Capability Driven Development

Janis Stirna

Stockholm University

js@dsv.su.se
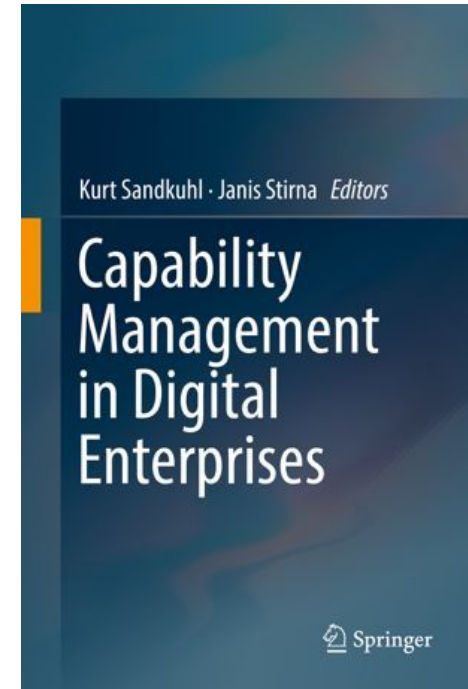
Outline

The general need for capability

Outline to Capability Driven Development (CDD)

CDD Methodology

CDD Environment

Capability in other frameworks

Based on EU FP7 project CaaS – Capability as a Service in digital enterprises

Kurt Sandkuhl · Janis Stirna *Editors*

Capability Management in Digital Enterprises

Springer

http://caas-project.eu

© J.Stirna

Motivation:
context changes, businesses need to adapt

Nov 22, 2011 3:10pm

Groupon Deal Burns Small Bakery With Orders for 102,000 Cupcakes

Tamara Lackey/Getty Images

REUTERS — Business | Markets | World | UK | Tech | Money | Commentary | Breakingviews | Sport | Life

World | Wed May 18, 2016 4:53pm BST

Sabotage of telecoms masts reignites Swedish security fears

STOCKHOLM | BY MARTIN LINDSTAM

PHOTOS

The broken top of a 300-metre high telecom mast is seen outside Boras, Sweden, May 16, 2016. TT News Agency/Adam Ihse /via REUTERS
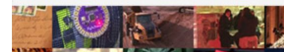
1 of 5

Editor's choice
Our top photos from the last 24 hours.

REUTERS VIDEO
The Latest in Business, Finance and Technology News

The need for **capability** as a concept

The **ability** to run the airport, e.g skills, experience

The **goal** to accomplish, e.g. efficient operations, no delays, no queues for takeoff, landing, luggage on time

The **capacity** such as money or equipment to refuel aircraft, remove snow, ensure security

The **context** in which the airport services must not shut down (weather, passenger intensity, *other* events, etc.)

Capability: normal day

Capability: normal day + VPOTUS

Capability: snowstorm + runaways closed

© J.Stirna

Design questions to address and the definition of capability

Karlis Neretnieks @neretnieks · Jun 26
Arlanda, vedervärdigt. Saknar i alla avseenden förmåga/kapacitet att hantera antalet resande en vardagmorgon.

💬 12   🔁 5   ♡ 57   ↑

- Need to know how to make choices and why (goals and KPIs)
- Need to know how to do (ability - processes)
- Need to have capacity (resources)
- Need to know when to do what (context)
- Need to be able to do repetitively (patterns)

Capability is the ability and capacity that enable an enterprise to achieve a business goal in a certain context.

© J.Stirna

What capability is and is not

In very general terms is can be anything. So, the point here are in terms of CDD which is to a large extent compatible to the EA frameworks

CDD definition: Capability is *the ability and capacity that enable an enterprise to achieve a business goal in a certain context*.

It is a development construct
It changes over time
It depends on the situation
It can be configured and adjusted
It is critical to the organization

It is defined by a meta-model (see MODAF, NAF, CDD)
It is associated to a development approach and has (some) tool support

It is *not* anything that the company can do
It is *not* a service or process

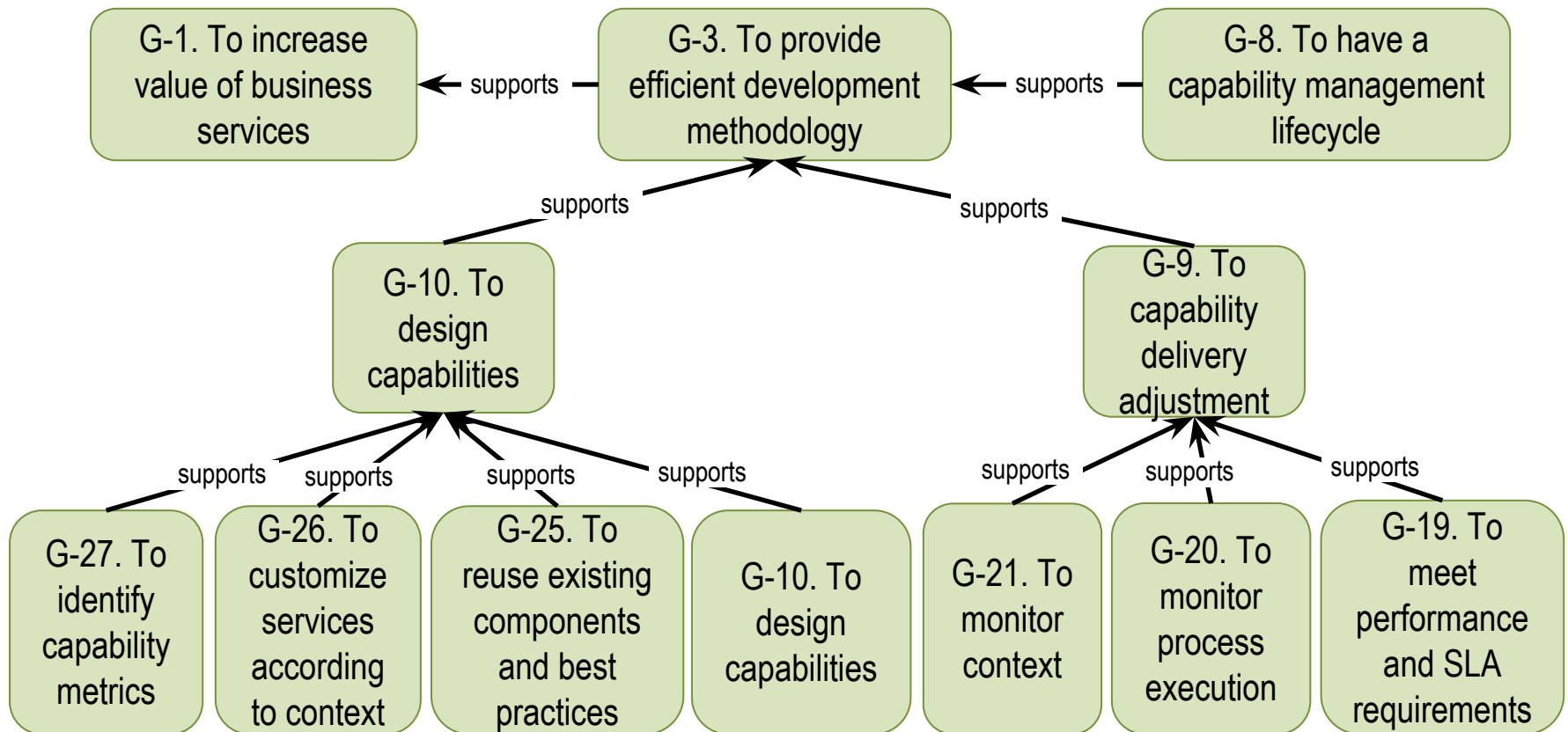It is *not* the same as capability in the Capability Maturity Model of SEI
It is *not* the same as EA capability*
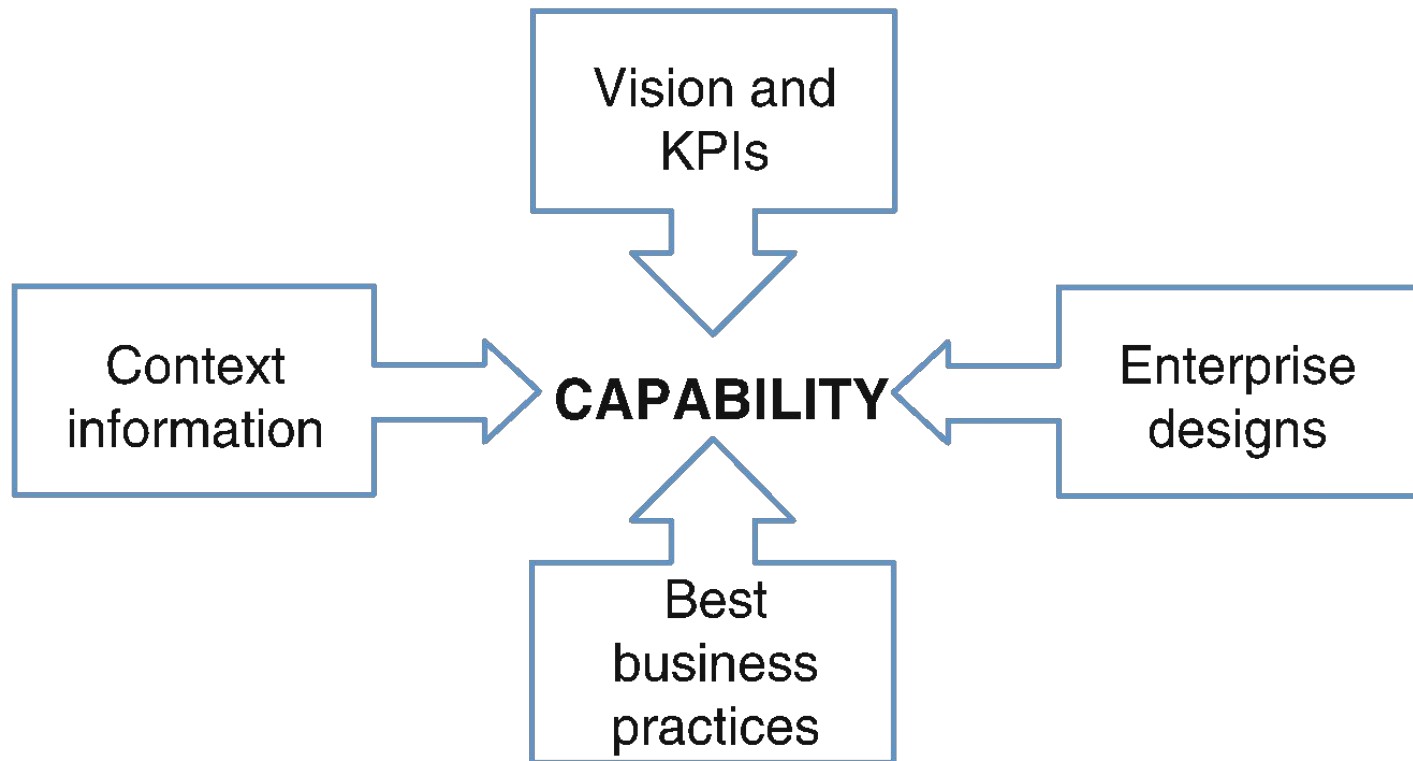
It is *not* poorly defined and confusing

