TRADEOFFS IN ARCHITECTING SMART EV CLUSTERS

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The Mobi.E Project

Overview

Introducing MOBI.E

Why architecture?

Capturing architecture

Evaluating architecture

Drawing conclusions

Next steps

Why is Architecture Important?

The primary link between benefit and cost.

High leverage on an organization's activities.

- Relatively small portion of an organization's efforts
- Yet dictates majority of work!

Source of competitive advantage.

Good architecting provides:

- Leverage within one project.
- Cross project commonality.
- Good interface control.
- Creative new solutions.

(E. Crawley)

EV CHARGING SYSTEMS
IT

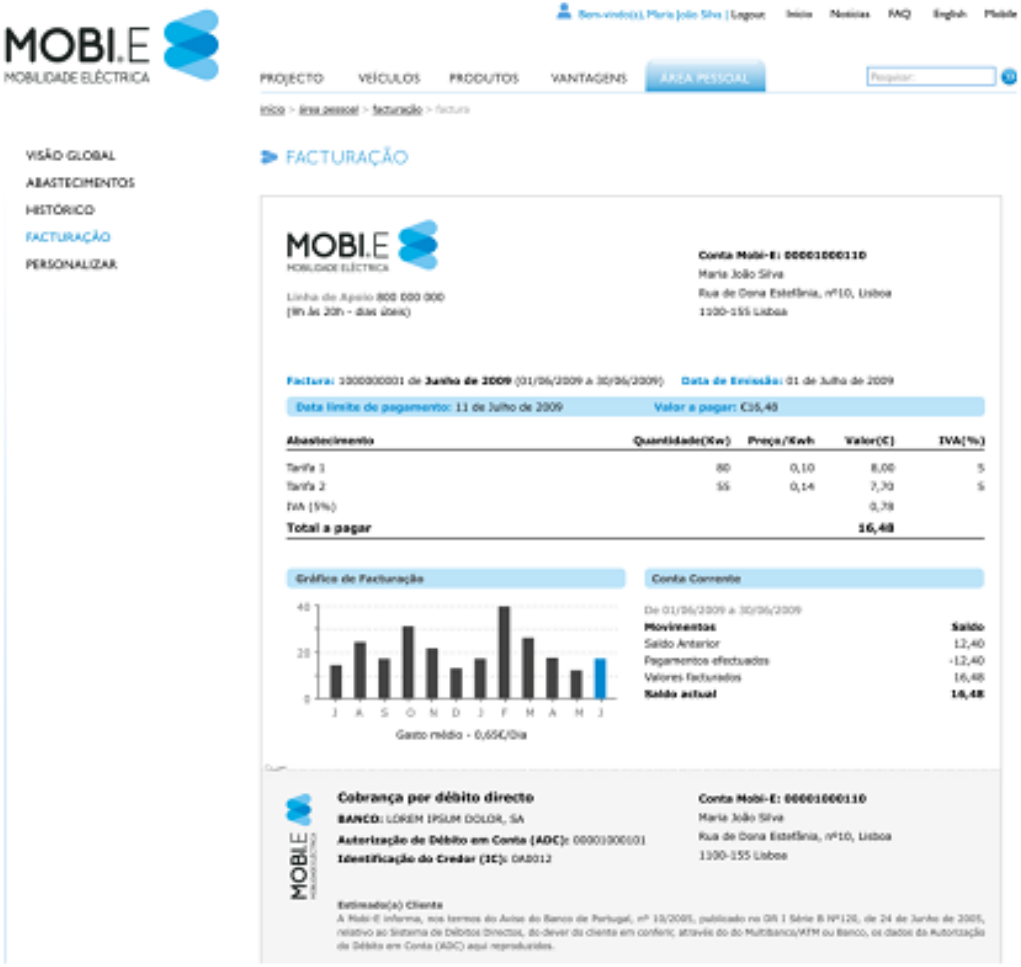
REAL-TIME VISUALIZATION OF CHARGING POINTS, INCLUDING CHARGING STATUS AND VACANCY INFORMATION

