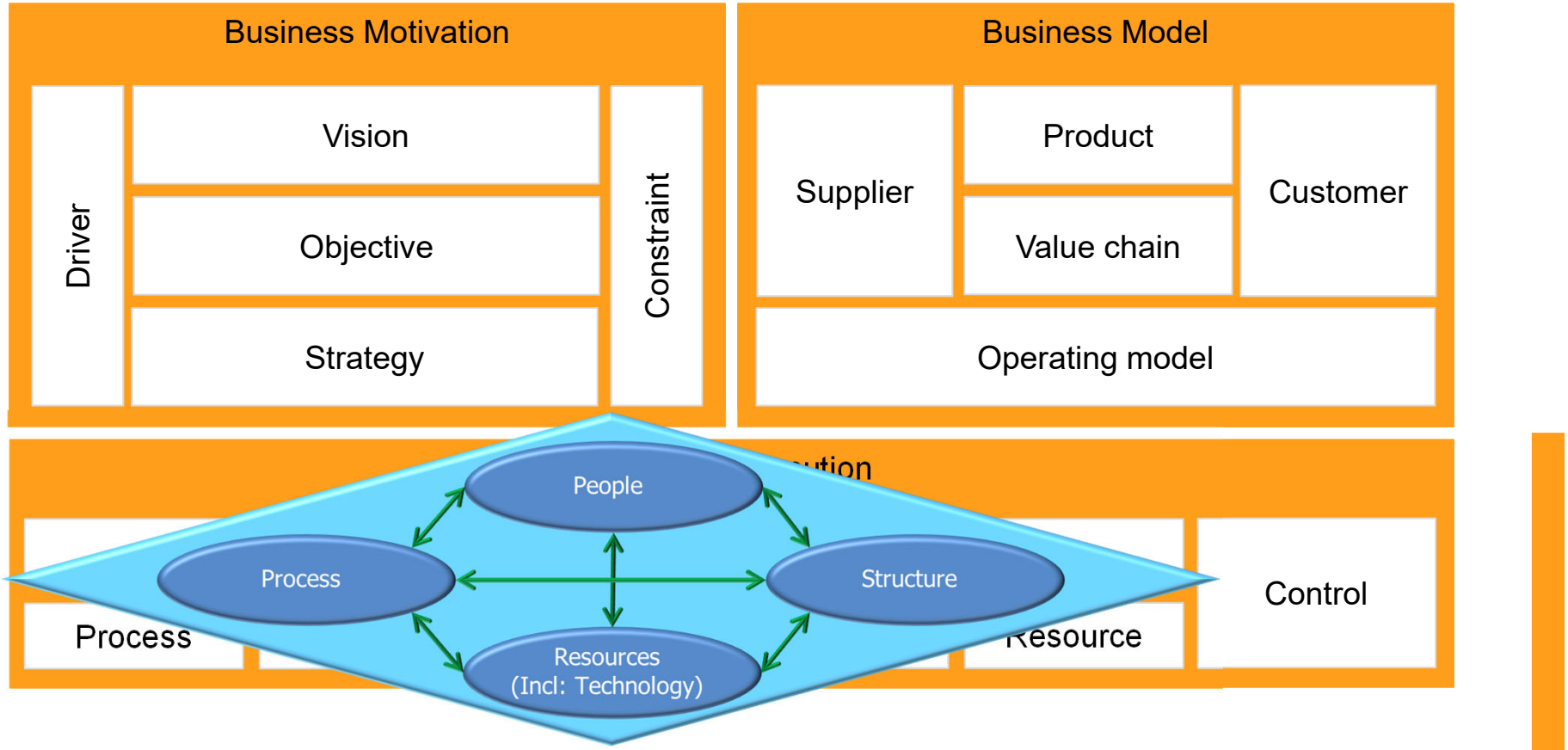
"A sales opportunity can be transformed into a contract with a customer by the sales capability."

Business Architecture – Further Concepts



Source: Simon, D.; Schmidt, C.: *Business Architecture Management: Architecting the Business for Consistency and Alignment*. Springer, 2015

Business Architecture – Just a Different View!



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Business Architecture – Business Motivation

Concept	Description
Driver	Motivation for setting the vision and achieving objectives
Vision	Guiding image for the enterprise, providing direction
Objective	Desired result—specific, measurable, achievable, timed
Strategy	General course of actions and business priorities
Constraint	Political, economic, social, technological or internal

Business Architecture – Business Model

Concept	Description
Supplier	Partner providing resources or services
Product	Product or service with value proposition for customers
Customer	Business customer or consumer grouped by segment
Value chain	Main value adding stages from supplier to customer
Operating model	Business blueprint for implementing the value chain

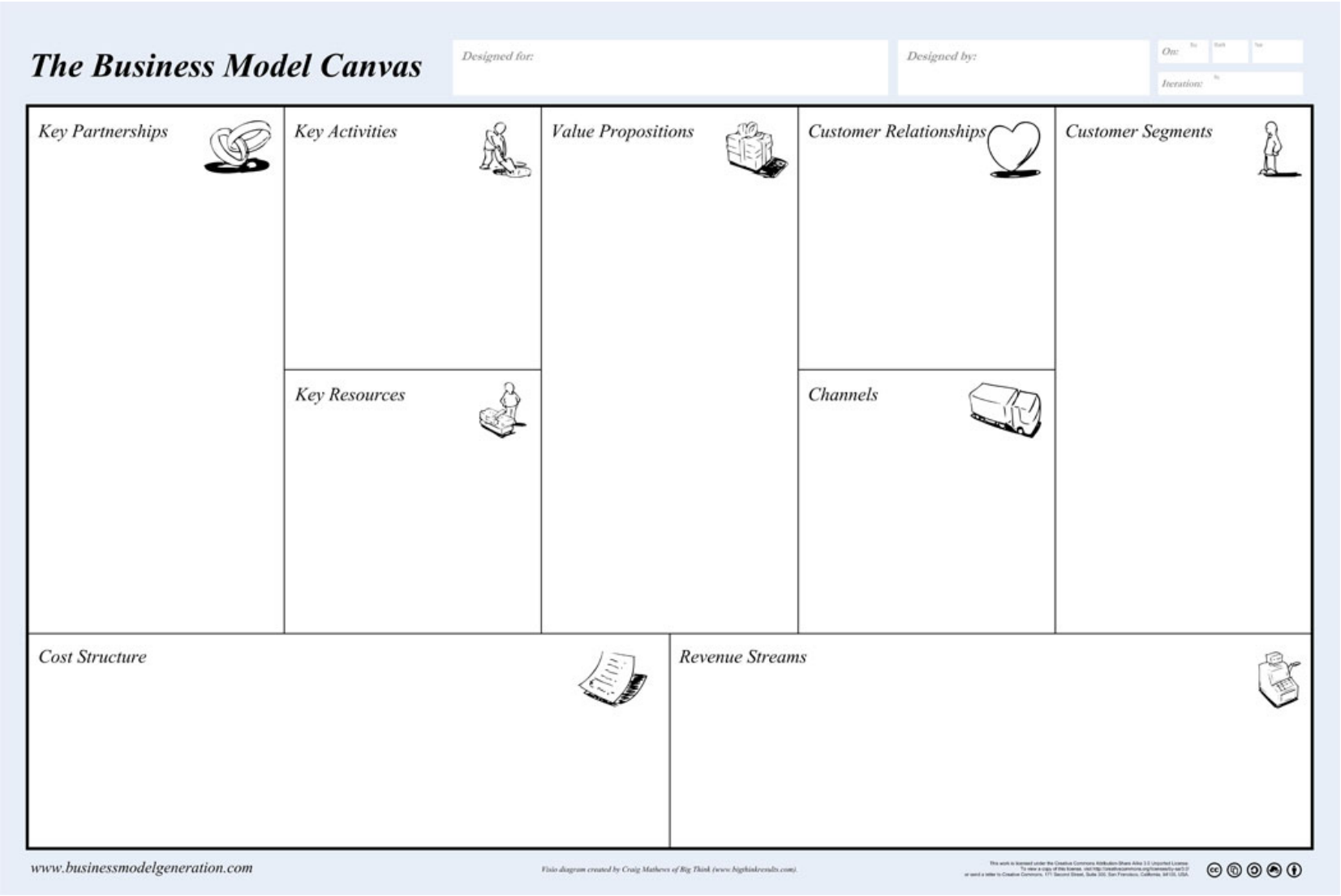
Business Architecture – Business Execution

Concept	Description
Information	Information objects required for performing processes
Organisation	(Hierarchical) structure of executing business units
Role	Human actor or skill required for a specific activity
Resource	Any tool or material required for business processes
Control	Measures for controlling compliance and performance

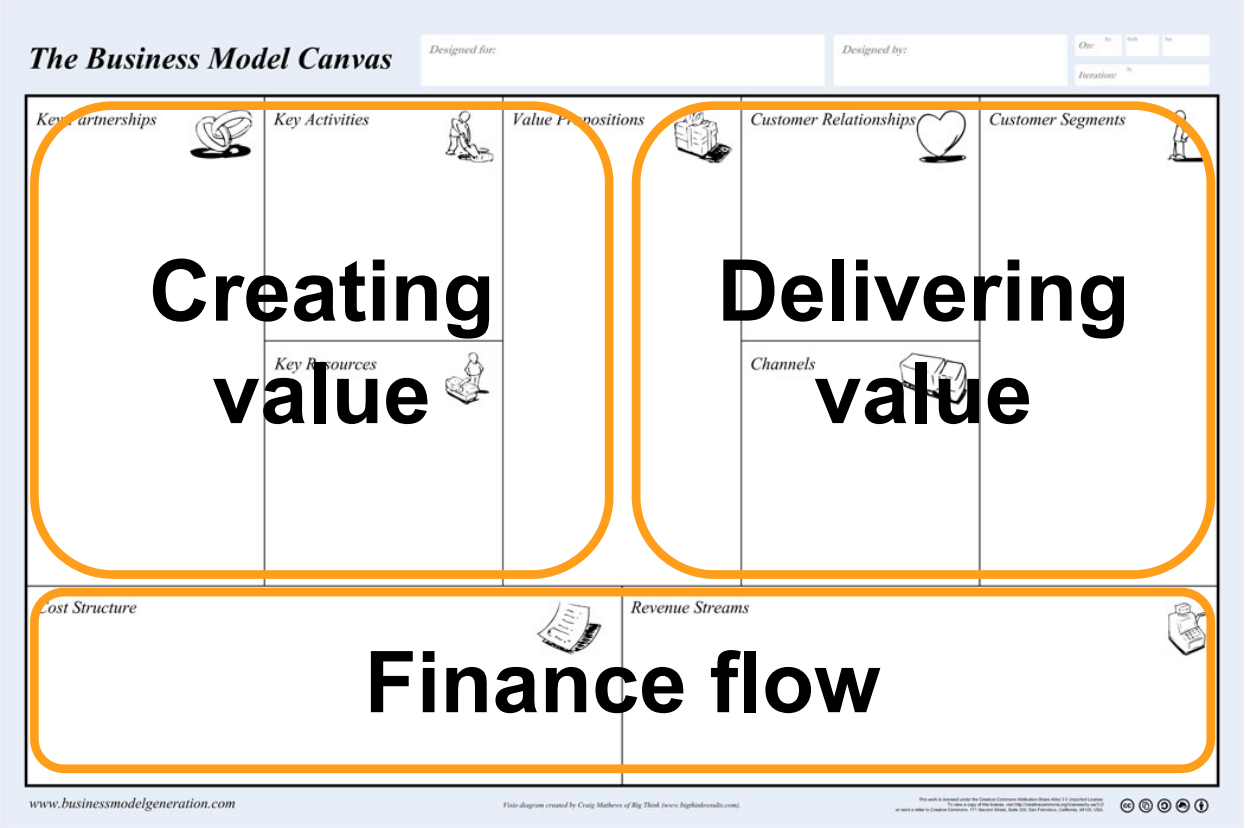
Business Architecture – Further Reading

- Sharp, A.; McDermott, P.: *Workflow Modeling: Tools for Process Improvement and Application Development*. 2nd edition, Artech House, 2008
- Simon, D.; Schmidt, C.: *Business Architecture Management: Architecting the Business for Consistency and Alignment*. Springer, 2015
- The Open Group: *Business Capabilities.* Open Group Guide, 2016
- Burlton, Roger: *Developing your Capability Architecture. It's all about being able to get things done*. bptrends, 2017. https://www.bptrends.com/essentials-of-business-architecture-developing-your-capability-architecture-its-all-about-being-able-to-get-things-done

Business Model Canvas – Overview



Business Model Canvas – Major Aspects



Business Model Canvas – Delivering Value

Value Proposition	Customer relationships	Customer segments
• Products and services creating value for a customer • Solves a customer problem or satisfies a customer need • Reason why customers turn to one company over another.	• types of relationships with customers • Personal or digital **Channels** • Channel for delivering a Value Proposition • Communication, distribution, and sales channels	• People or organizations an enterprise aims to serve • Grouped by common needs, common behaviour, or other attributes

Source: Osterwalder, A.; Pigneur, Y.: *Aligning Profit and Purpose Through Business Model Innovation*. In: Responsible Management Practices for the 21st Century, 2011

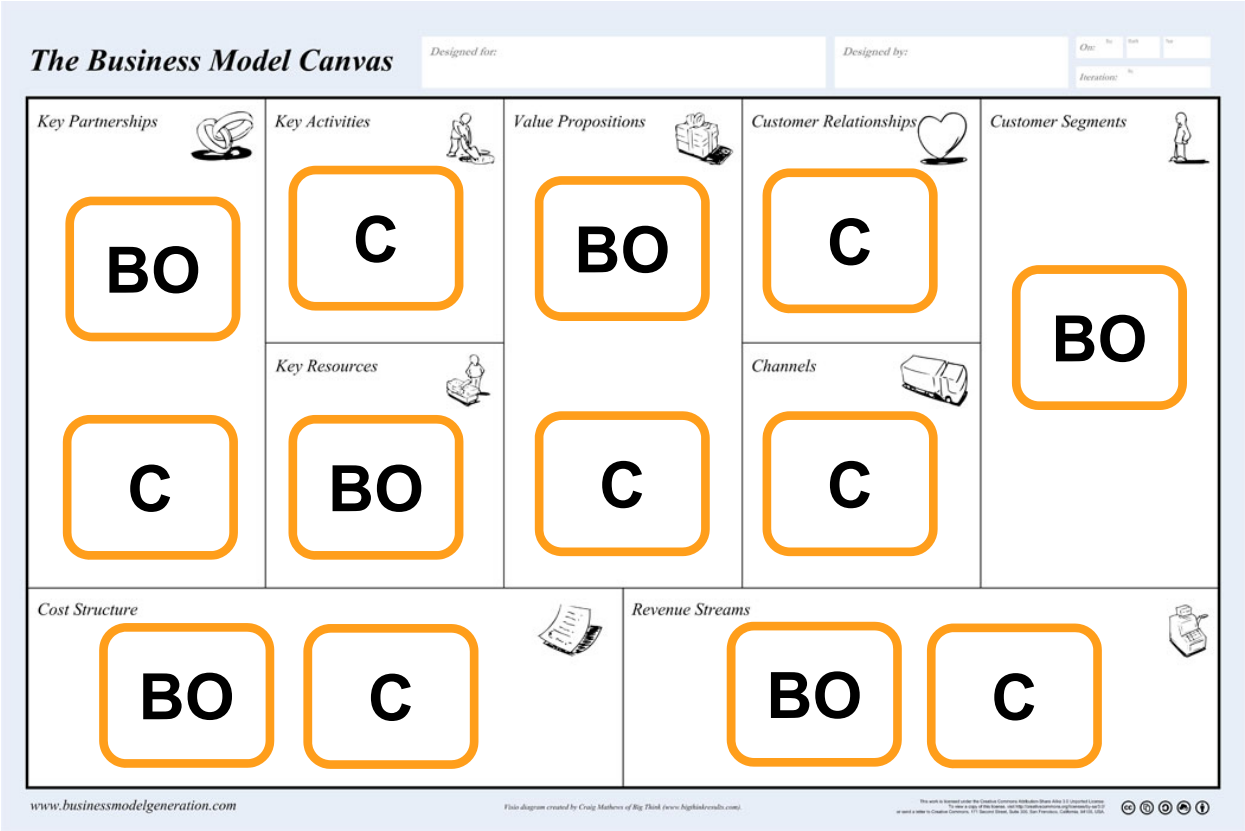
Business Model Canvas – Creating Value

Key Partners	Key Activities	Value Proposition

• Network of suppliers and partners
• Purpose
  • optimise business model
  • reduce risk
  • acquire resources
• Partnerships need to be established and managed
	Activities for
	• Creating and offering a Value Proposition
	• Reaching markets
	• Maintain relationships
	
	Key Resources
	• Performing key activities
	• Examples: physical, financial, intellectual, or human resources
		• Products and services creating value for a customer
		• Solves a customer problem or satisfies a customer need
		• Reason why customers turn to one company over another.