It is *not* applicable to all business and IT problems

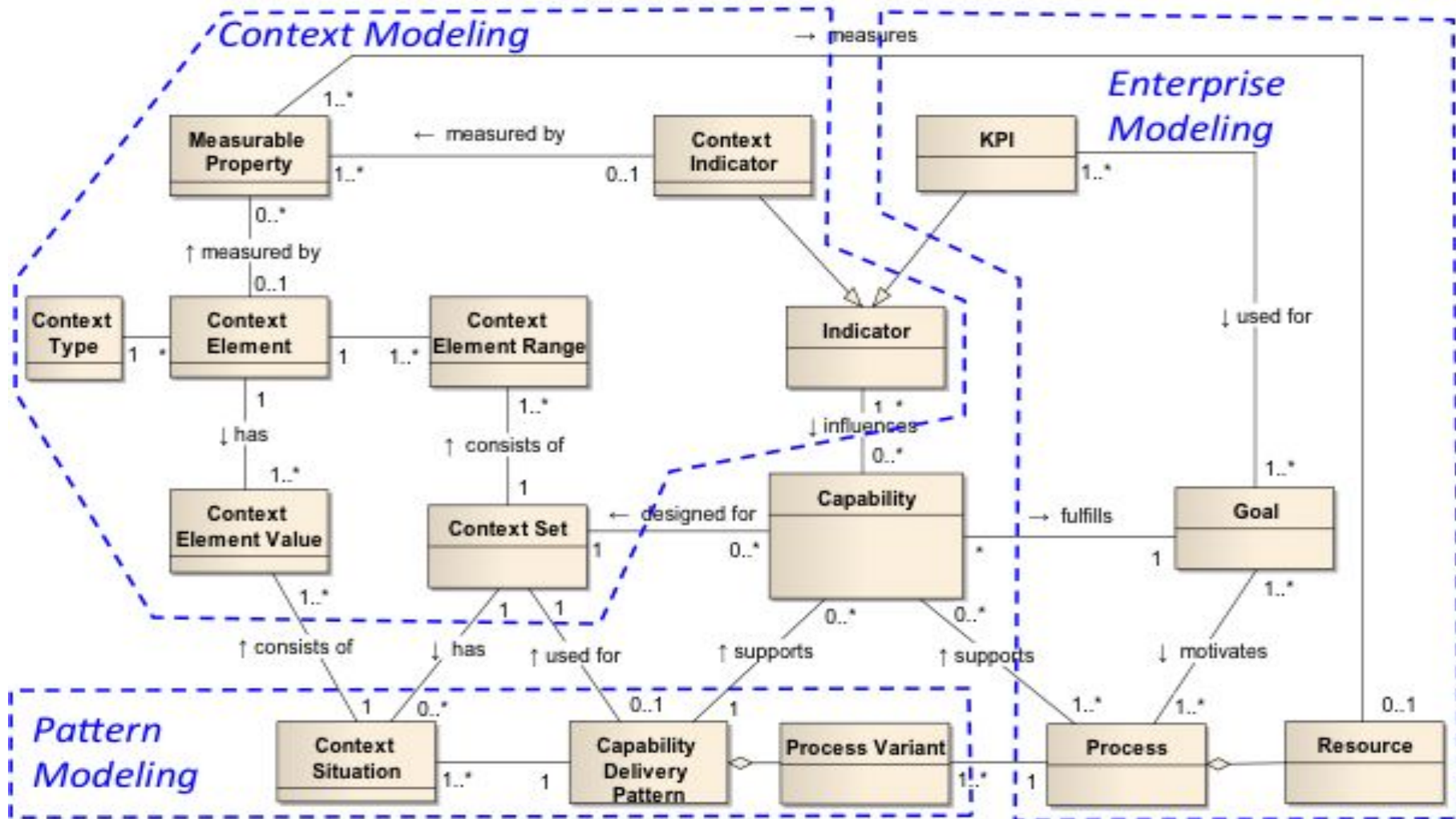*EA capability means the capability of a organization tasked to perform EA within some setting
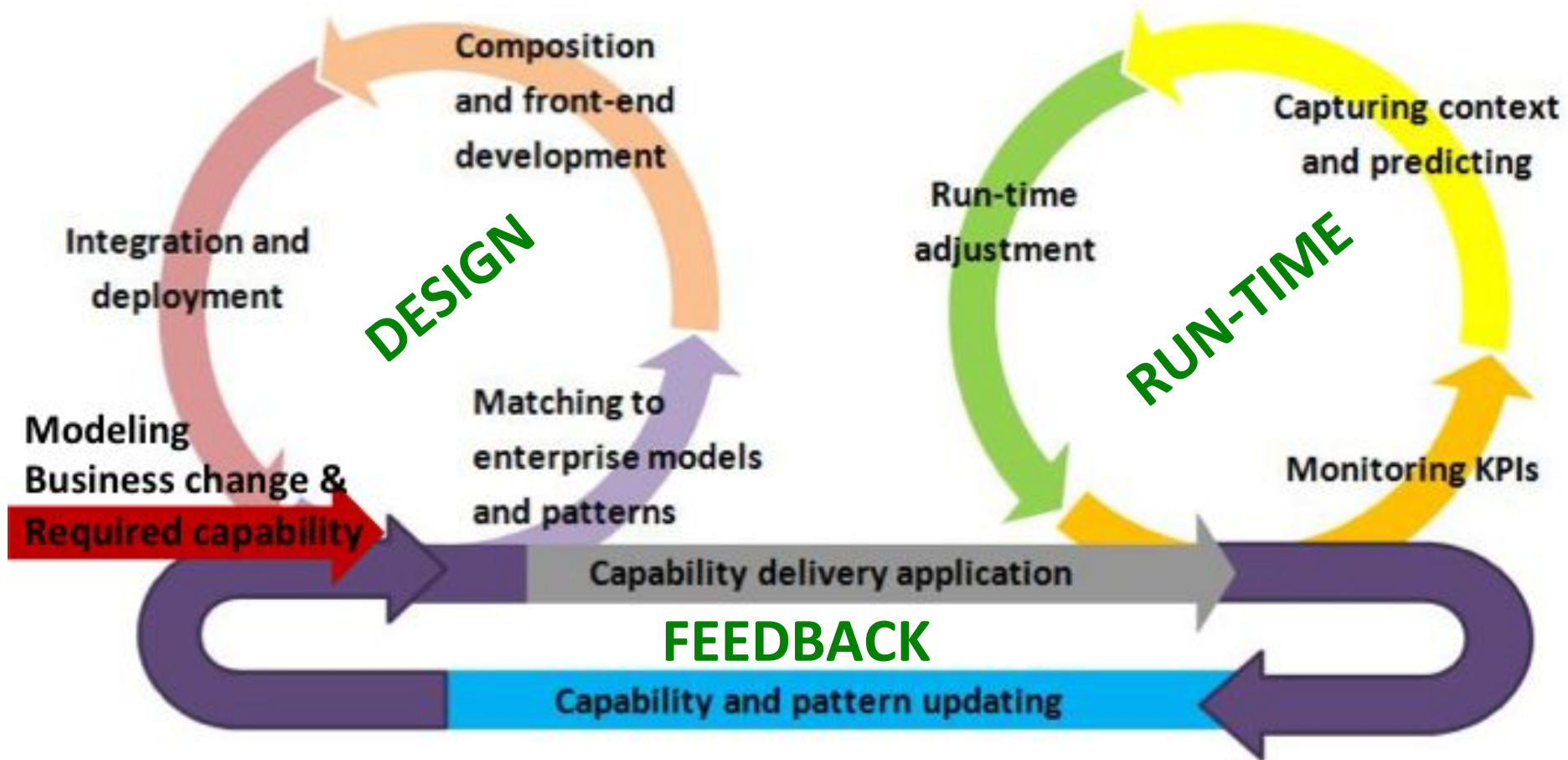
© J.Stirna