REMOTE MONITORING OF CHARGING PROCESS

CRM PLATFORM FOR STAKEHOLDERS' MANAGEMENT

MOBI.E
MOBILIDADE ELÉCTRICA

EV CHARGING SYSTEMS
IT



WEB-BASED MULTI-PLATFORM ACCESS
PC, PDA, CELL PHONE

INTEGRATED INVOICING WITH COMPLEMENTARY SERVICES
PARKING, PUBLIC TRANSPORTS, DOMESTIC ELECTRICITY, CREATION OF PERSONAL AND BUSINESS ACCOUNTS

ROAMING BETWEEN ELECTRIC MOBILITY ELECTRICITY RETAILERS

MOBI.E
MOBILIDADE ELÉCTRICA

PORTUGUESE ELECTRIC MOBILITY PROGRAM
BUSINESS MODEL: WHO'S WHO IN ELECTRIC MOBILITY

USER
Citizen / Organization

ELECTRIC MOBILITY ELECTRICITY RETAILER
Sells electricity for EV vehicle charging

CHARGING NETWORK OPERATOR
Operates charging network access points, making the charging service available to its users through different electric mobility retailers

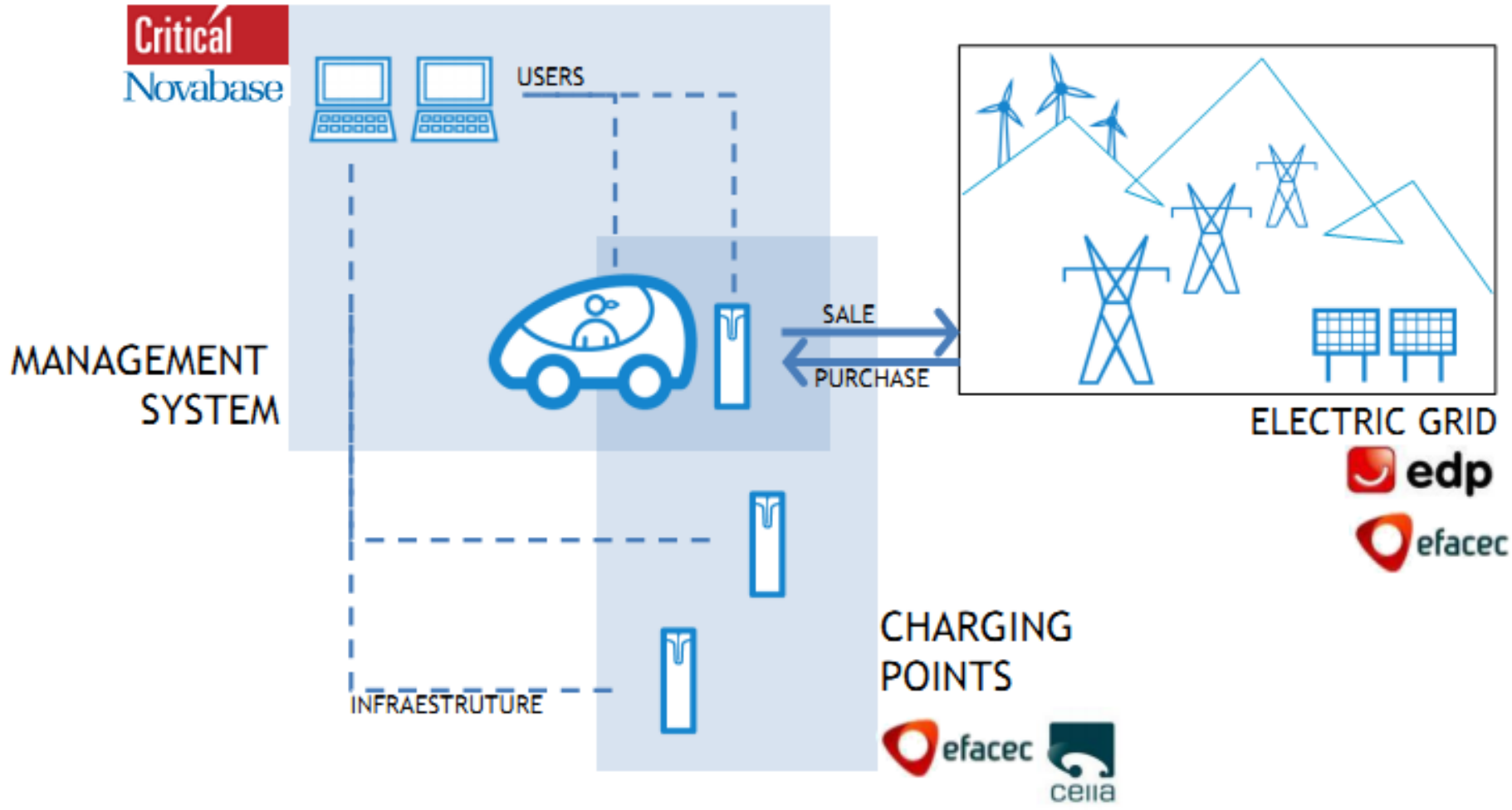
MANAGING AUTHORITY
Ensures integration between all stakeholders as well as the integrated management of information and energy flows within the electric mobility framework