Source: Osterwalder, A.; Pigneur, Y.: *Aligning Profit and Purpose Through Business Model Innovation*. In: Responsible Management Practices for the 21st Century, 2011

Business Model Canvas – Architecture

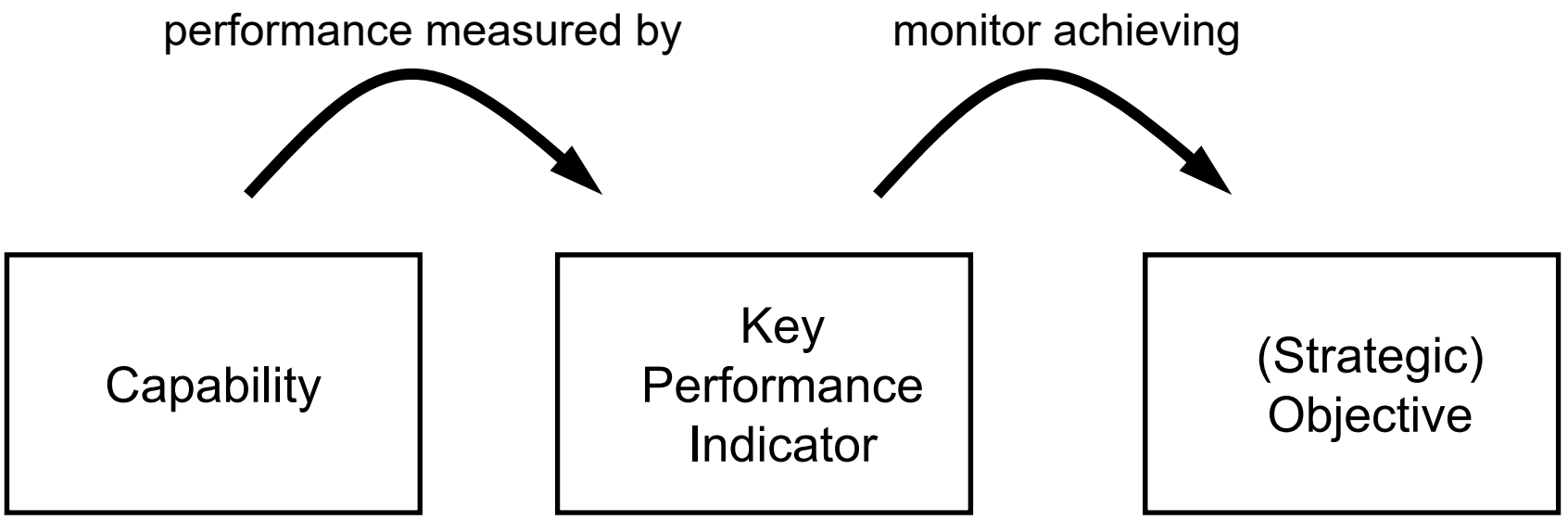


Legend

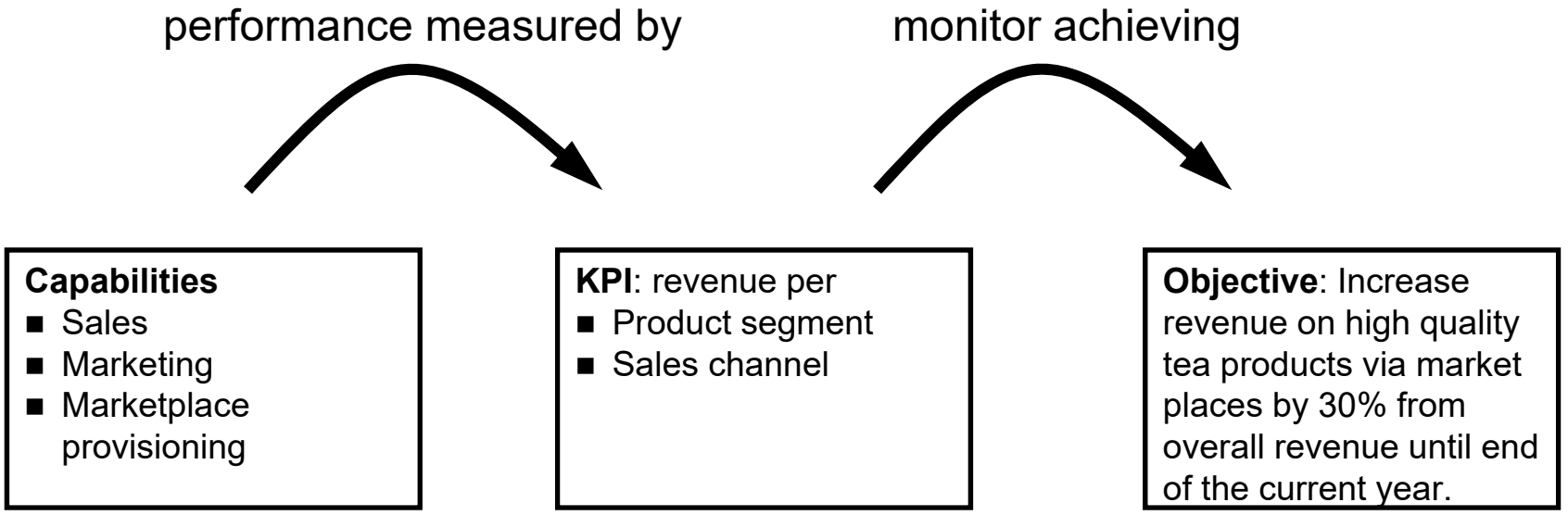
C Potential candidates for capabilities

BO Potential candidates for business objects

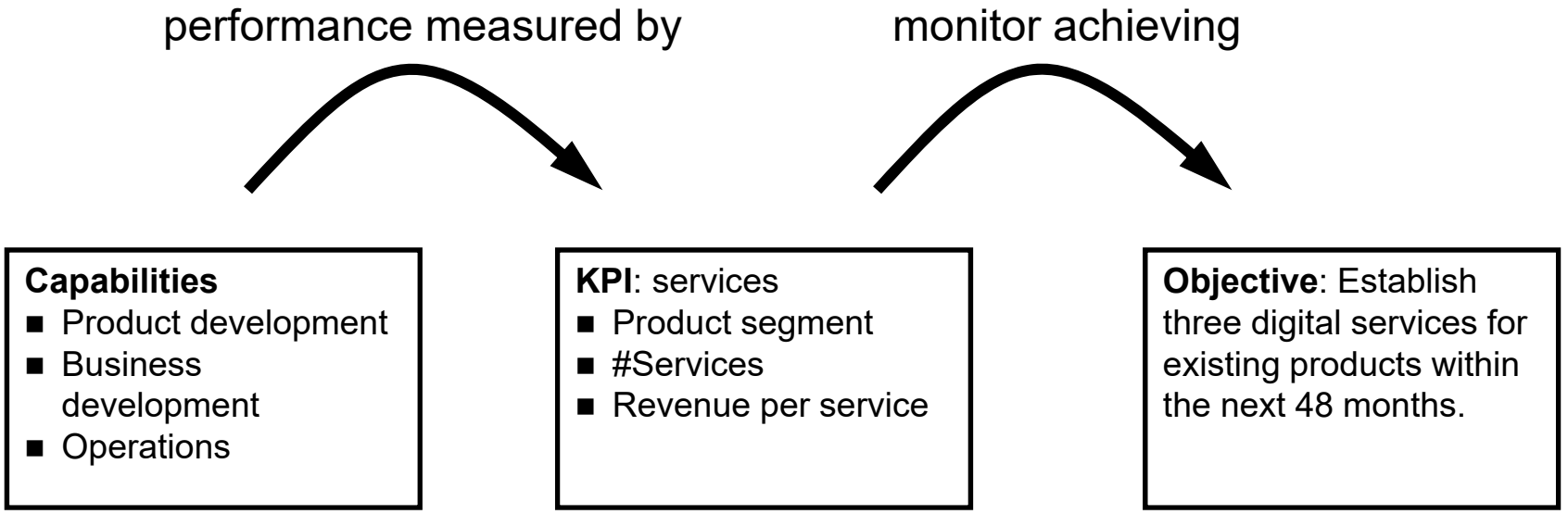
Capabilities and Strategy



Capabilities and Strategy



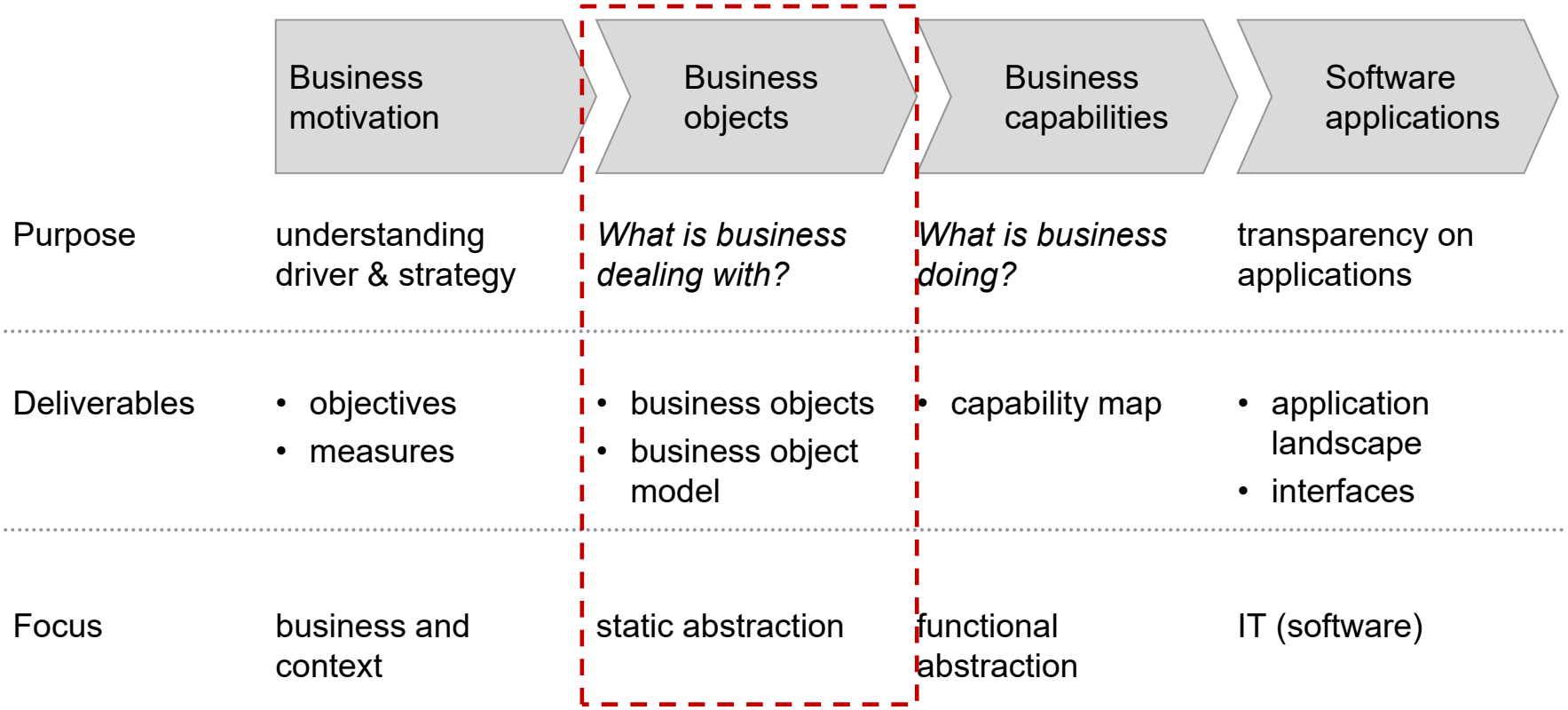
Capabilities and Strategy



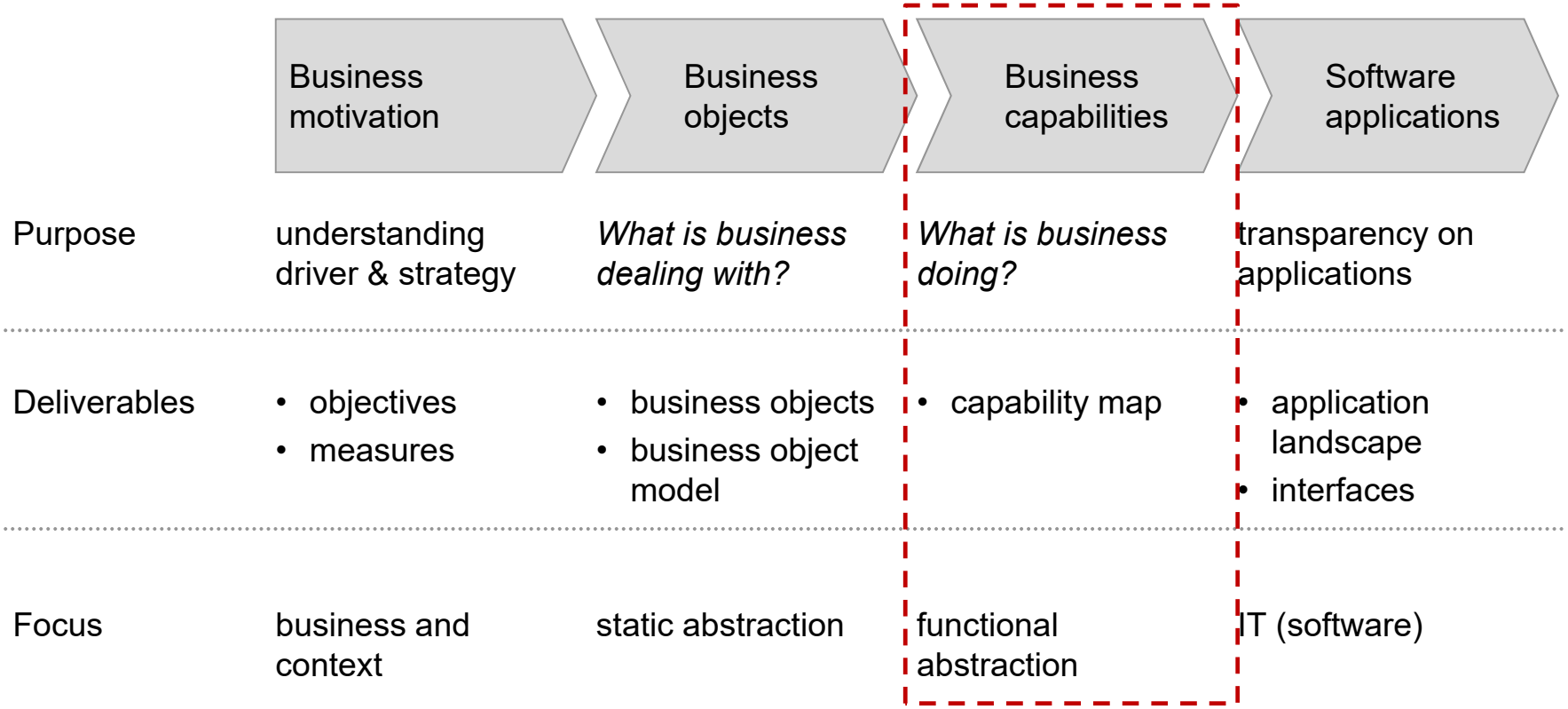
Business Objects and Context

Purpose	understanding driver & strategy	*What is business dealing with?*	*What is business doing?*	transparency on applications
Deliverables	• objectives • measures	• business objects • business object model	• capability map	• application landscape • interfaces
Focus	business and context	static abstraction	functional abstraction	IT (software)