User goals for the CDD methodology

© J.Stirna

Key aspects of capability

CDD meta-model overview

© J.Stirna

CDD life-cycle process

CDD methodology artifacts

DESIGN
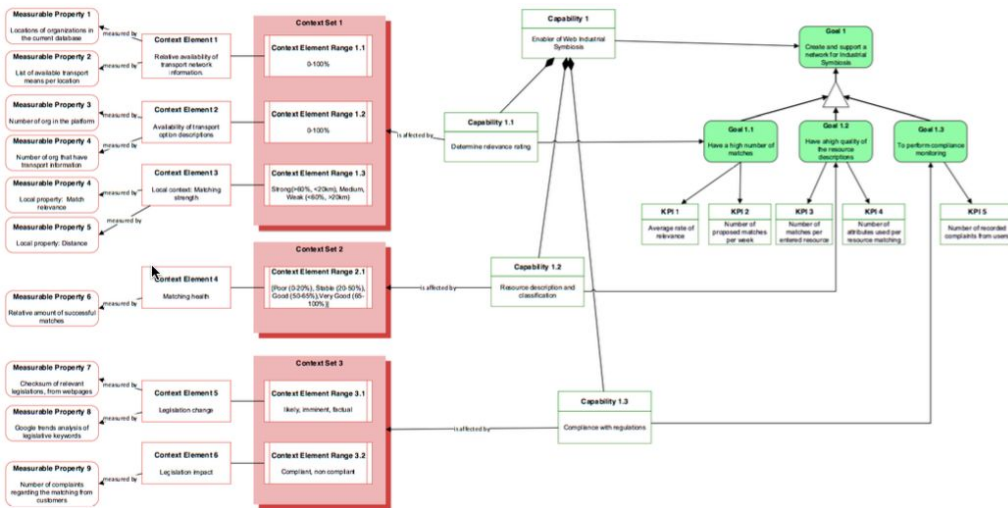
RUN-TIME
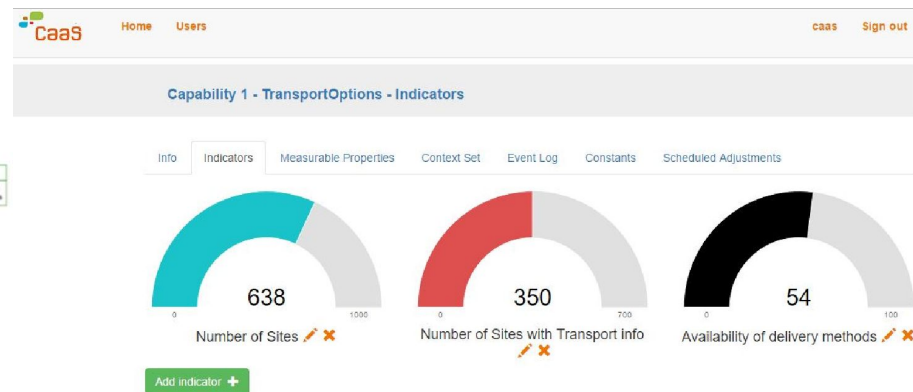
FEEDBACK

© J.Stirna

Meta-model Defining the Modeling Language

Model elements for capability design, incl. goals, KPIs, context, measurable properties, patterns, etc.

for variability design

for specifying capability adjustment algorithms, *some components omitted*
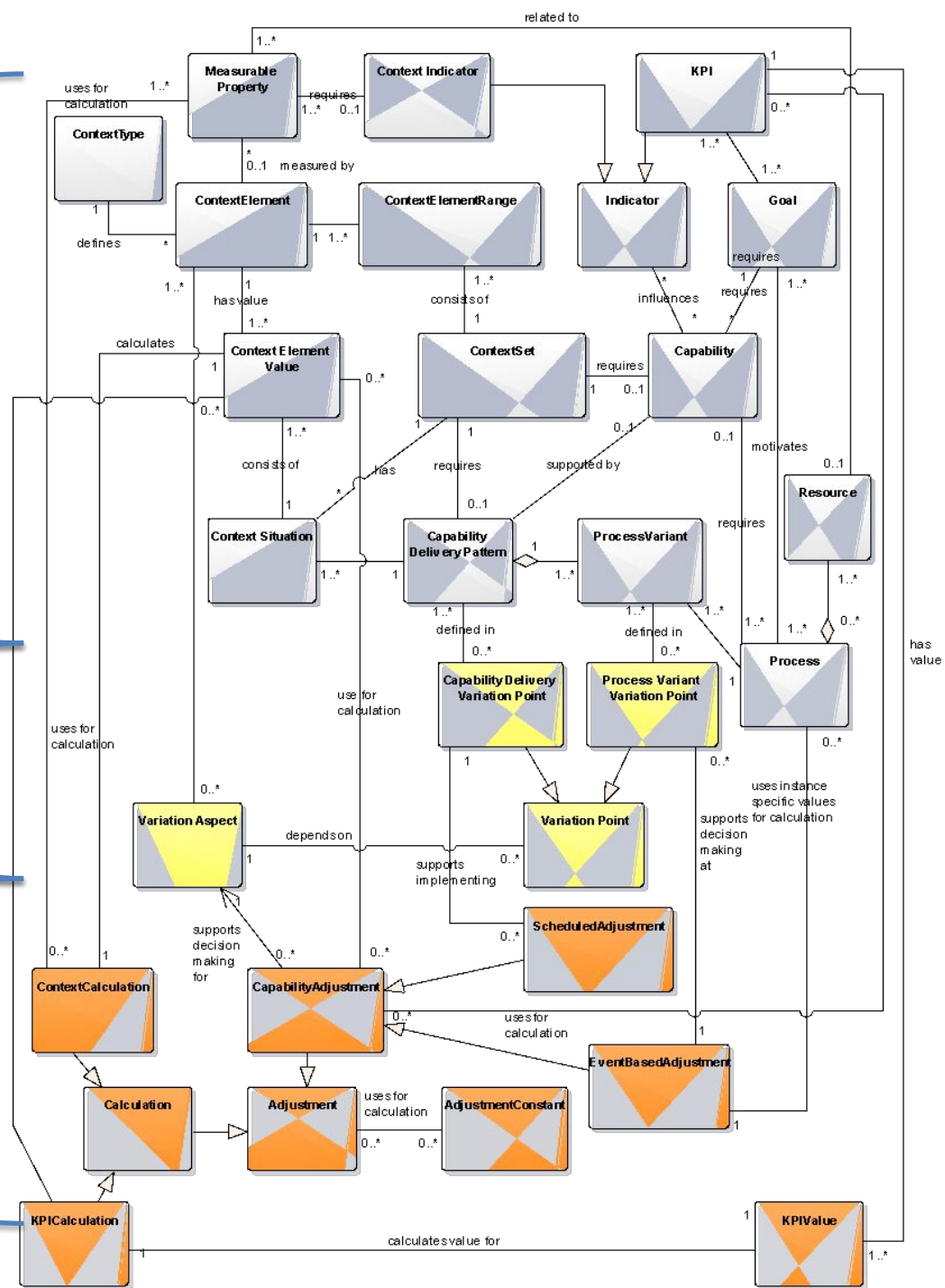
Example of the CDD Steps