SERVICES OPERATOR
Supplies additional services such as parking, which might be integrated into a single invoice

ELECTRICITY DISTRIBUTION NETWORK
Distributes and supplies the electricity sold by the electric mobility retailer

MOBI.E MOBILIDADE ELÉCTRICA inveli

EV CHARGING SYSTEMS
TECHNICAL CONSORTIUM ARCHITECTURE



Study questions

What were the design choices made in MOBI.E?

What functionality was given up?

Is MOBI.E considered to be ‘well’ architected?

- According to the current architecture principles.
- Is it future ready and foolproof?
  - Is it flexile, scalable, agile and adaptable?

Have we discovered anything new about architecting during MOBI.E?

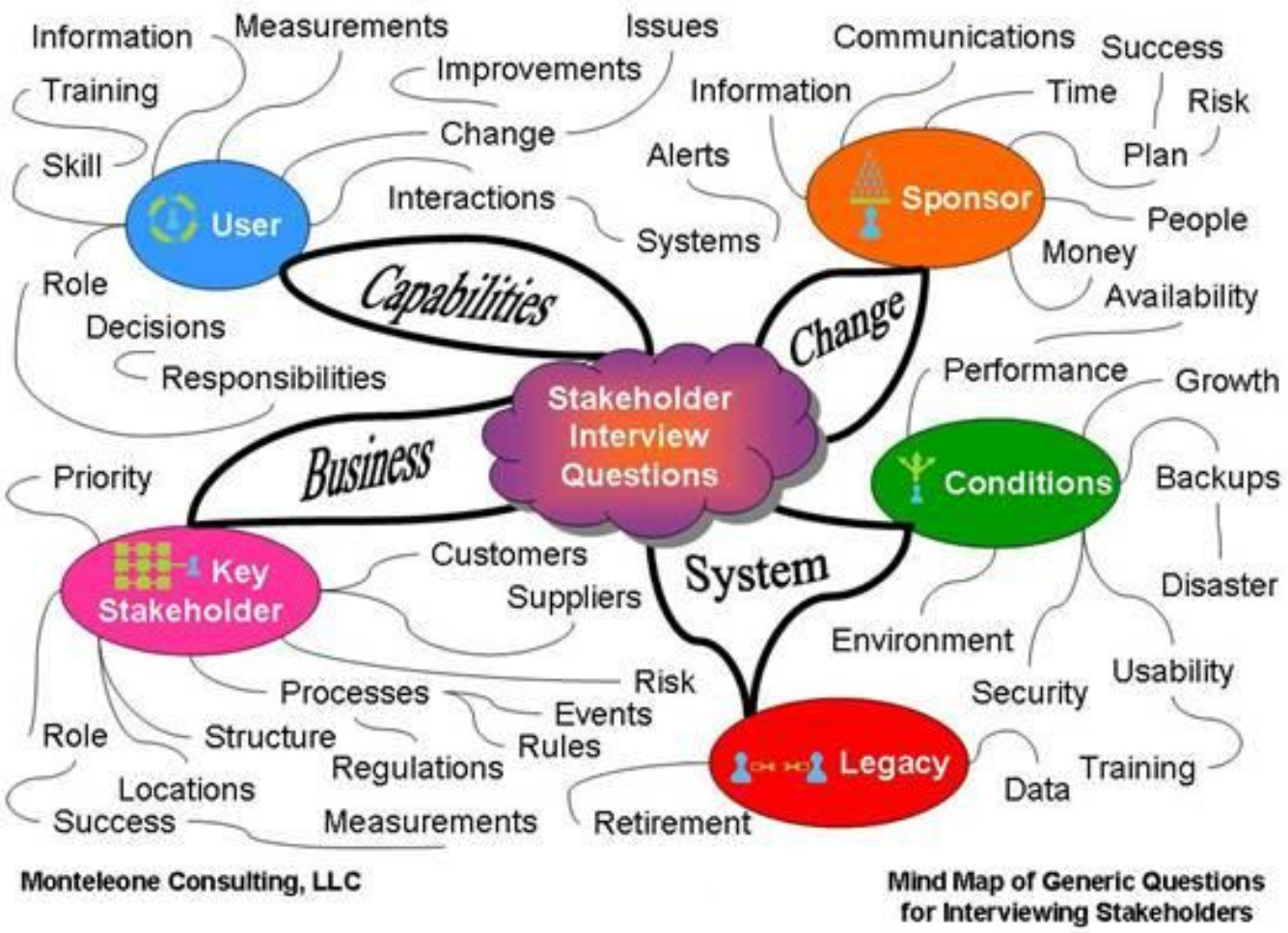
- What can we add to the body of architecting knowledge?

Capturing System Design

Who am I talking to?

RESEARCH & INNOVATION	COMMUNICATION	ENERGY	TECHNOLOGY
inveli 1	FIGHT GRAVITY 6	edp inovação 4	NOVABASE 2
RENER LIVING LAB			Critical 5
ceiia			SIEMENS
REMOBI			efacec 3
			MAGNUM CAP ELECTRICAL POWER STORAGE