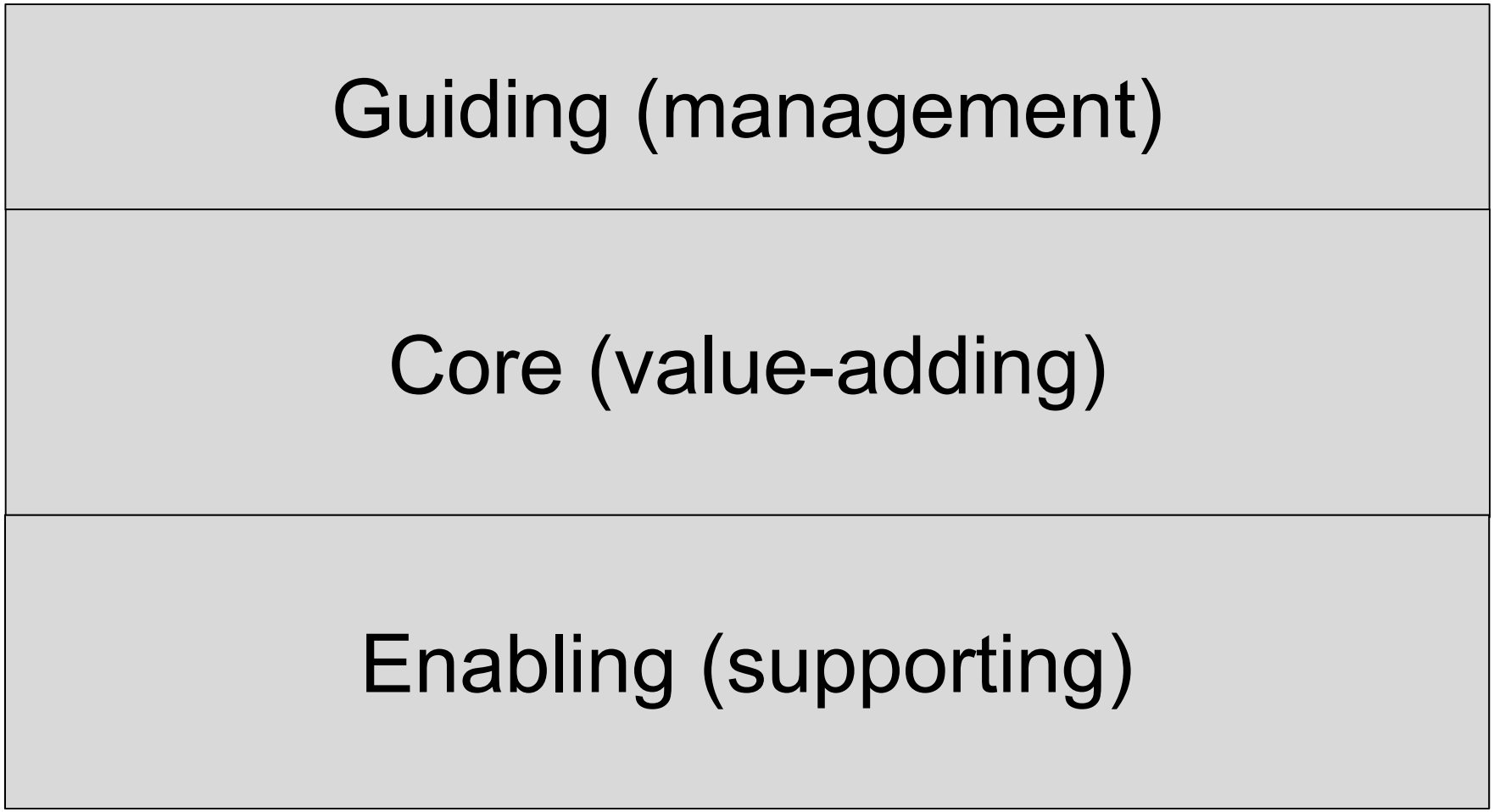
Business Objects and Context



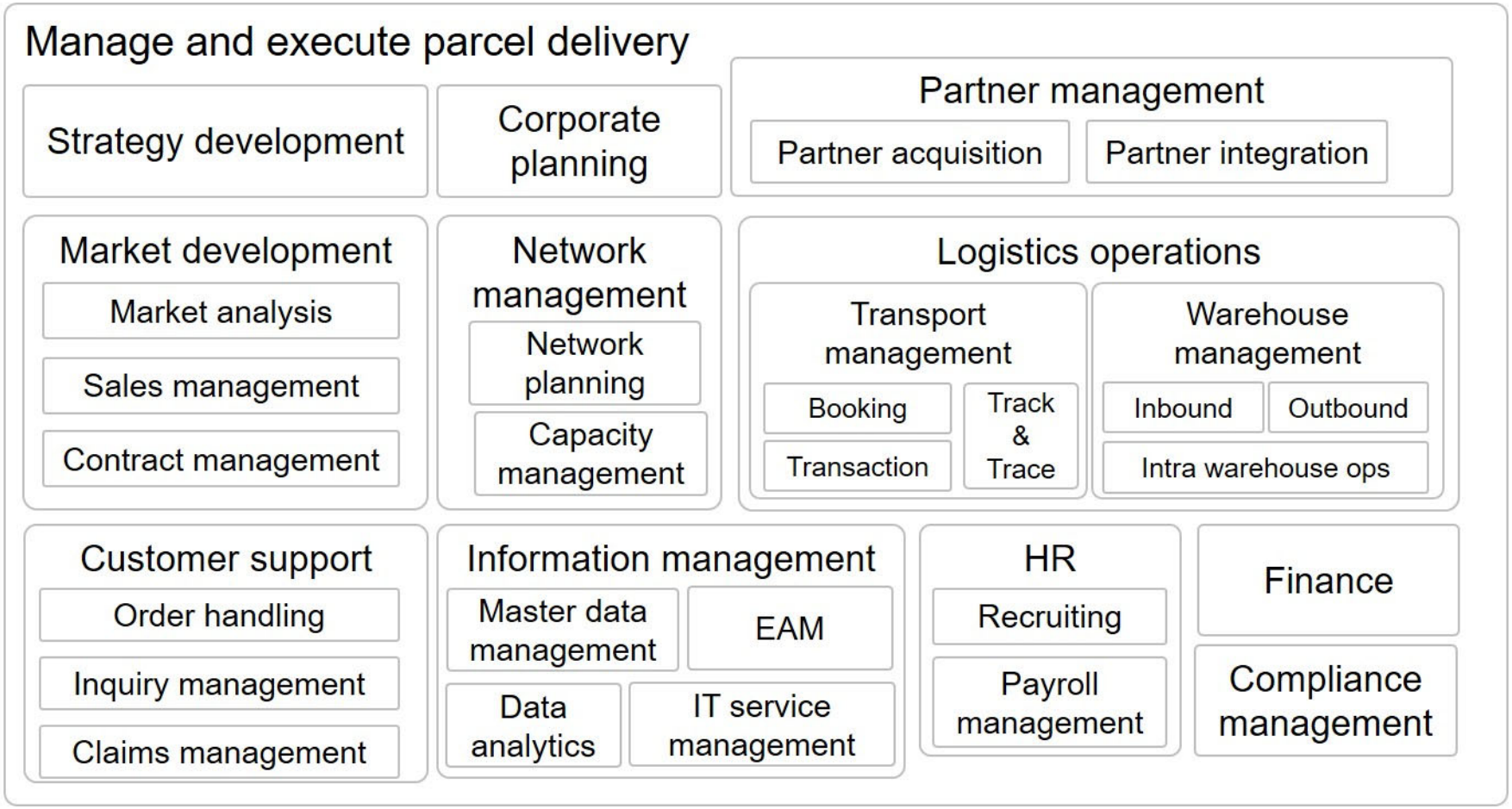
Business Objects and Context



Business Capabilities – Example



Business Capabilities – Example



Business Capabilities – Sources

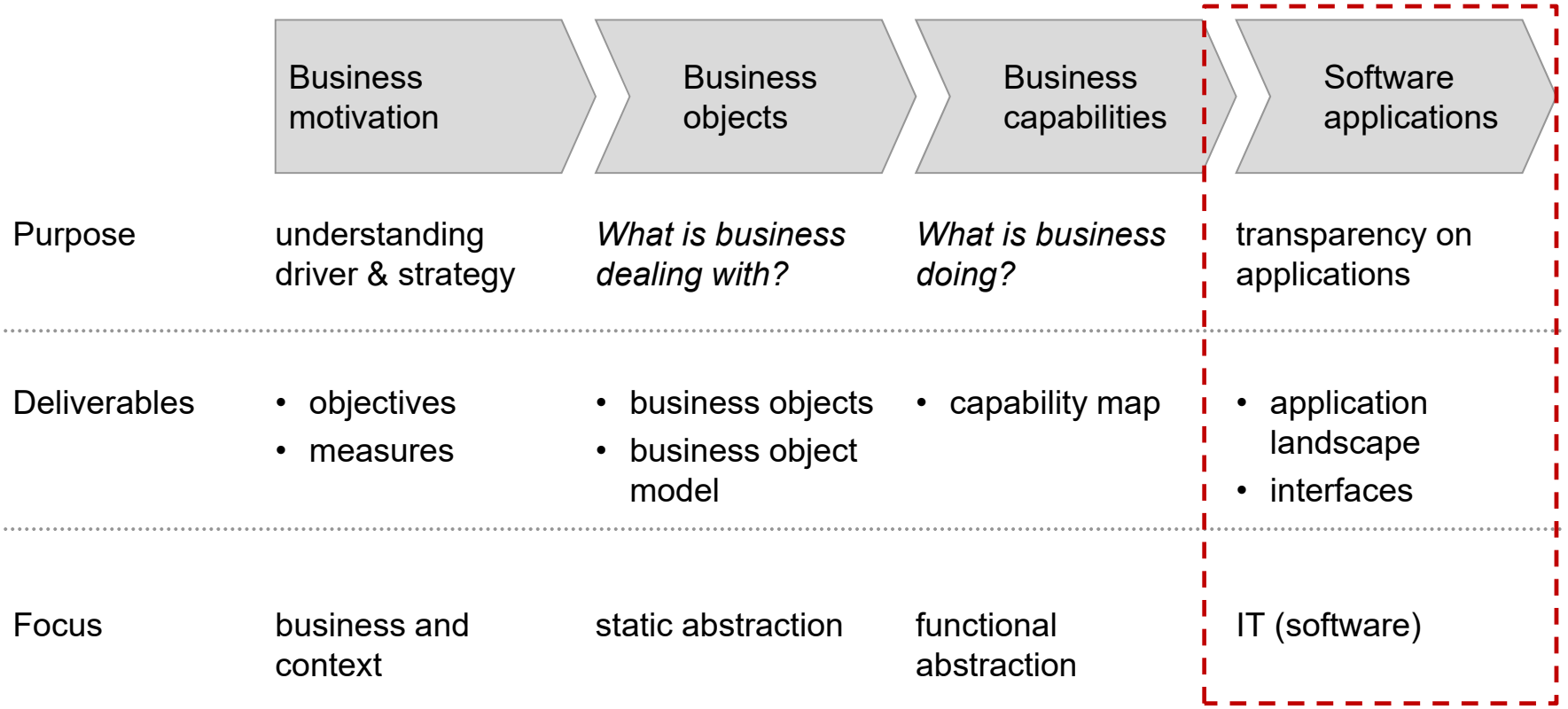
Source	Description	Examples
Business processes	• Consolidation of common steps in processes • But: Risk of replicating redundancies	Customer data management
Business objects	• Identify business-relevant concepts • Determine what needs to be done with them	Customer, order, invoice
Reference architecture	• Existing capability maps as reference • Process frameworks or reference processes	Business Architecture Guild

Enterprise Architecture Management Application Architecture

Henan Normal University, 2023

Prof. Dr. Jürgen Jung,
Frankfurt University of Applied Sciences

Business Objects and Context



Capability – Example Capability Map

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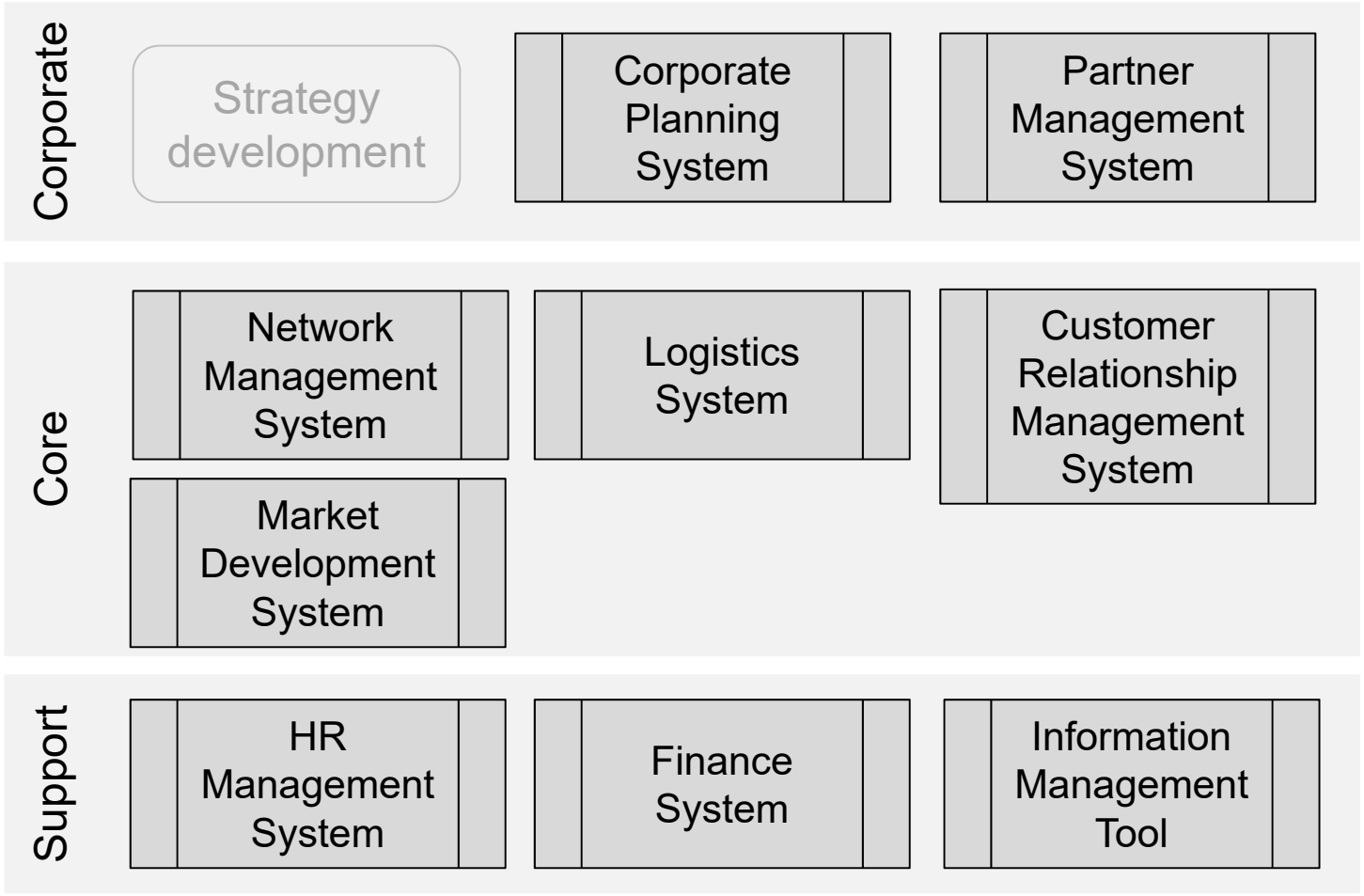
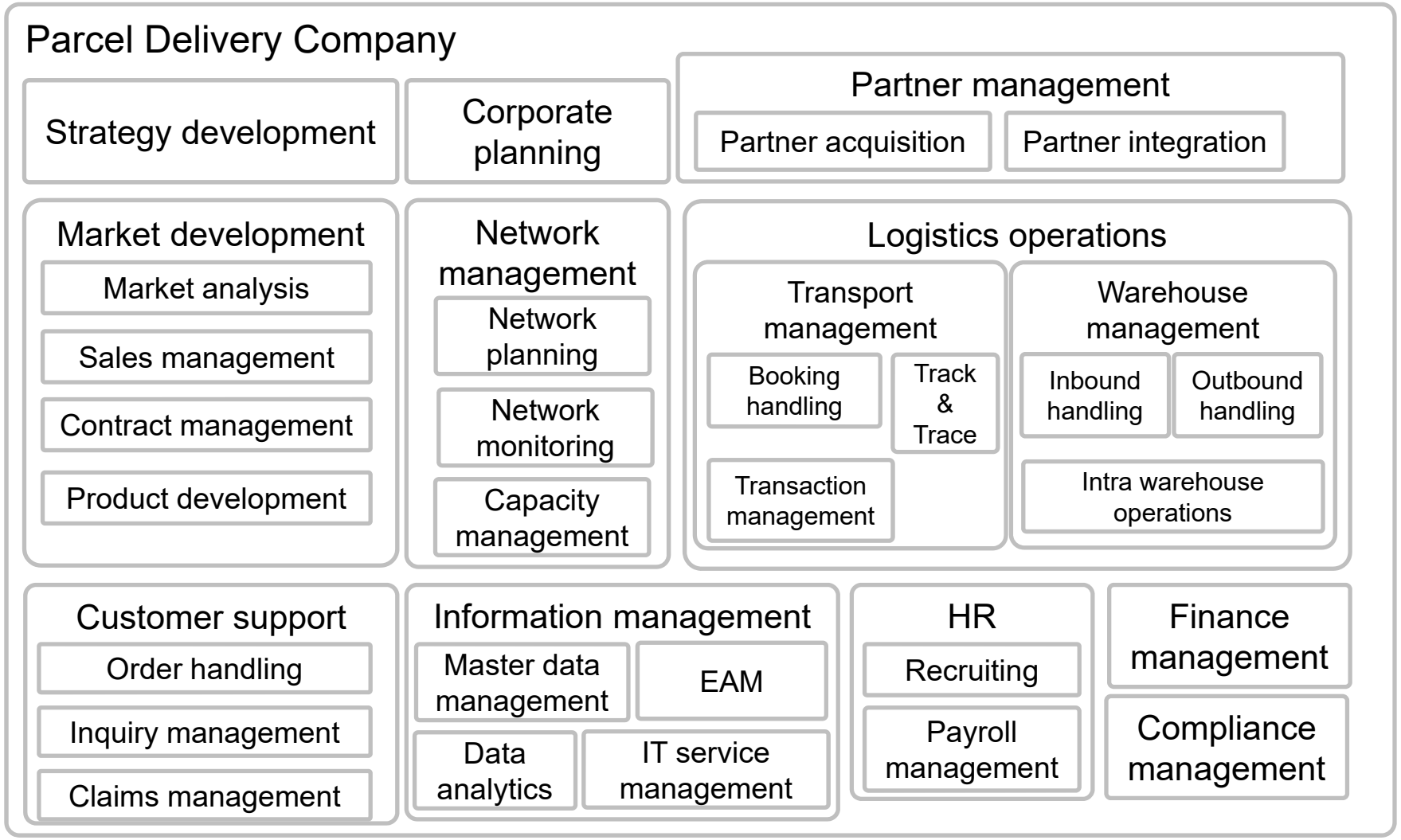