Initial definition of scope, several approaches possible

Component 1: Scope Definition

Component 2: Enterprise Modelling

Component 3: Context Modelling
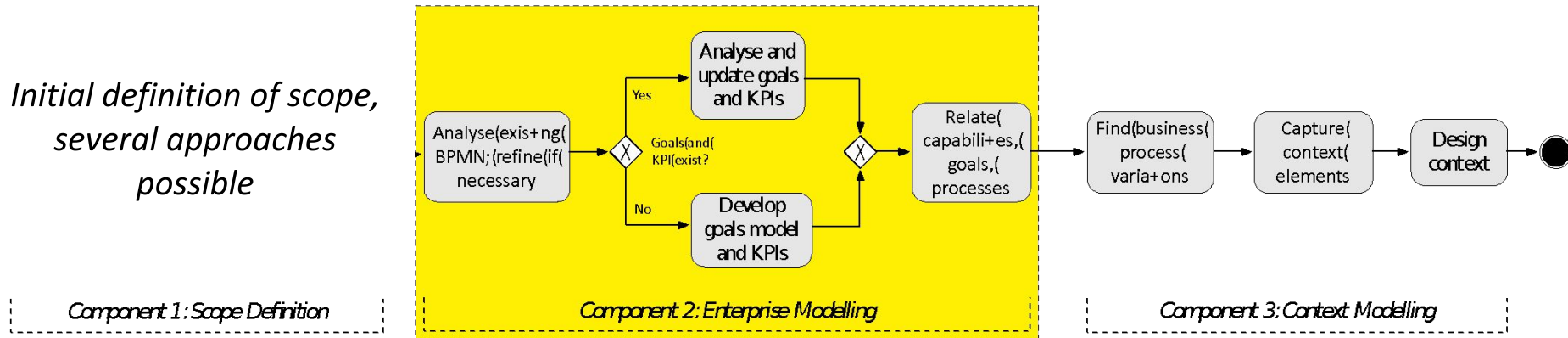
Alternative method paths ways possible
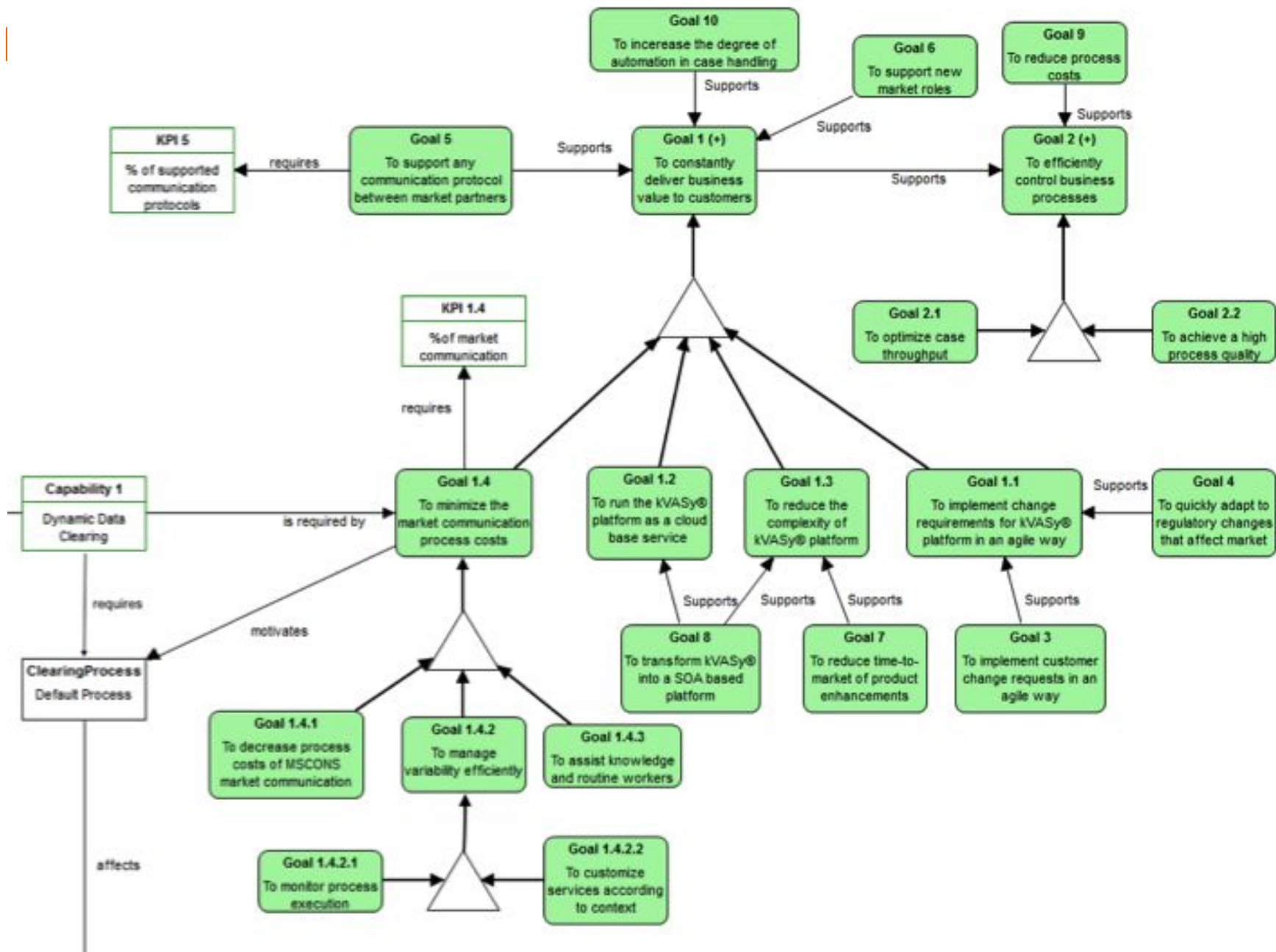
© J.Stirna

© J.Stirna

Overview of the method

Component 1: Scope Definition

Component 2: Enterprise Modelling

Component 3: Context Modelling

15

© J.Stirna
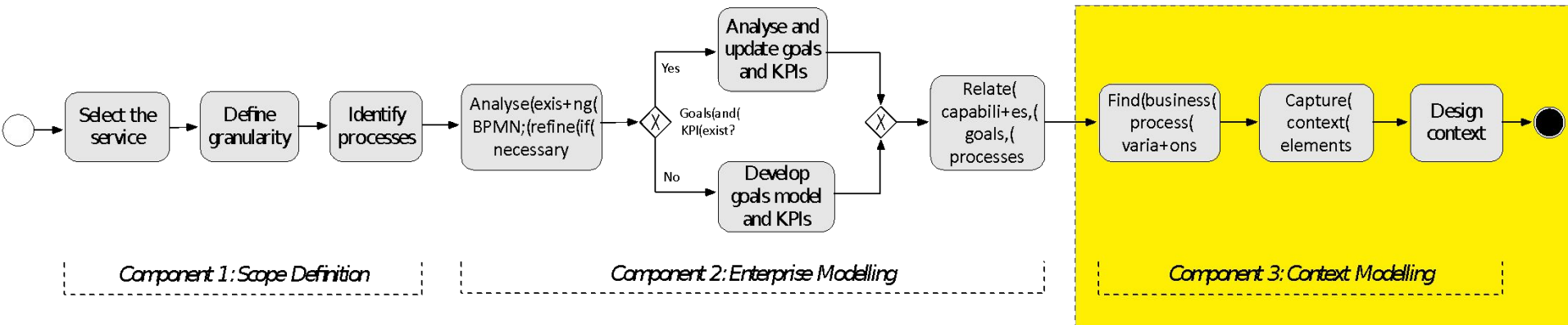
Method Component 3: Context Modelling

Exception Type
Number = Process
Variant

1	CLEARING FOR „Der Zählerstand in kVASy entspricht nicht dem zu stornierenden Zählerstand"
2	CLEARING FOR „[NZM-1122] Der Zählpunkt ist für die Energieart im System nicht bekannt"
3	CLEARING FOR „[VA-13855] Kein Zählwerk zum Zählpunkt gefunden"
4	CLEARING FOR „[NB-1418] Es wurde kein Medium zu dem Zählpunkt gefunden"
5	CLEARING FOR „Zählerstand wurde nicht importiert, da dieser einen Nulldurchgang erzeugen würde"
6	CLEARING FOR „[ORA-20500] Das Zählwerk ist bereits bis zum <DD.MM.YYYY> abgerechnet"
7	CLEARING FOR „Es existiert bereits ein manuell eingefügter Zählerstand"
8	CLEARING FOR „Es gibt keinen eingebauten Zähler mit der Zählernummer zum Ablesedatum am ZP"
9	CLEARING FOR „Der Ein-/Ausbaustand kann nicht storniert werden"
10	CLEARING FOR „Eine Nachricht mit gleicher Nachrichtennummer und gleichem Absender wurde bereits empfangen"
11	CLEARING FOR „Keine Nachricht mit Nachrichten-Nr. und Datum zum Absender (GLN) und Empfänger (GLN) gefunden"
12	CLEARING FOR „Es existieren bereits Einbauzählerstände von einem anderen Absender"
13	CLEARING FOR „[NZM-1040] Zum Zähler wurde kein Zählertyp gefunden"
14	CLEARING FOR „Der Absender der Datei ist derzeit im System nicht vorhanden"
15	CLEARING FOR „[EDM-1814] Es wurde kein Rahmenvertrag zwischen den Marktpartnern gefunden"

Variation
Point
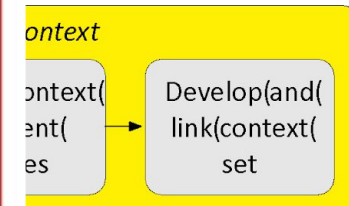
Define exception type

Develop(and(
link(context(
set

© J.Stirna

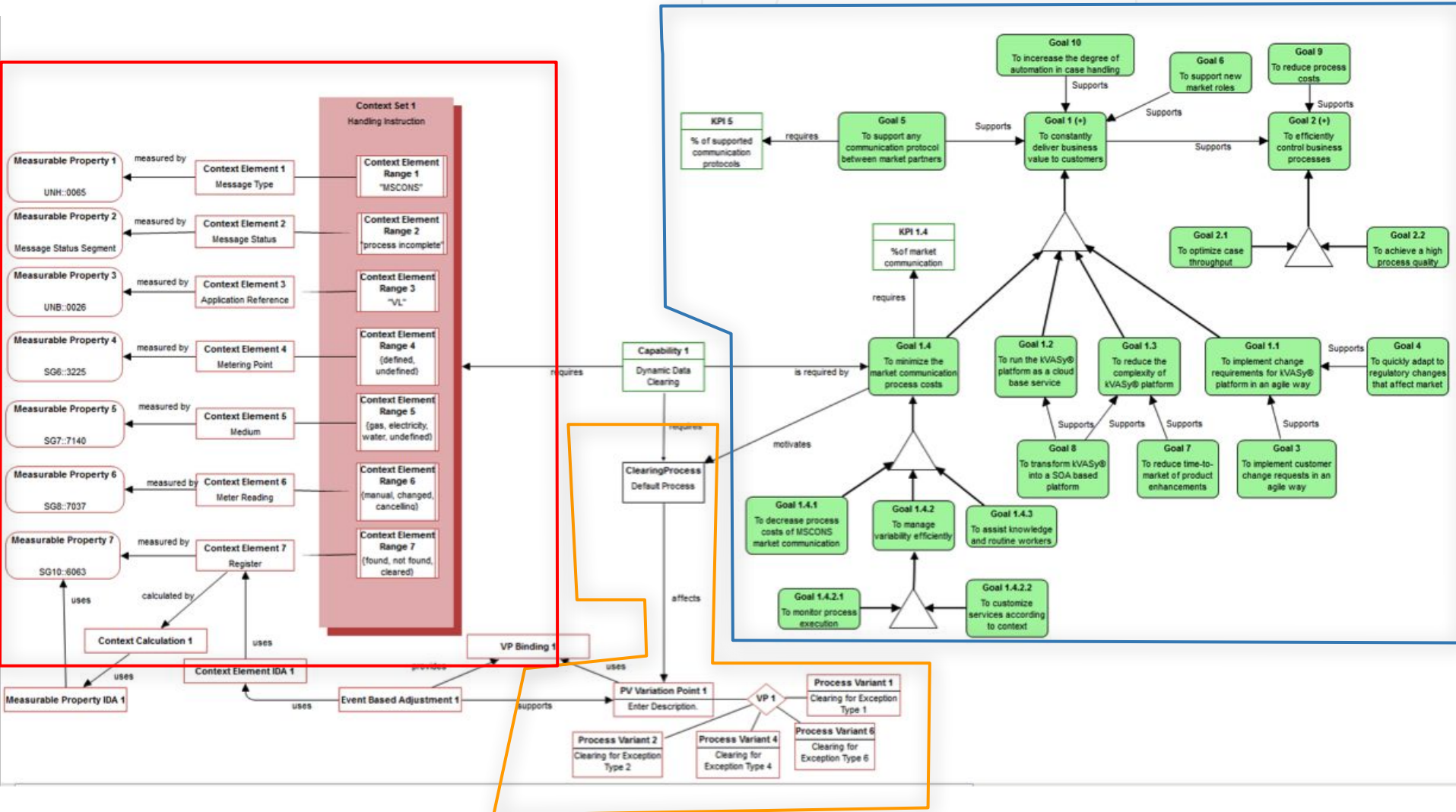| Context element candidates	Influence on fulfilment of the capability
Message Type Message Status Application Reference	High - Related to all process variants
Metering Point	High – Related to most of the process variants
Medium	High – Related to most of the process variants
Meter Number	Low - Only related to the process variants which require manual work
Meter Reading_Customer	Low - Only related to one process variant
Meter Reading_Message	Low - Only related to one process variant
Cancellation	Low - Only related to two process variants
Exception Type	Low - Only related to the process variants which require manual work
Meter Reading	High – Related to most of the process variants
Reading	Low – Only related to one process variant
Meter Reading Type	Low - Only related to one process variant
Register	High – Related to most of the process variants
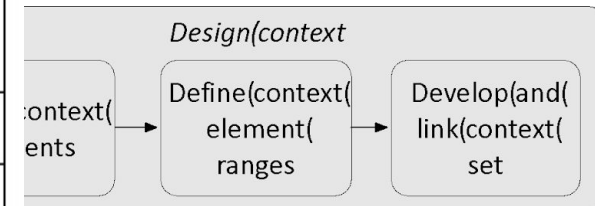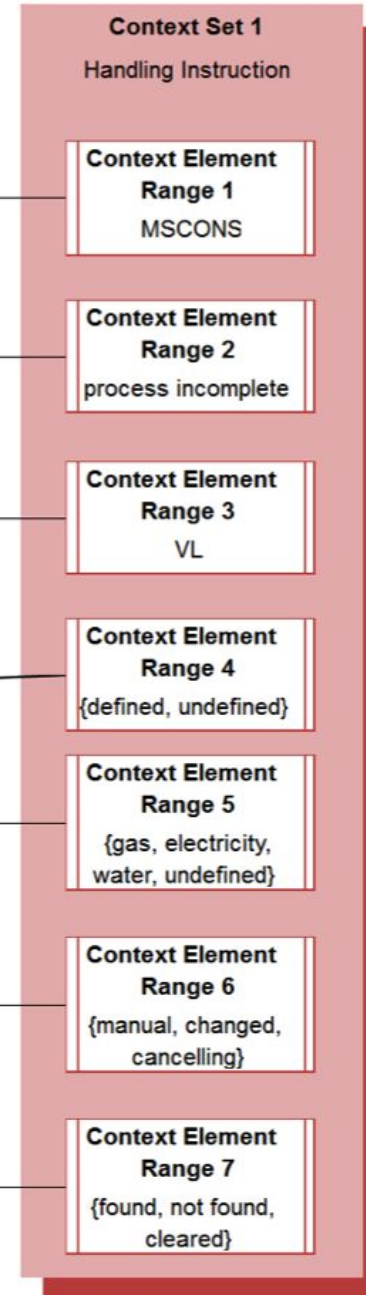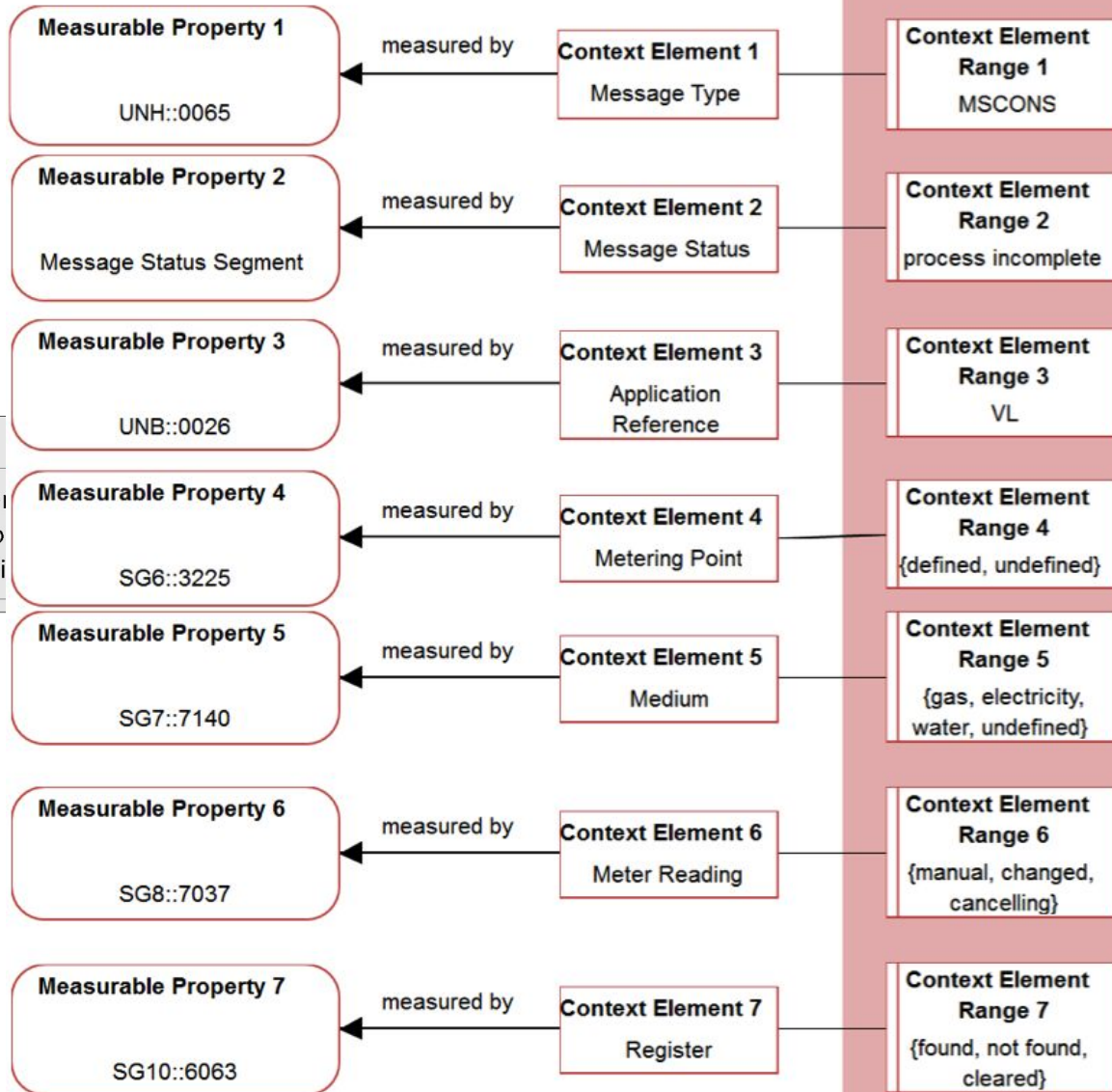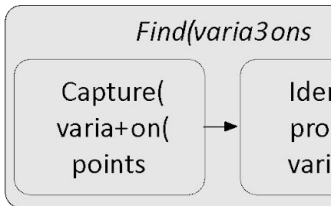
Design(context

| context(
ents | Define(context(
element(
ranges | Develop(and(
link(context(
set |