Example Capability Map – Logistics Company



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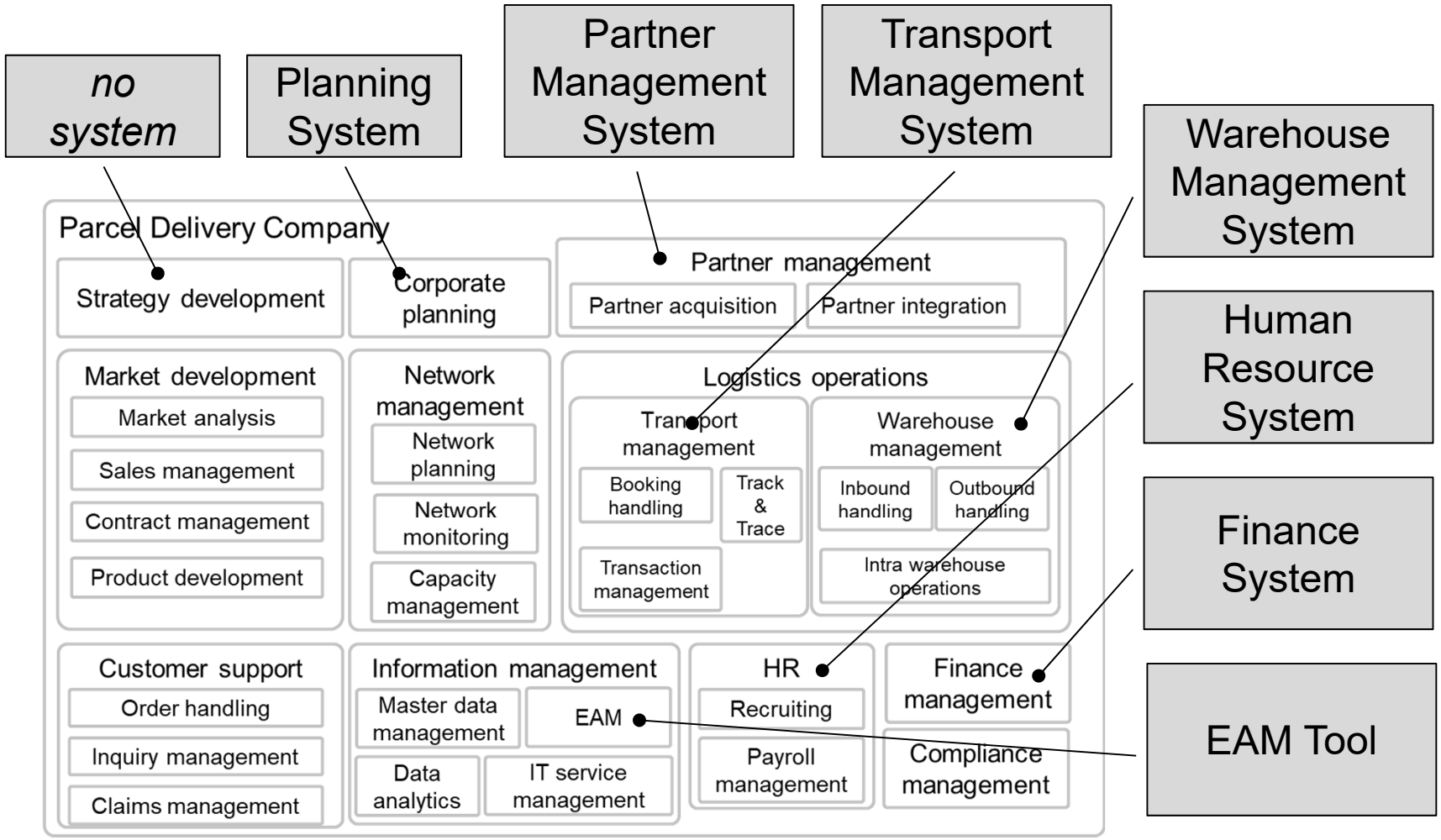
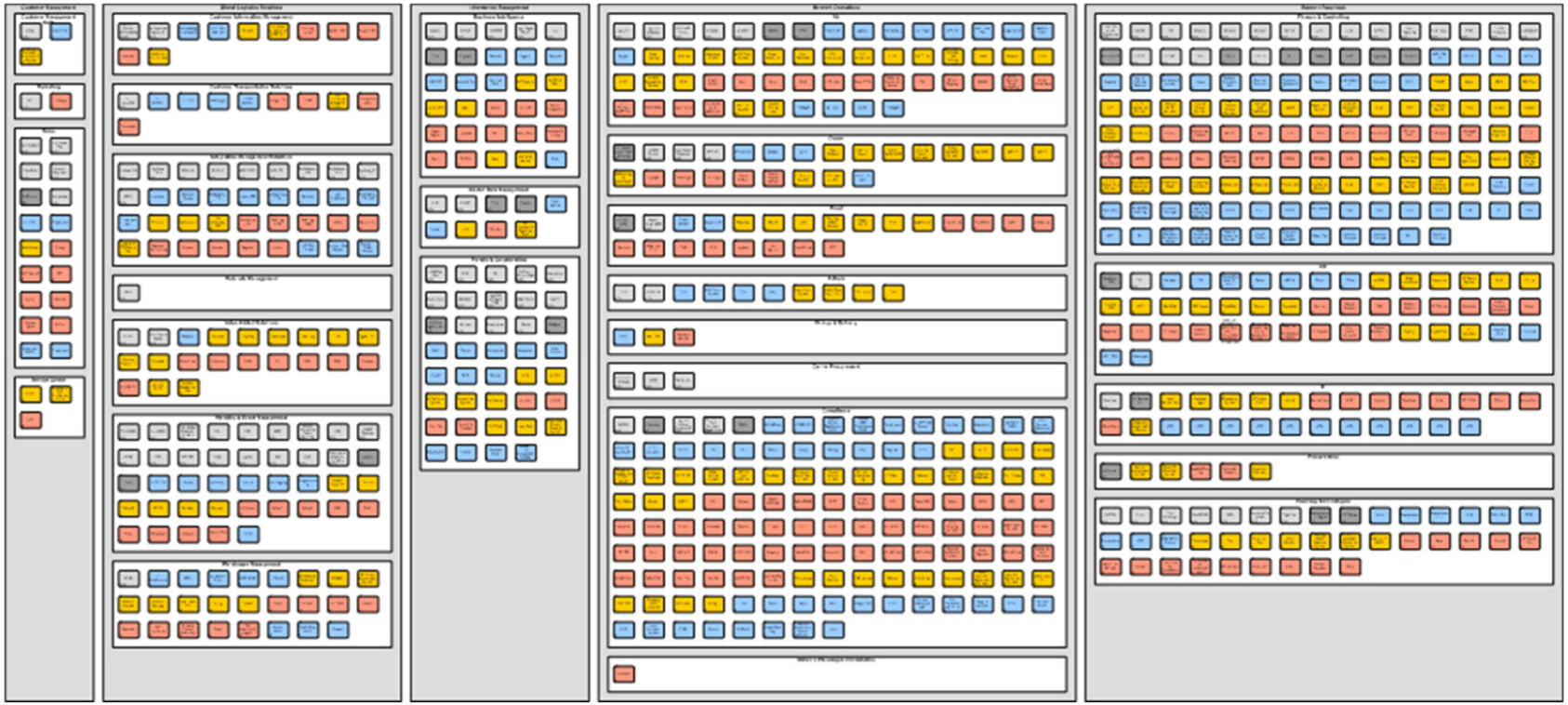
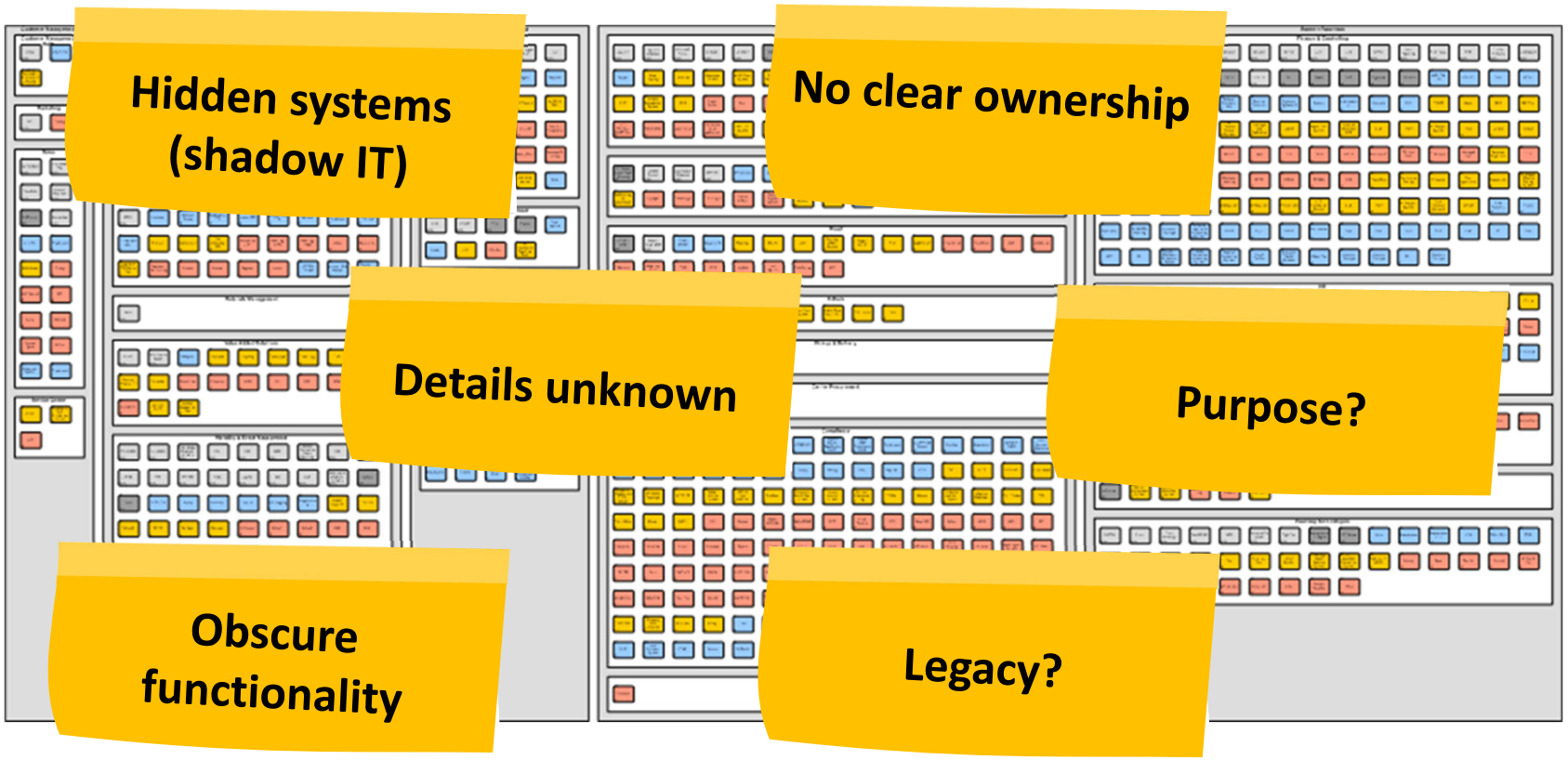


Application Landscape – Large Example



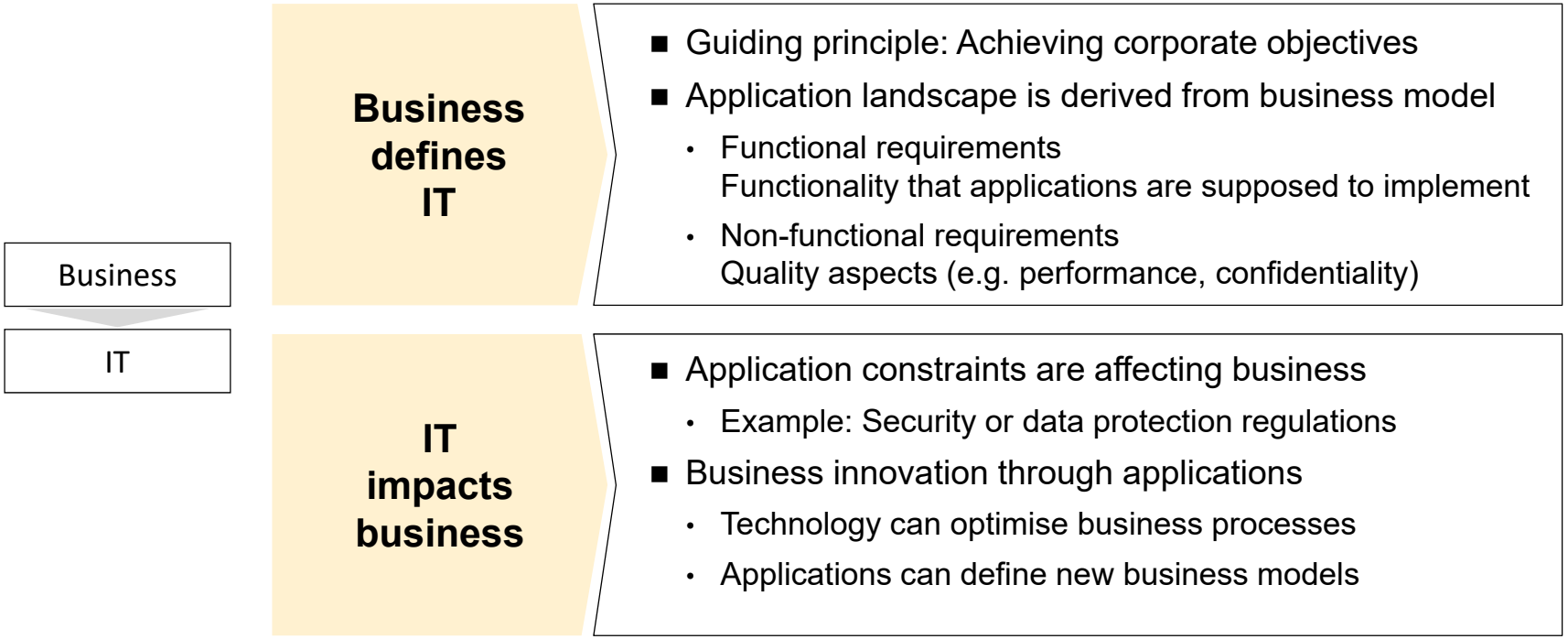
Applications: global regional Icon ASPA Icon EMEA Icon AM

Remember – There is also an As-is!

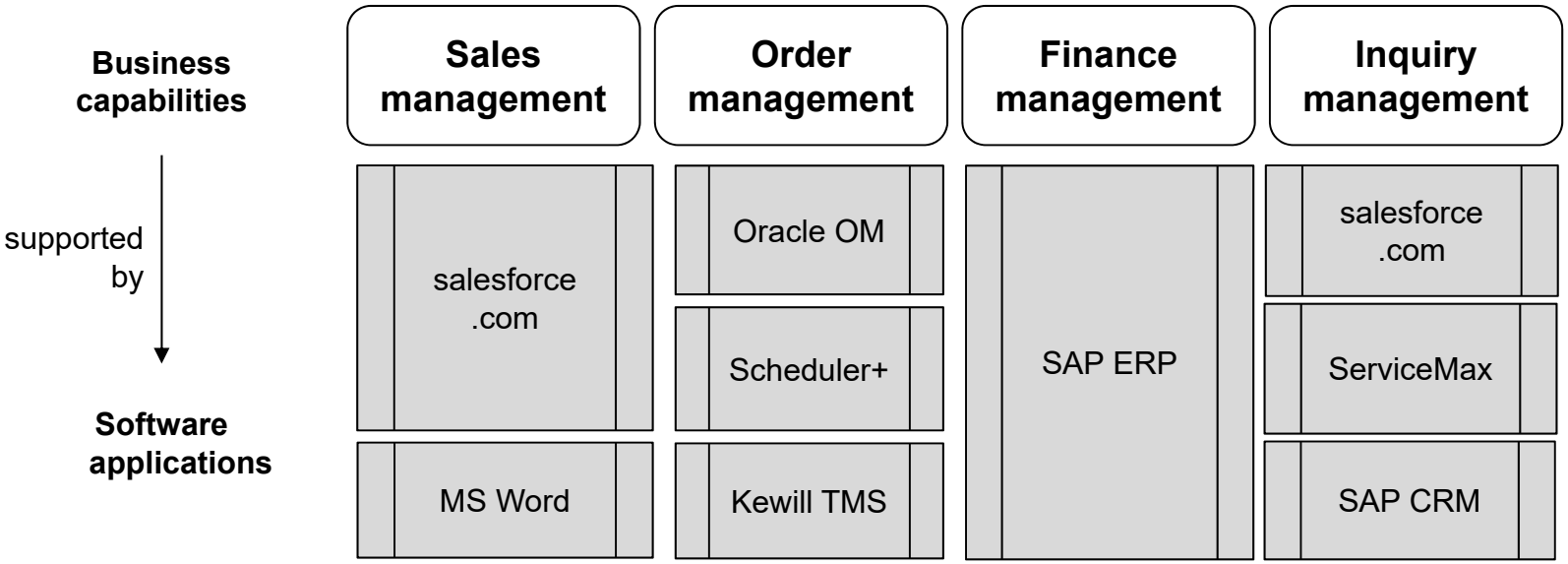


Enterprise Architecture – Business-driven IT

Enterprise Architecture is a holistic approach for aligning business and IT.