© J.Stirna

Designing Context

© J.Stirna

Capability Model

© J.Stirna

Alternative scenarios of capability design

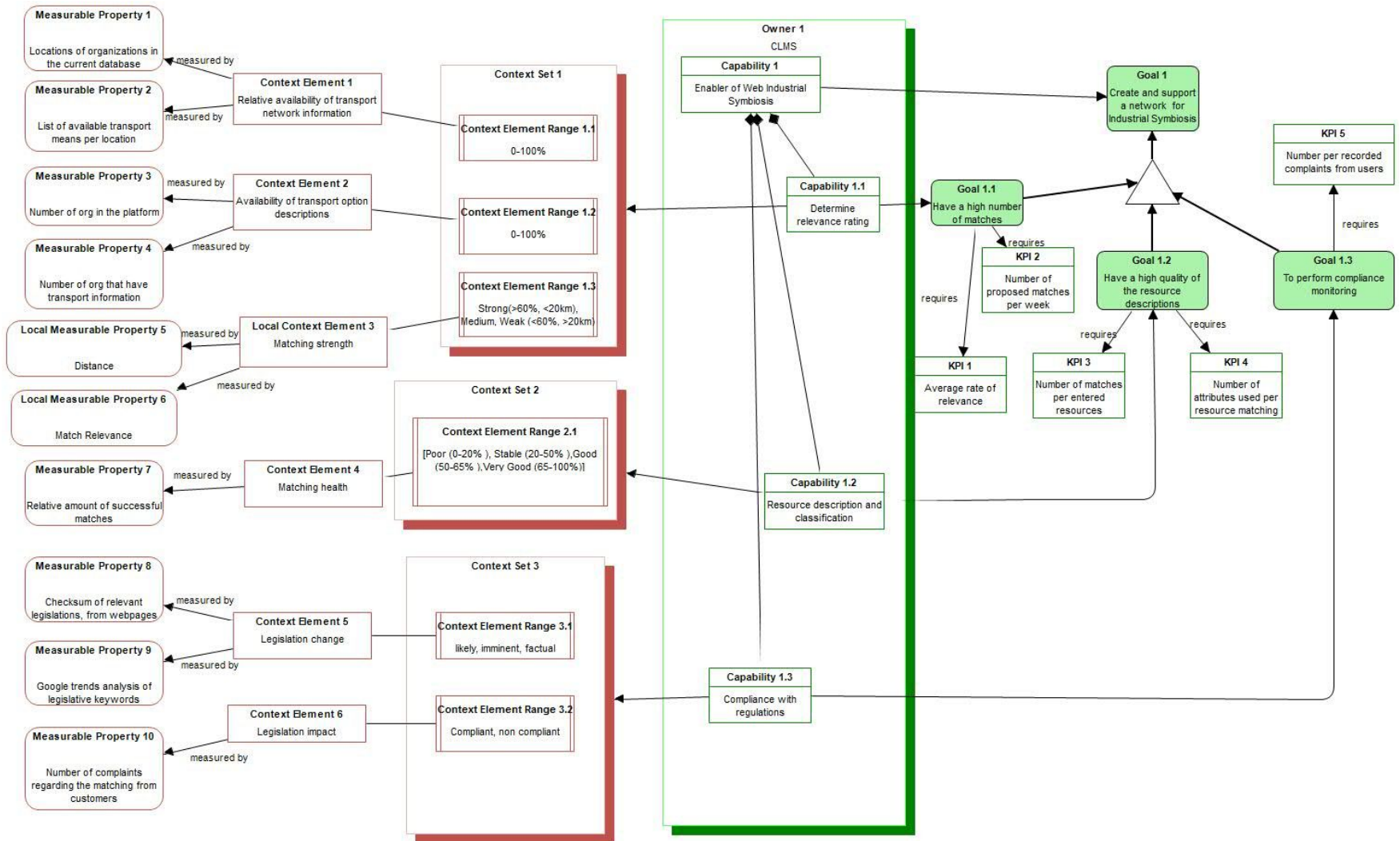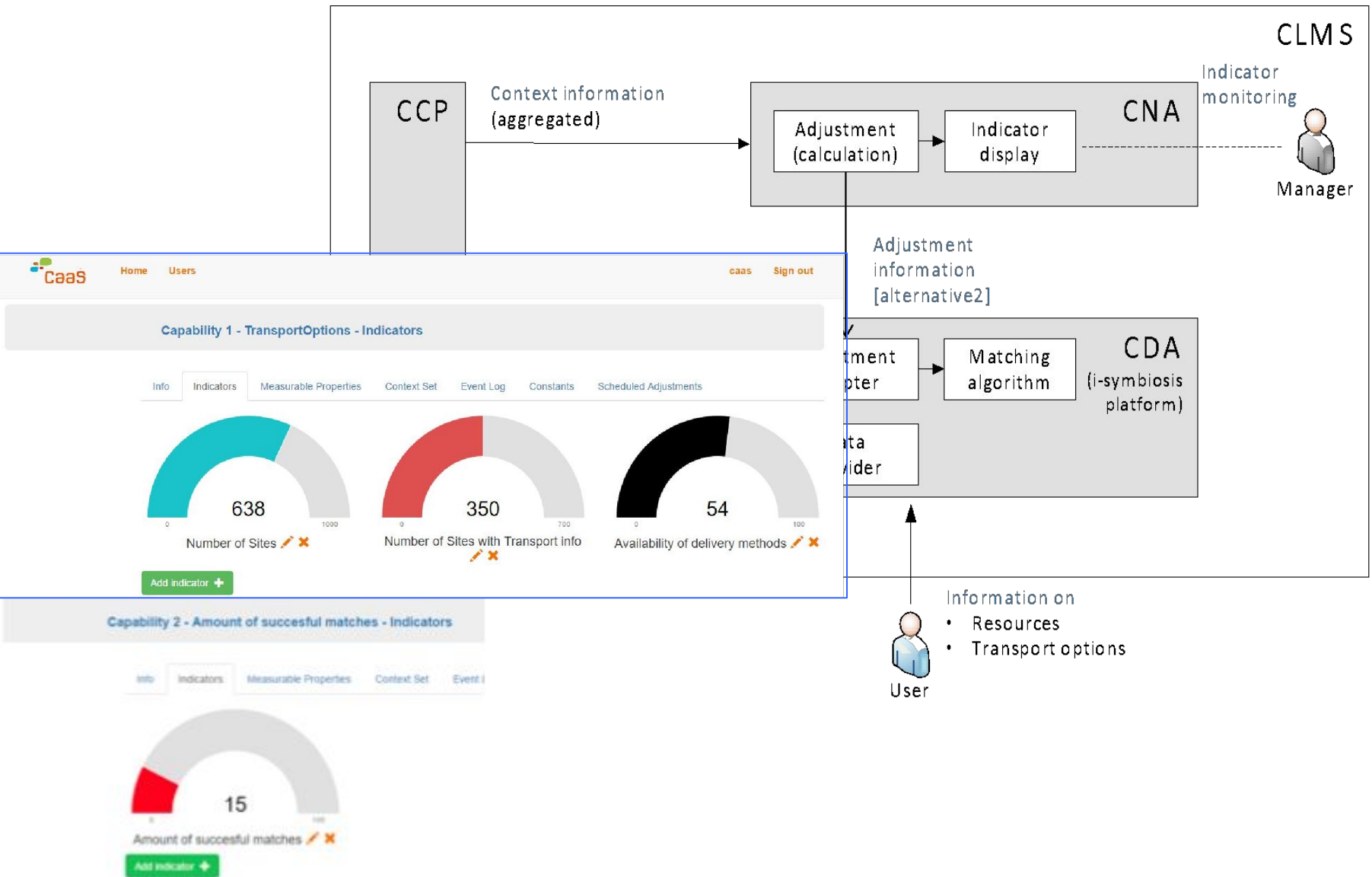| Aspect of comparison	Perspective		
	Goal-first	Service-first	Context-first
Primary view on capabilities	Capability fulfils key organisational goals and KPIs	Capability operationalises business services	Capability encompass the management of business contexts
Preconditions with respect to models	Strategy, top-level organisational goals defined.	Pre-existing business process specifications, service-oriented culture.	Pre-defined management structures, product structures or other conceptual models.
Effect/Impact	Provides a base for capability monitoring by the use of KPIs. Reinforces strategic vision and clarifies the IT-business alignment.	Provides a base for having capabilities as the enabler for variety of customer needs.	Provides a base for context-aware variability management.

© J.Stirna

Architecture of the CDD Environment

Capability Context Platform (CCP) → MP value push → **Capability Navigation Application (CNA)**

Capability model and implementations

Capability Pattern Repository

Capability Context Platform (CCP) → MP → **Capability Design Tool (CDT)**

Adjustment information

Capability Delivery Application (CDA)

Measurable property (MP) value push

External data providers

Measurable Property (MP) value push

Internal data providers

application data

© J.Stirna

CDD Environment at SIV

© J.Stirna

CLMS the case of industrial symbiosis

© J.Stirna

CDD Environment for i-symbiosis

© J.Stirna

Everis capability design for service promotion

Adjustment algorithm:

© J.Stirna
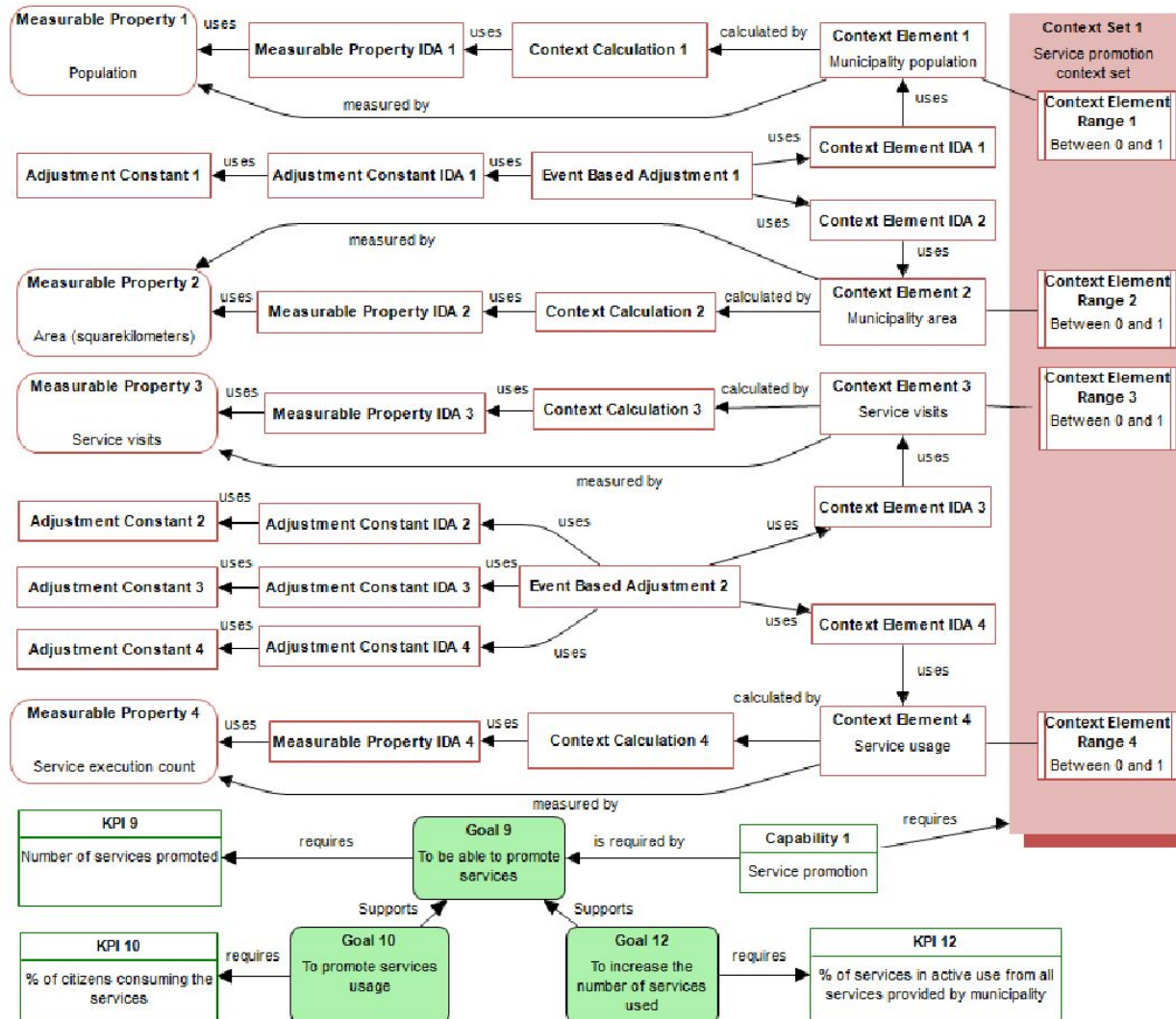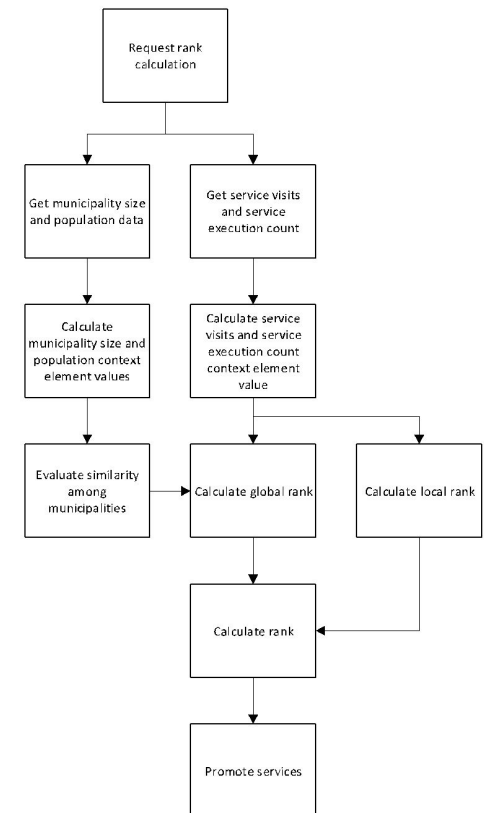
# Existing use of the concept of capability

Framework	*Some capability definitions… there are plenty more*
OMG-BA	The ability or capacity that the business possesses or exchanges to achieve certain outcome.
OMG-VDML	The ability of an organization to perform a particular type of work and may involve people with particular skills, intellectual property, defined practices, operating facilities, tools and equipment.
TOGAF	The ability expressed including a combination of organization, people, processes, and technology to achieve it.
DODAF	The ability to achieve a Desired Effect under specified standards and conditions through combinations of means to perform a set of activities.
MODAF	A high level of enterprise's ability - classification of some ability, specified regardless of whether the enterprise is currently able to achieve it.
NAF	The ability of one or more resources to deliver a specified type of effect or a specified course of action.
O. G. SOA	A category of requirements that fulfills a set of needs. It is aggregated in an Architecture Building Block.
OMG SoaML	A set of functions or resources that a service provided by one or more participants might offer.

… we talked about some of these in the previous lecture.