Business Support Matrix – Example



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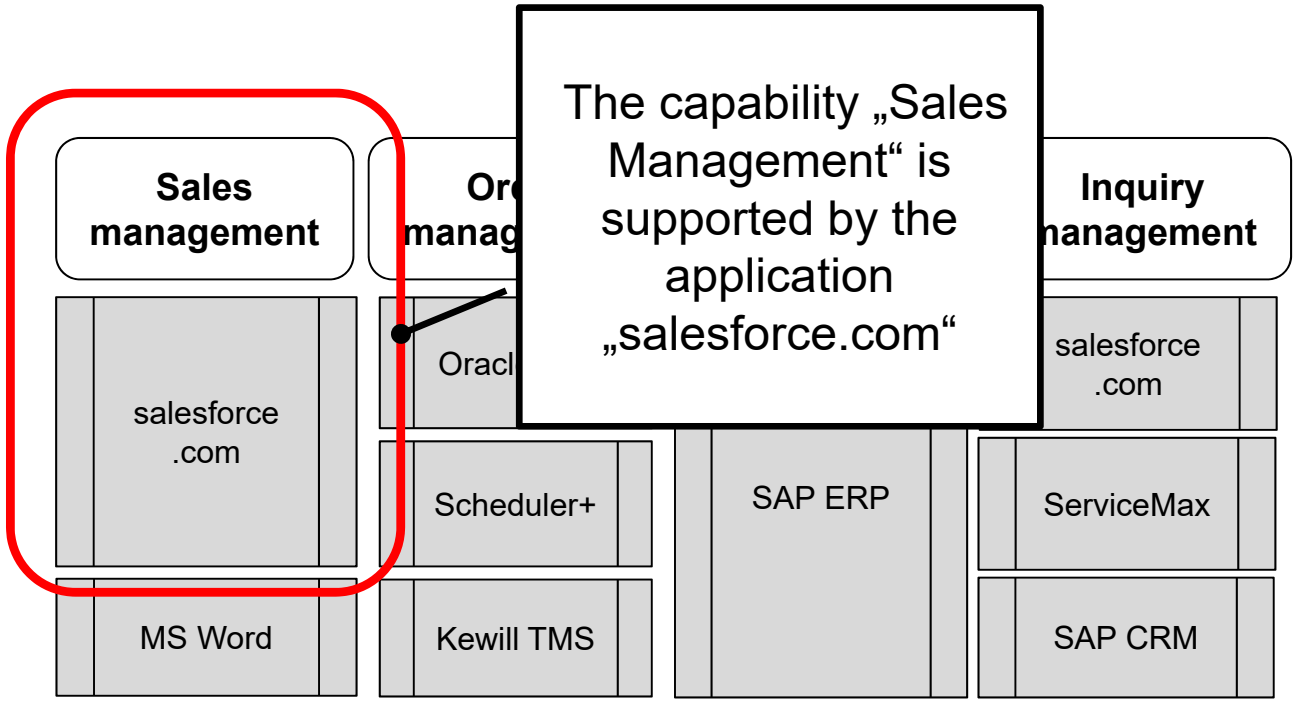
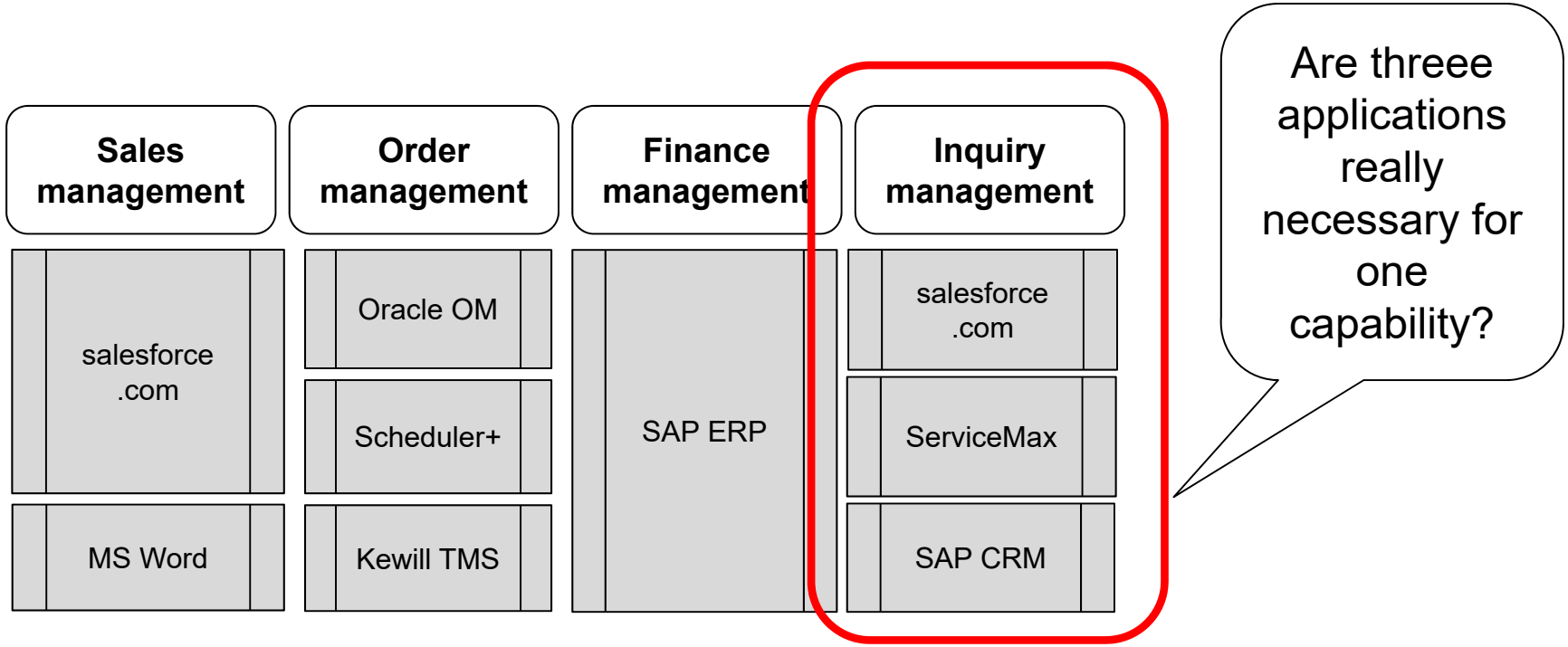


Business Support Matrix – Example

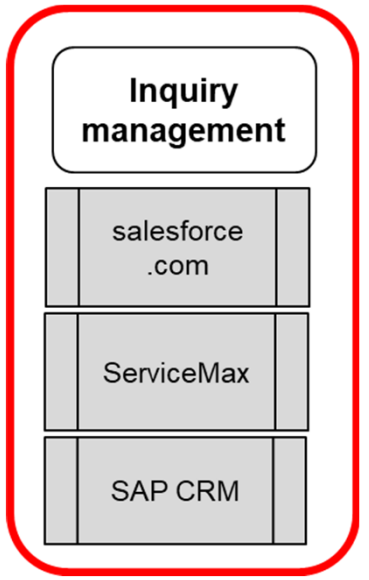


Business Support Matrix – Example

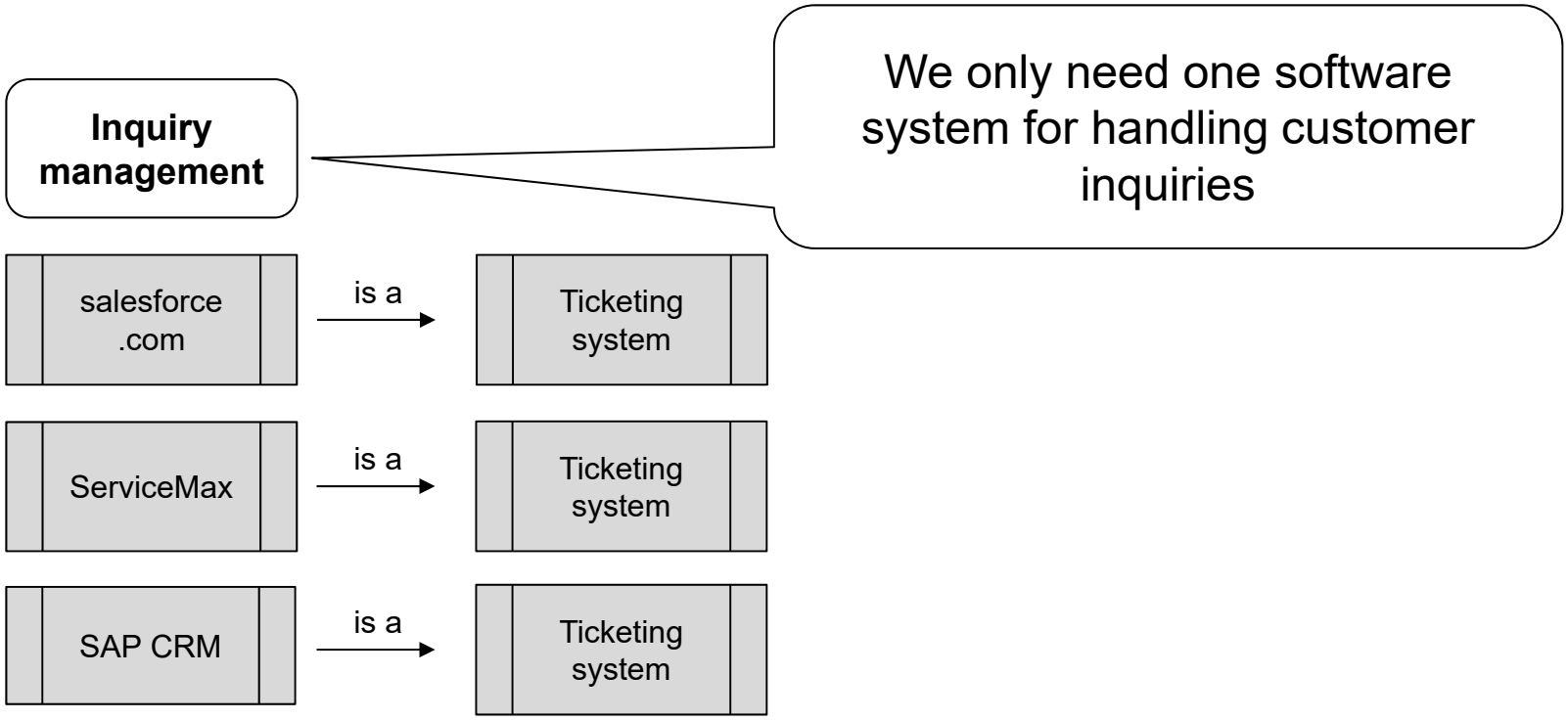
Three applications for one capability means *three times* …

- … cost for server hardware
- … cost for software license and maintenance
- … end user training and support
- … security issues and risk
- … three data storages with redundant data

➢ Potential for saving money and reducing risk



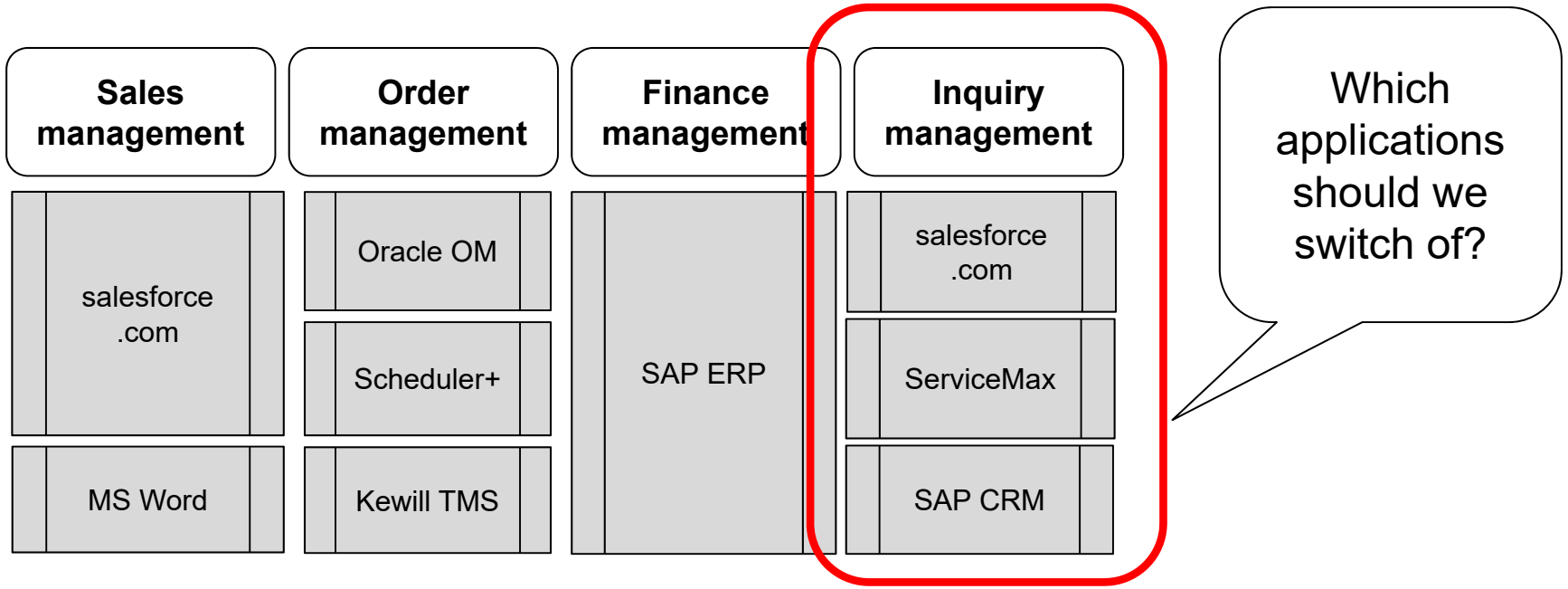
Business Support Matrix – Example



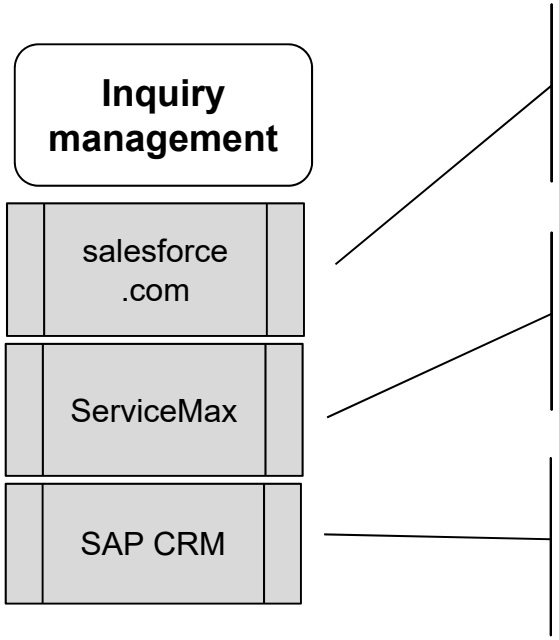
Business Support Matrix – Example

Less cost	Cost savings because of (for example) • Less hardware and software • Less training effort
Better data quality	All data in one system • Less data redundancies • Single data storage
Lower risk	Less systems at risk • Less application for potential attack • Less sources for errors

Business Support Matrix – Example



Business Support Matrix – Example



cost: 1 Million RMB per year
technology: modern
user happyness: low

cost: 2 Million RMB per year
technology: old
user happyness: high

cost: 3 Million RMB per year
technology: modern
user happyness: medium

Application – Properties

- Application landscapes are usually subject to further evaluation
- There are several factors for determining the value of an individual application
  - Cost: Budget spent on developing and owning the application
  - Quality: Poor quality can cause additional or future cost