© J.Stirna

An example of capability design in MODAF

J.Stirna
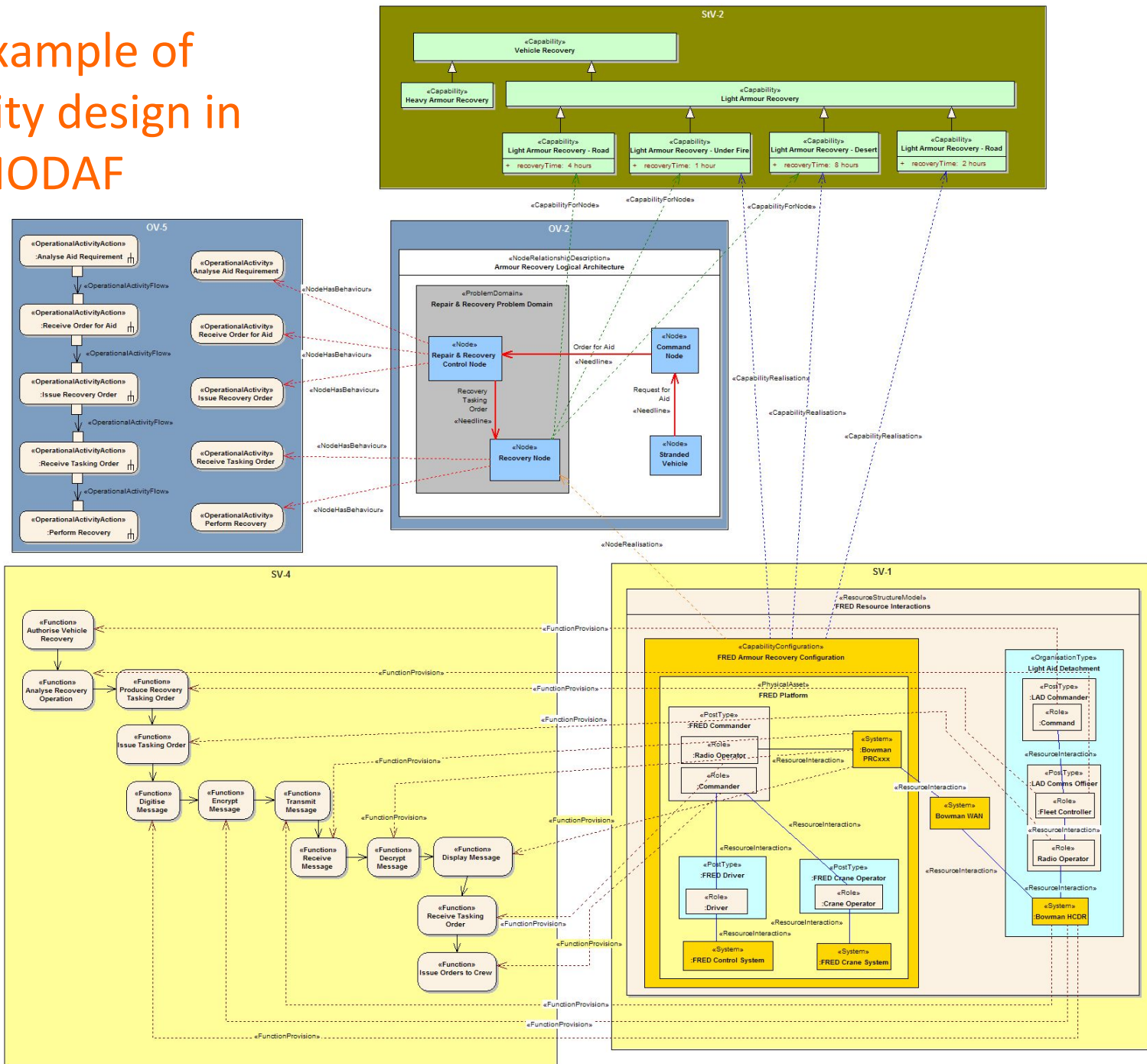
Example of capability taxonomy according to NAF
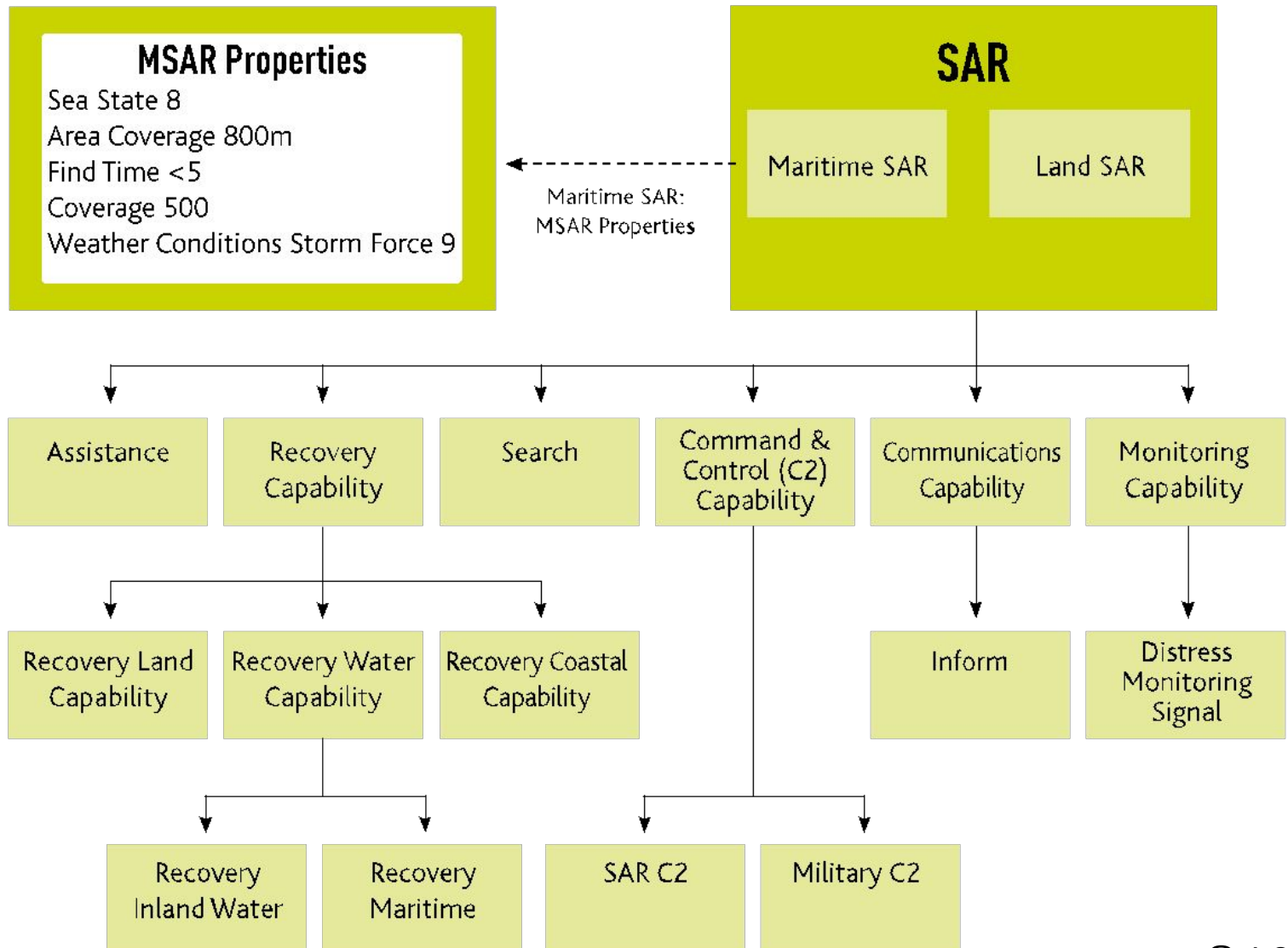
Outlook – potential applications

- Cyber-resilience – resilient capabilities need to dynamically adjust to adverse cyber-events
- Digital transformations of companies – creating new business from traditional and IT capabilities
- Big data management – support for enterprise-wide data management, analysis of large business contexts
- Continuous and congruent business and IT development.

Continuous Business Planning · Collaborative Design · Continuous Deployment · Continuous Monitoring · Continiuous Adjustments · Continiuous Feedback
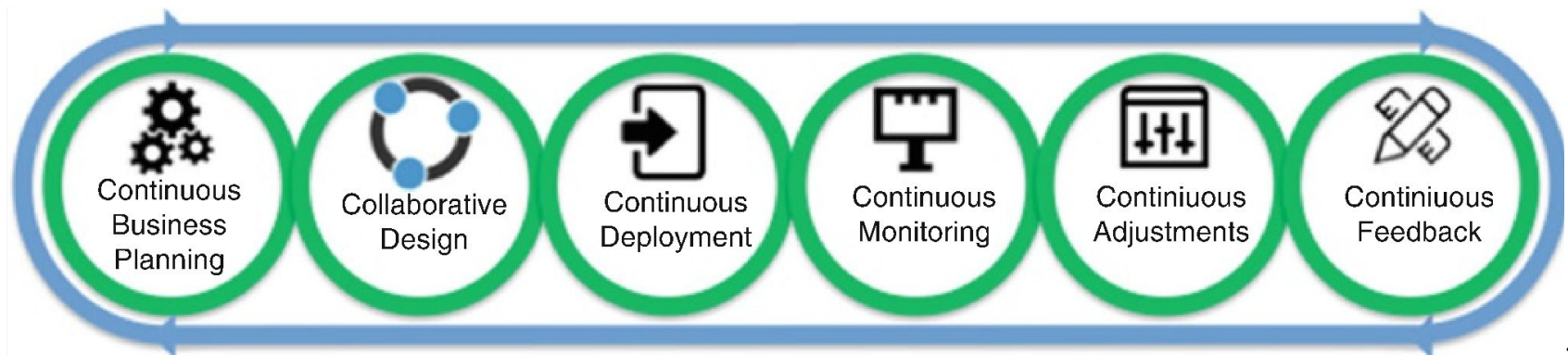
Additional Reading

- **http://caas-project.eu** lots of papers here

- Sandkuhl & Stirna (eds.) Capability Management in Digital Enterprises, Springer (2018)
  https://link.springer.com/book/10.1007/978-3-319-90424-5

- This book descibes the state of the art in capability management we well as presents the CDD approach in detail. Contains presentations of real life cases.

- An early paper on capabilities. Not really related to CDD but "ideologically significant": Teece, Pisano, & Shuen (1997). "Dynamic Capabilities and Strategic Management". *Strategic Management Journal. 18 (7): 509–533.* *http://onlinelibrary.wiley.com/doi/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z/epdf*