Cost

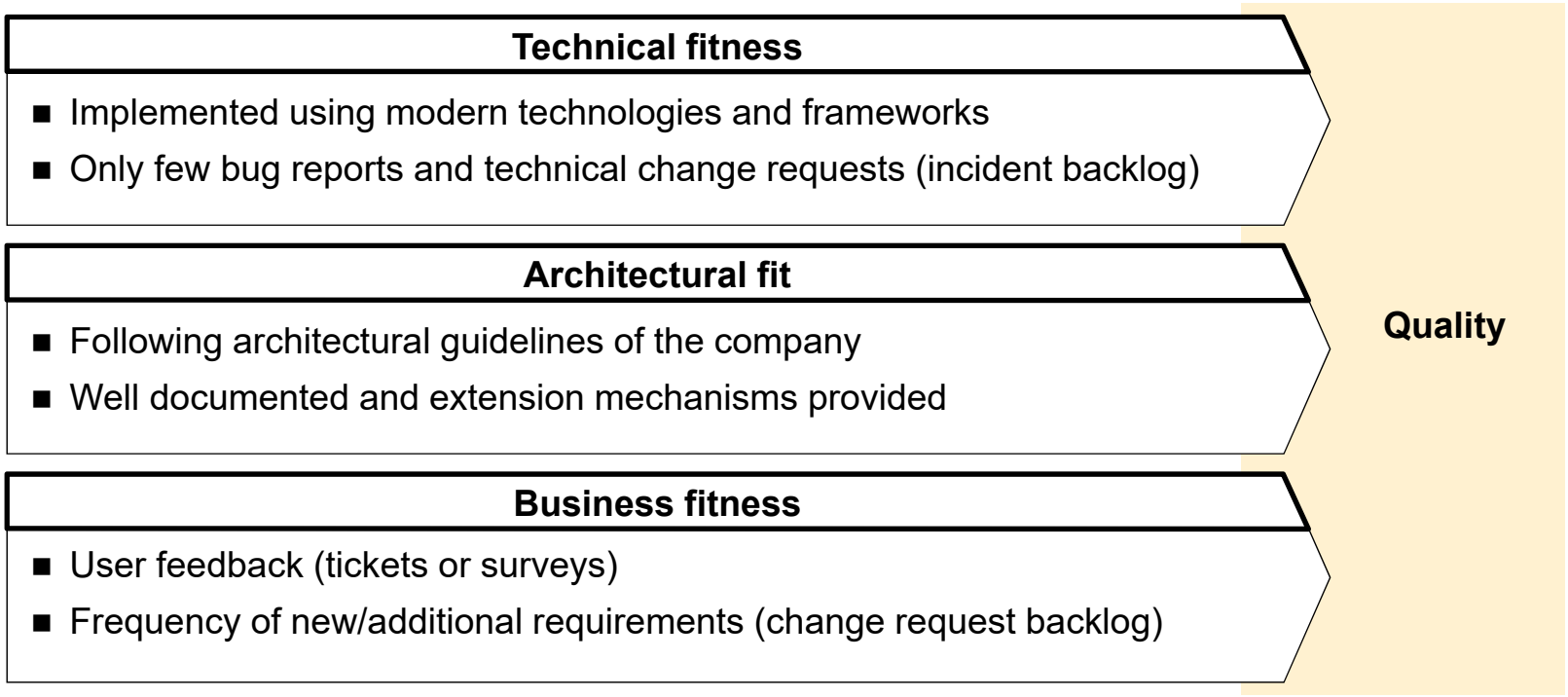
- **Build**: Initial cost for developing an application
- **Run**: Periodic cost for providing an application to users
- **Maintenance**: Bug fixing and adapting to changing requirements
- **Shut-down**: Decommissioning an application not needed anymore

Quality

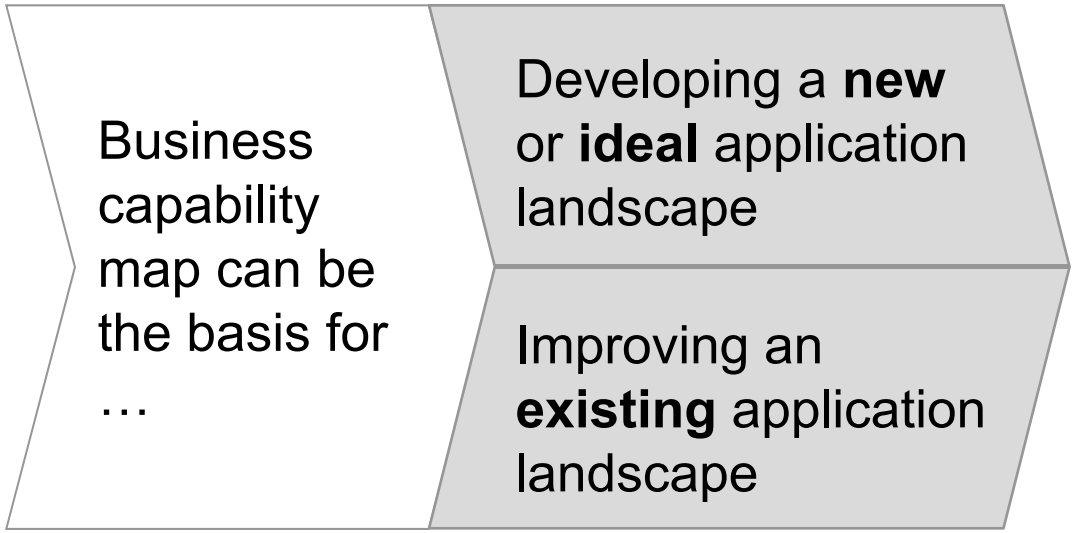
- **Technical fitness**: Avoiding old and insecure technologies
- **Architectural fit**: Flexibility for future enhancements
- **Business fit**: Quality perceived by business users
- **Strategic relevance**: Future business relevance

Application Properties – Quality

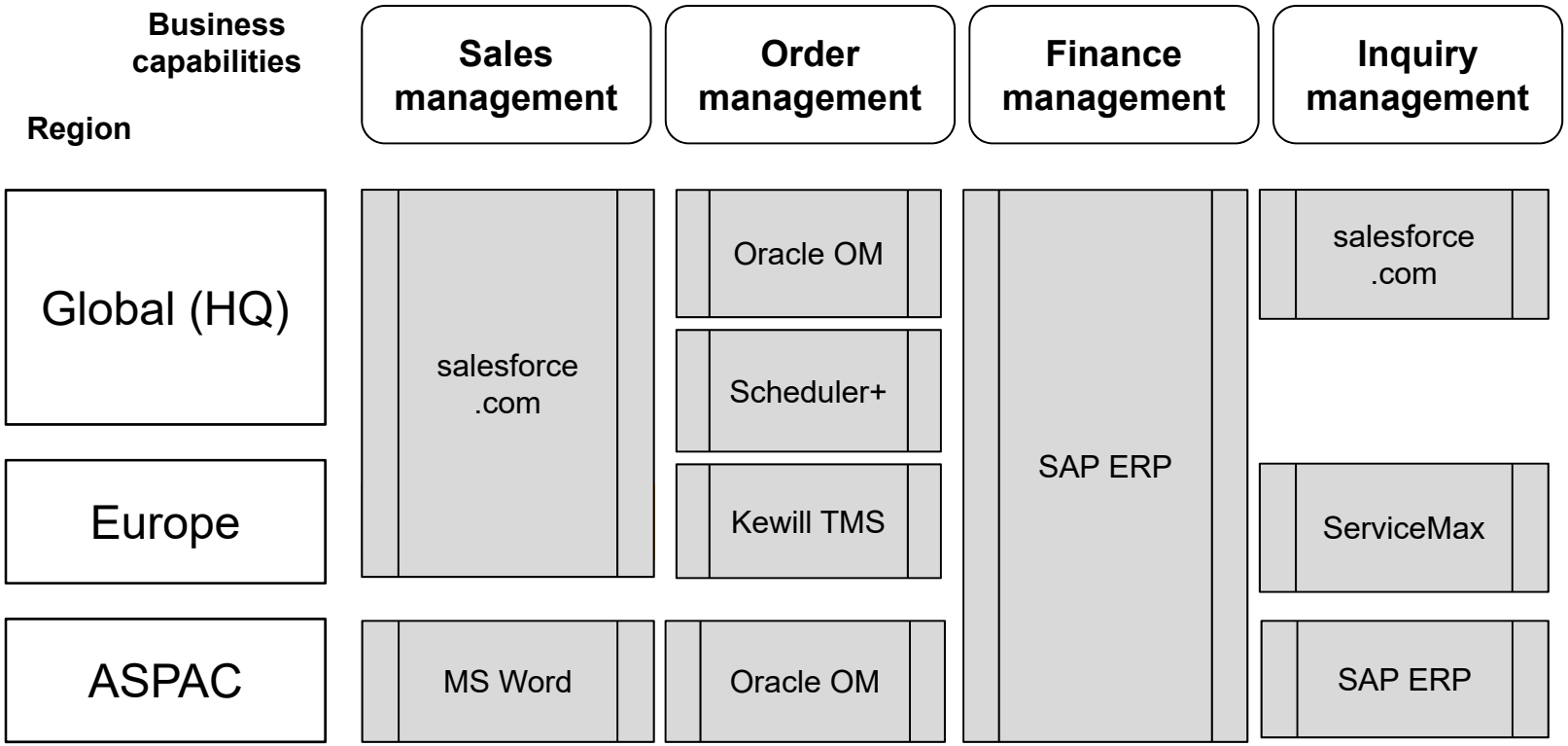
- The quality of an application is usually hard to measure
- However, there are some indicators (excerpt)



Business Support Matrix – Example



Business Support Matrix – Example



Enterprise Architecture Management Example

Henan Normal University, 2023

Prof. Dr. Jürgen Jung,
Frankfurt University of Applied Sciences

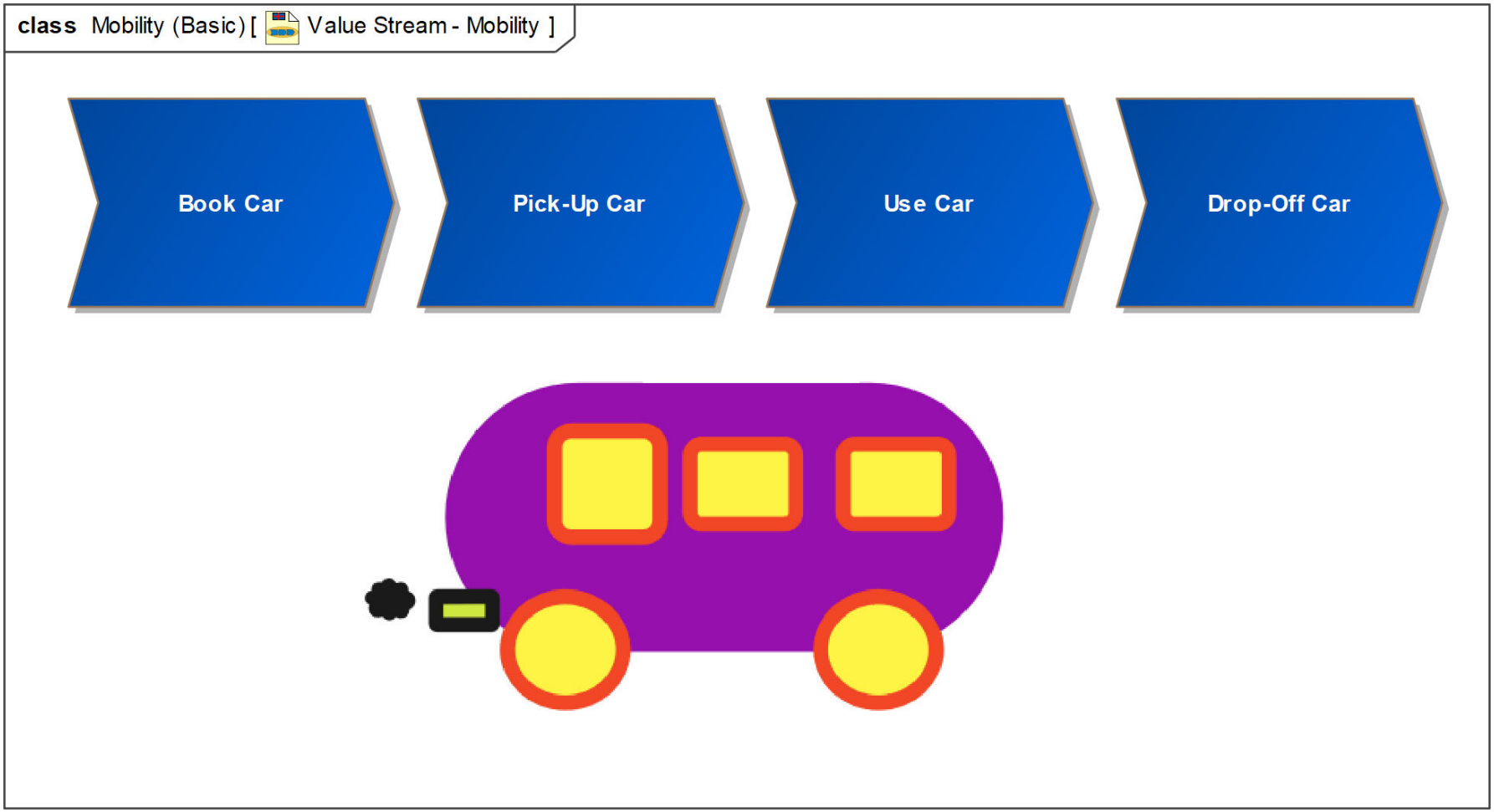
Business Objects and Context

Purpose	understanding driver & strategy	*What is business dealing with?*	*What is business doing?*	transparency on applications
Deliverables	• objectives • measures	• business objects • business object model	• capability map	• application landscape • interfaces
Focus	business and context	static abstraction	functional abstraction	IT (software)

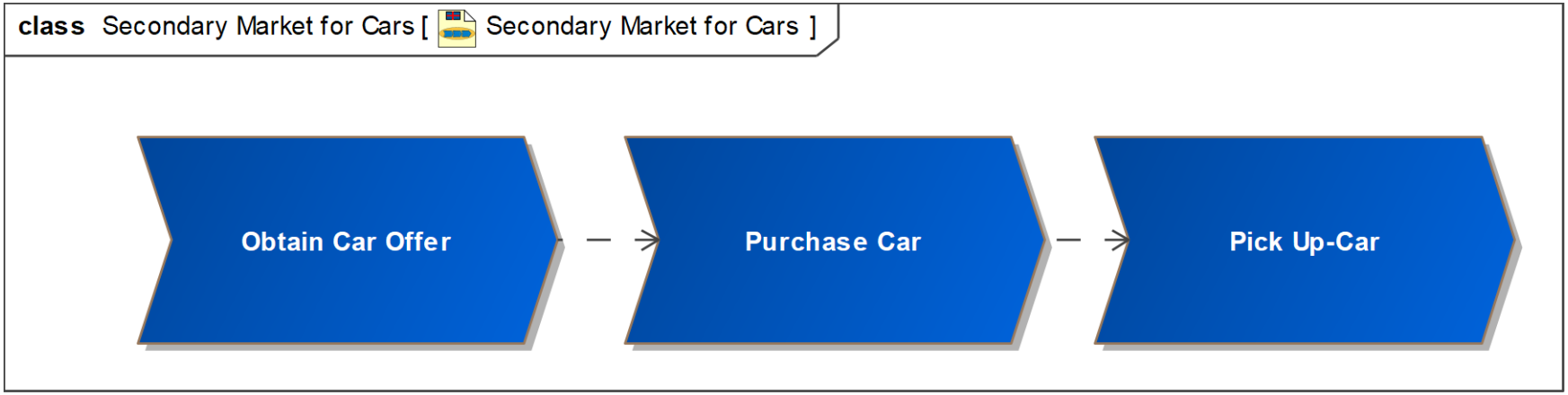
Example Company: FiniServRental

- Car rental company with focus on excellent service
- Locations
  - Rental: Frankfurt downtown and at the airport
  - Maintenance: Eschborn (close to Frankfurt)
- Business
  - Renting cars and corresponding services
  - Selling cars after two years
- Partnering with CSS Car Cleaning Services
  - Professional cleaning, maintenance and repair
  - Scheduled tasks, but ad-hoc orders possible

Value Chain: Car Rental



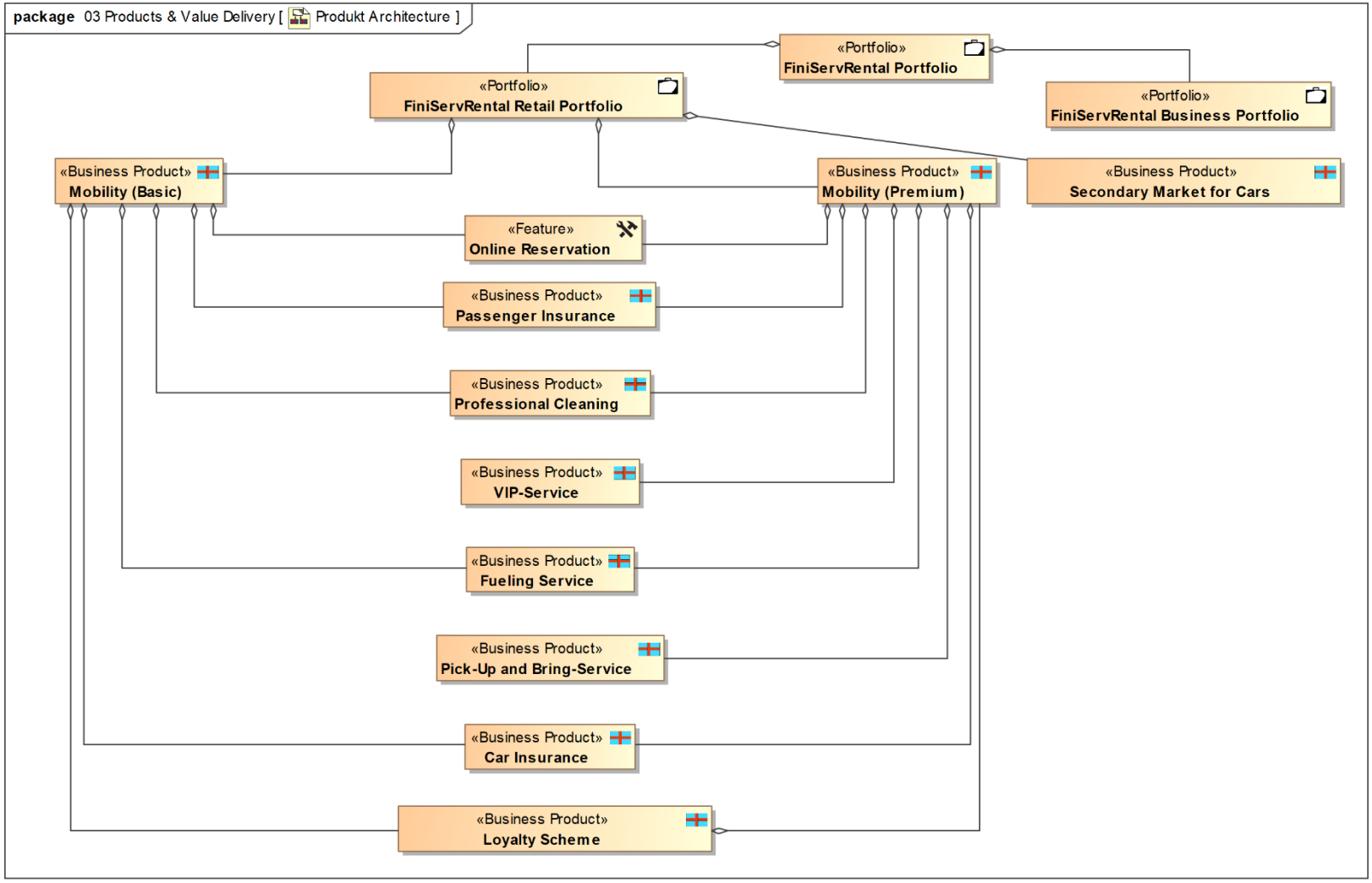
Value Chain: Car Sales



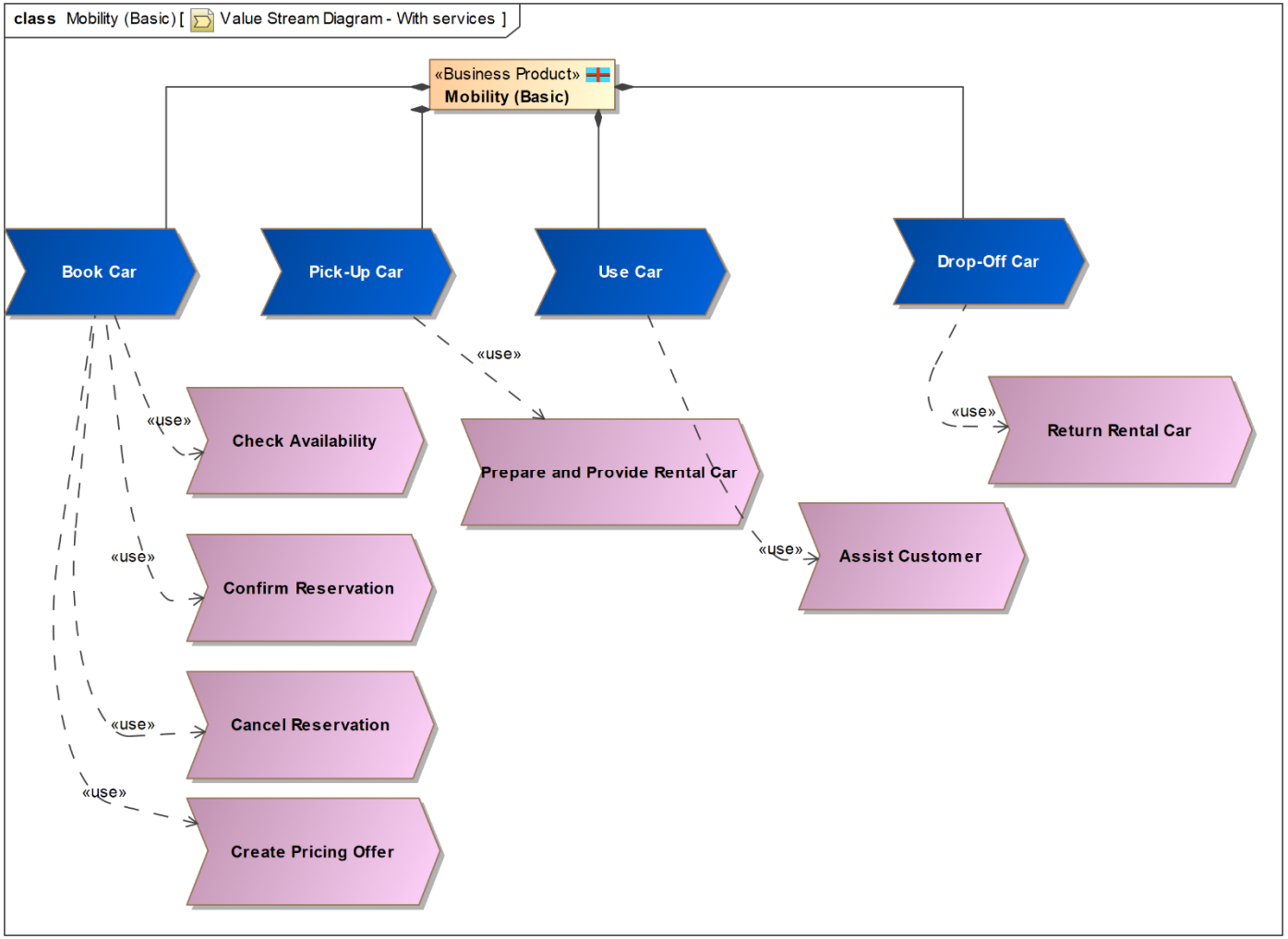
New Business Model: FiniServRental

- Transition towards *service-oriented* business
- *Mobility services* rather than just *rentals*
- Service levels
  - Mobility (Basic): getting from A to B
  - Mobility (Premium): additional features like pick-up or drop-off
- Available artefacts (living documents)
  - Product architecture
  - Business object model

FiniServRental: Product Architecture



FiniServRental: Value Chain for Mobility Basic



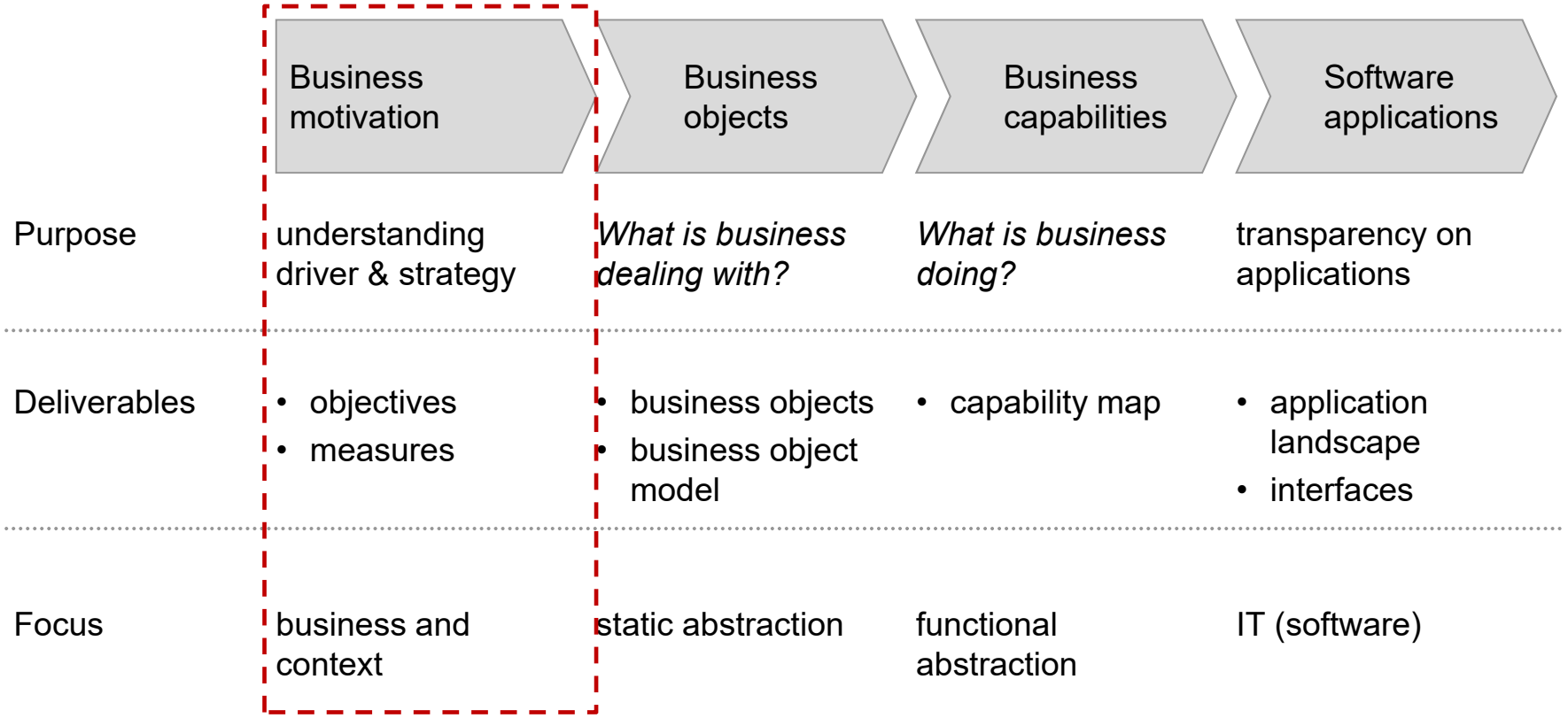
What to do now?

Creating an *Enterprise Architecture*

- Strategy of FiniServRental
  - Short description
- Capability map based on available documentation
  - Derived from business objects
- Application Architecture (next week)
  - Derived from capability map

➢ Interaction with customer

Business Objects and Context



FiniServRental: Strategy

Transition towards a service oriented business model by offering mobility services.

- Establishing mobility service
- Two service levels: Basic and Premium
- 50% of revenue
- By end of

➢ Is this objective SMART?

FiniServRental: Products

Mobility Basic

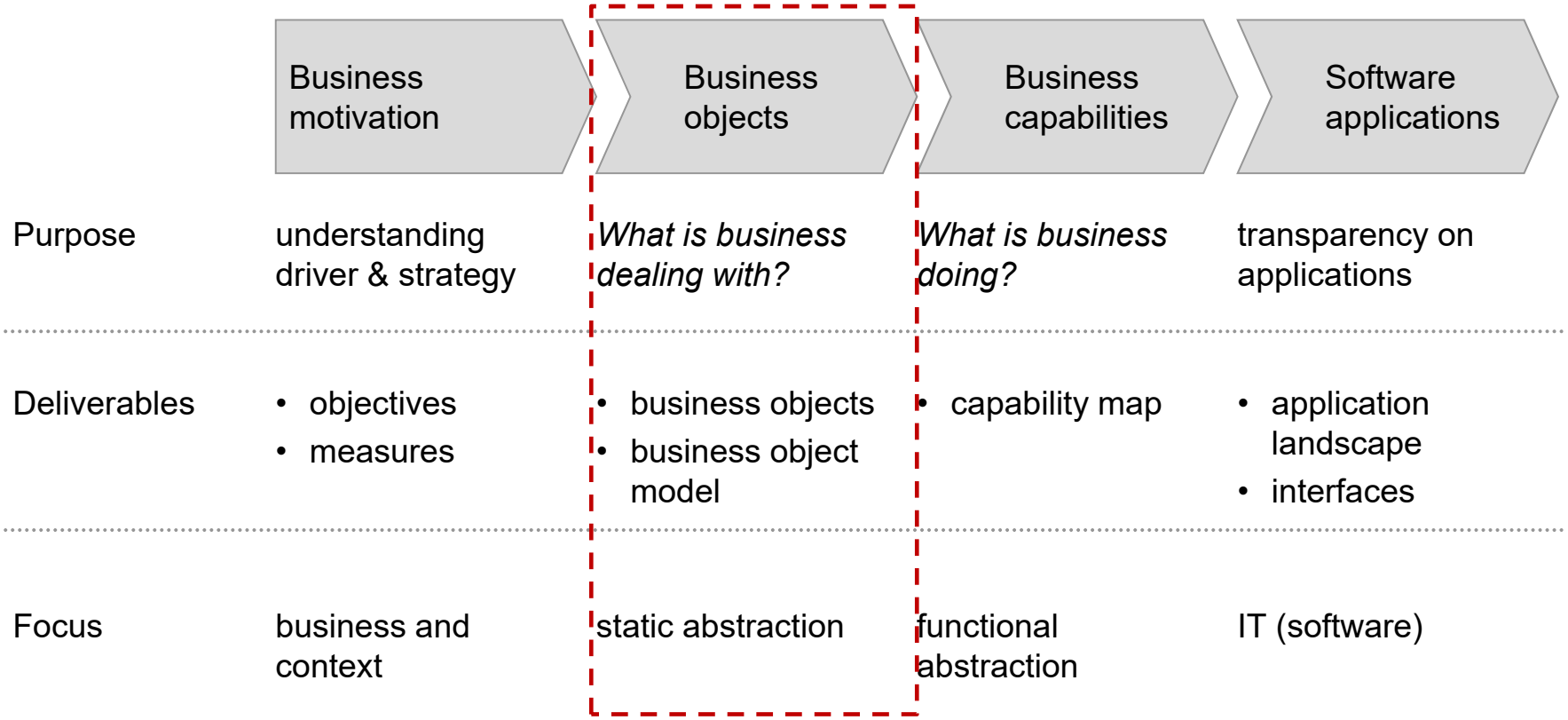
- Online reservation
- Passenger insurance
- Professional cleaning
- Fueling service
- Car insurance
- Loyalty program

Mobility Premium

Same features as **Basic**, plus

- VIP service
- Pick-up service
- Drop-off service
- Vehicle provisioning

Business Objects and Context



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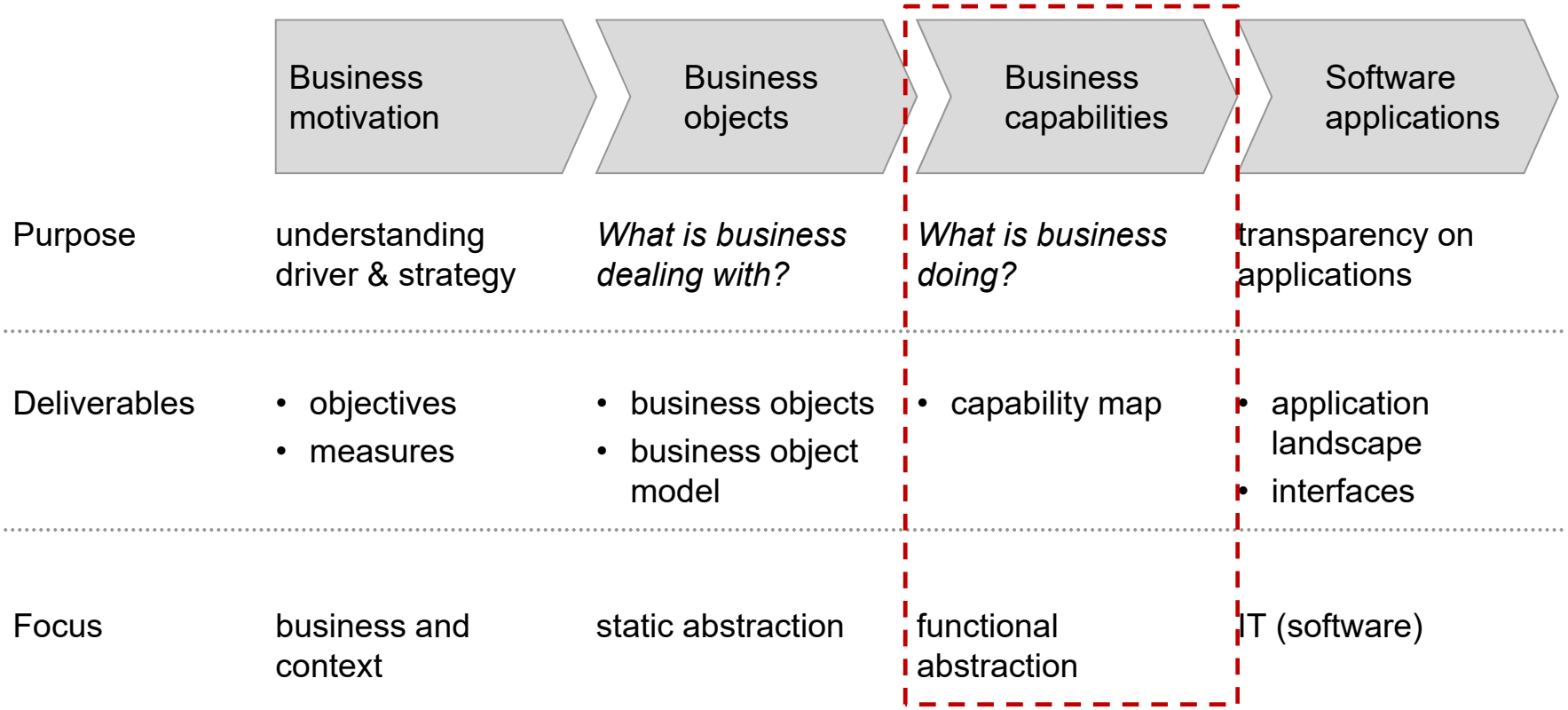
FiniServRental: Core Business Objects

Customer interaction	Infrastructure	Mobility
• Customer Profile • Reservation • Booking • Invoice • Payment • Loyalty program	• Rental station • Car • Service station • Filling station • Cleaning station • Service employee	• Mobility service • Service feature • VIP service • Insurance • Pick-up / drop-off

Business Objects and Context



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FiniServRental: Core Business Objects

Customer Interaction Management

- **Customer Profile** Management
- **Reservation** Management
- **Booking** Management
- **Loyalty Program** Provisioning

Financial Management

- **Invoic**ing
- **Payment** Handling

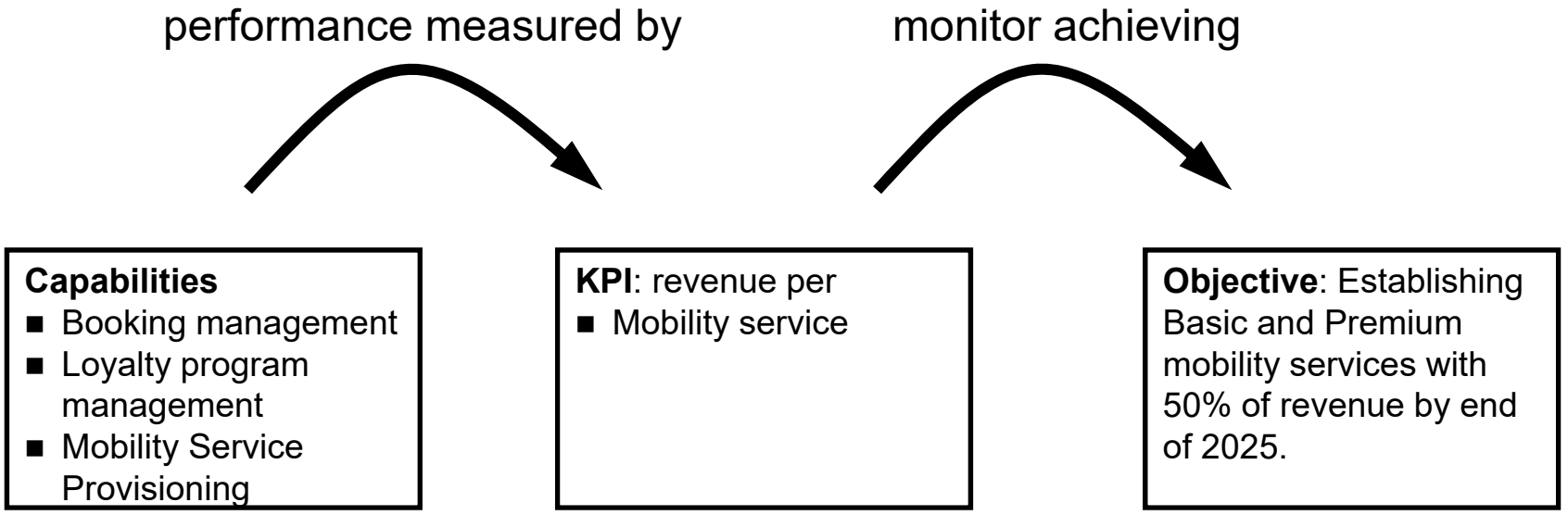
Infrastructure Management

- **Rental Station** Management
- **Car** Fleet Management
- **Service Station** Interaction
- **Filling Station** Contracting
- **Cleaning Station** Interaction
- **Service Employee** Planning

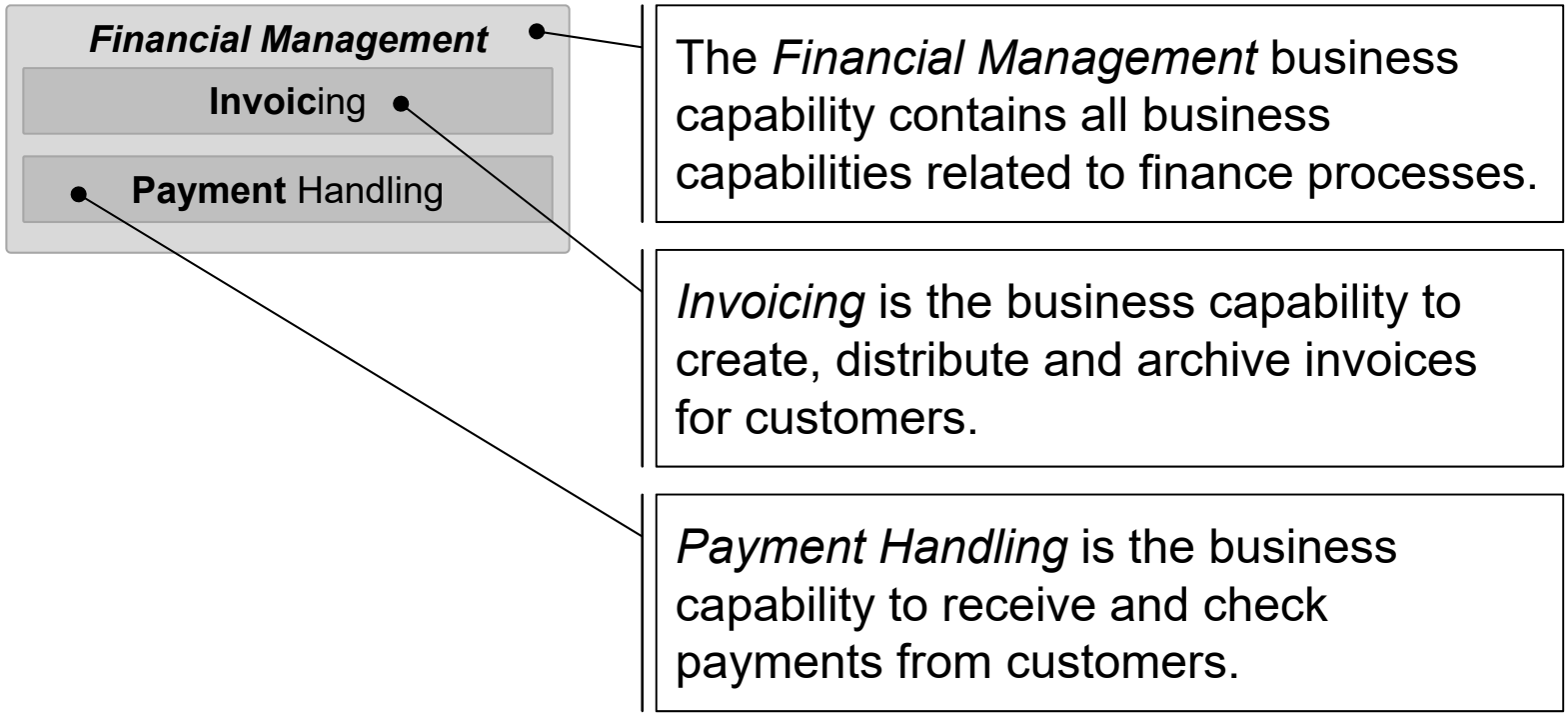
Mobility Service Management

- **Mobility Service** Provisioning
- **Service Feature** Provisioning
- **VIP Service** Provisioning
- **Insurance** Management
- **Pick-up** Provisioning
- ***Mobility Service*** *Development*

FiniServRental: Capabilities and Strategy



FiniServRental: Finance Capabilities



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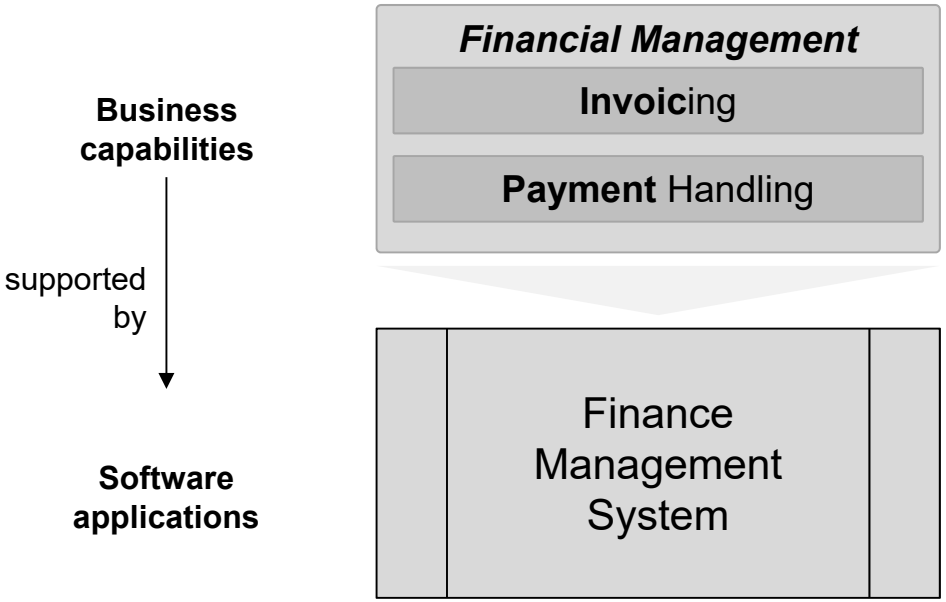

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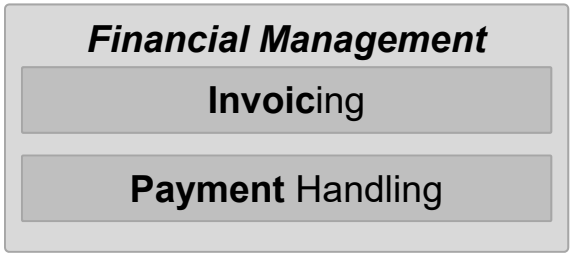
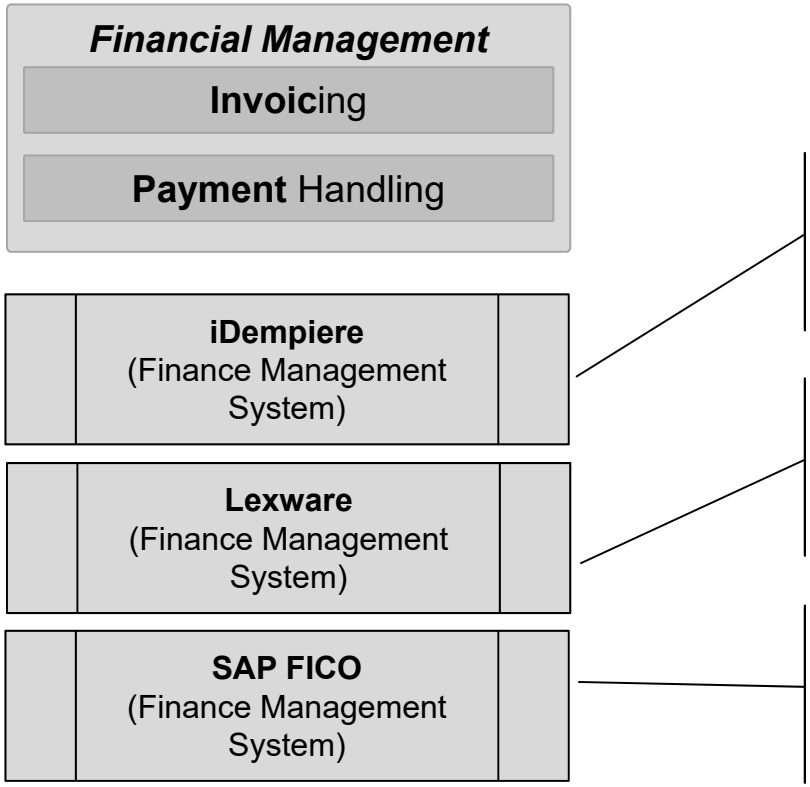


A *Finance Management System* is a software system to support financial processes in a company. This includes for example: invoices, payments, dunning, budget.

FiniServRental: Finance Capabilities



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technology: modern
user happyness: medium

cost: 2 Million RMB per year
technology: old
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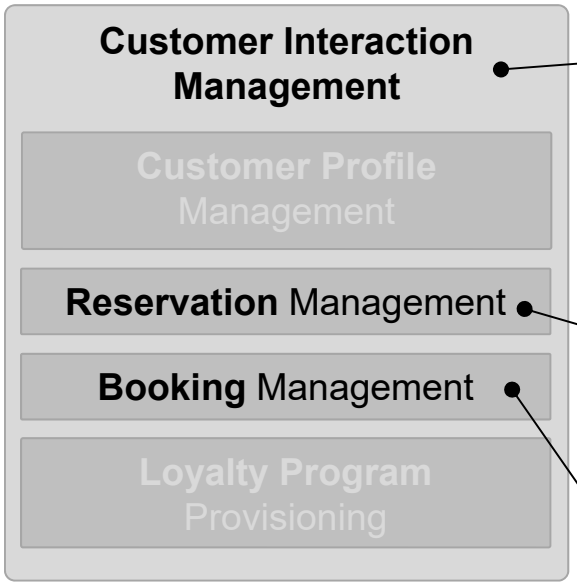
FiniServRental: Customer Interaction

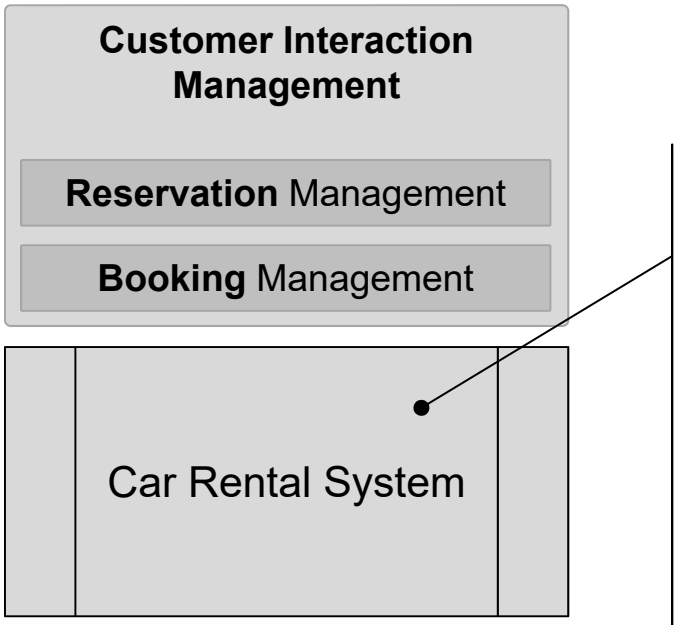


The *Customer Interaction Management* business capability contains all business capabilities that provide contact to the customer.

Reservation Management is the business capability for the customer to reserve a car for a specific time.

Booking Management is the business capability for the customer to make, update or cancel a booking for a car for a specific time.

FiniServRental: Customer Interaction



A *Car Rental System* is a software system to support car rental processes in a company. This includes for example:

- **Making a reservation**
- **Booking a car**
- Handing over a car to the driver
- Returning the car
- Maintaining car information

Business Objects and Context

	Business motivation	Business objects	Business capabilities	Software applications
Purpose	understanding driver & strategy	*What is business dealing with?*	*What is business doing?*	transparency on applications
Deliverables	• objectives • measures	• business objects • business object model	• capability map	• application landscape • interfaces
Focus	business and context	static abstraction	functional abstraction	IT (software)

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FiniServRental: Application Landscape

Customer Interaction Management

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- **Reservation** Management
- **Booking** Management
- **Loyalty Program** Provisioning

Financial Management

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- **Payment** Handling

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FiniServRental: Application Landscape