Questions to ask



An interview framework

Generic introduction

- Interviewer background

Architectural strategy

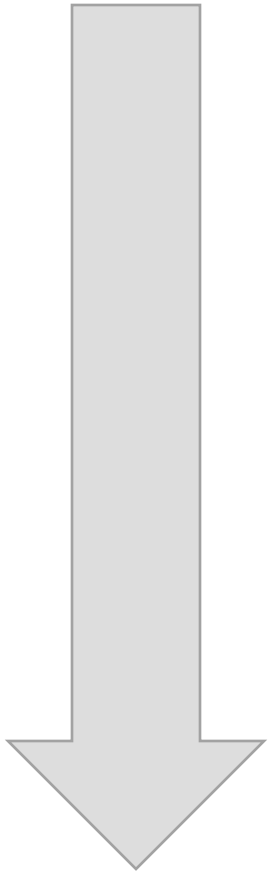
Beneficiary needs

Policy view, culture and incentives

Upstream and downstream influences

The organizational view

The knowledge view and the future

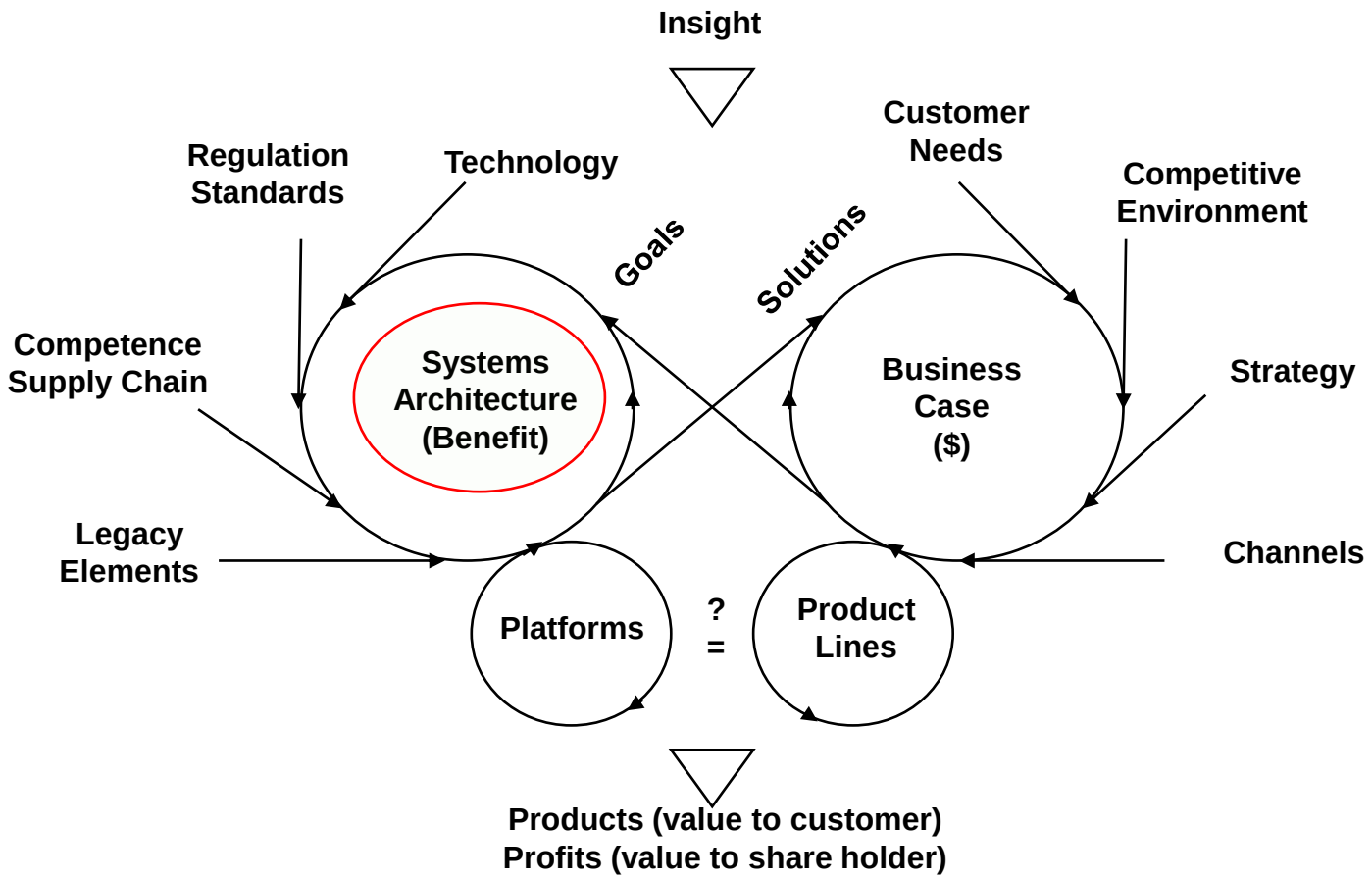


The Results <that I hope to get!>

Structured Morphological Matrix– MOBI.E (Hypothetical)

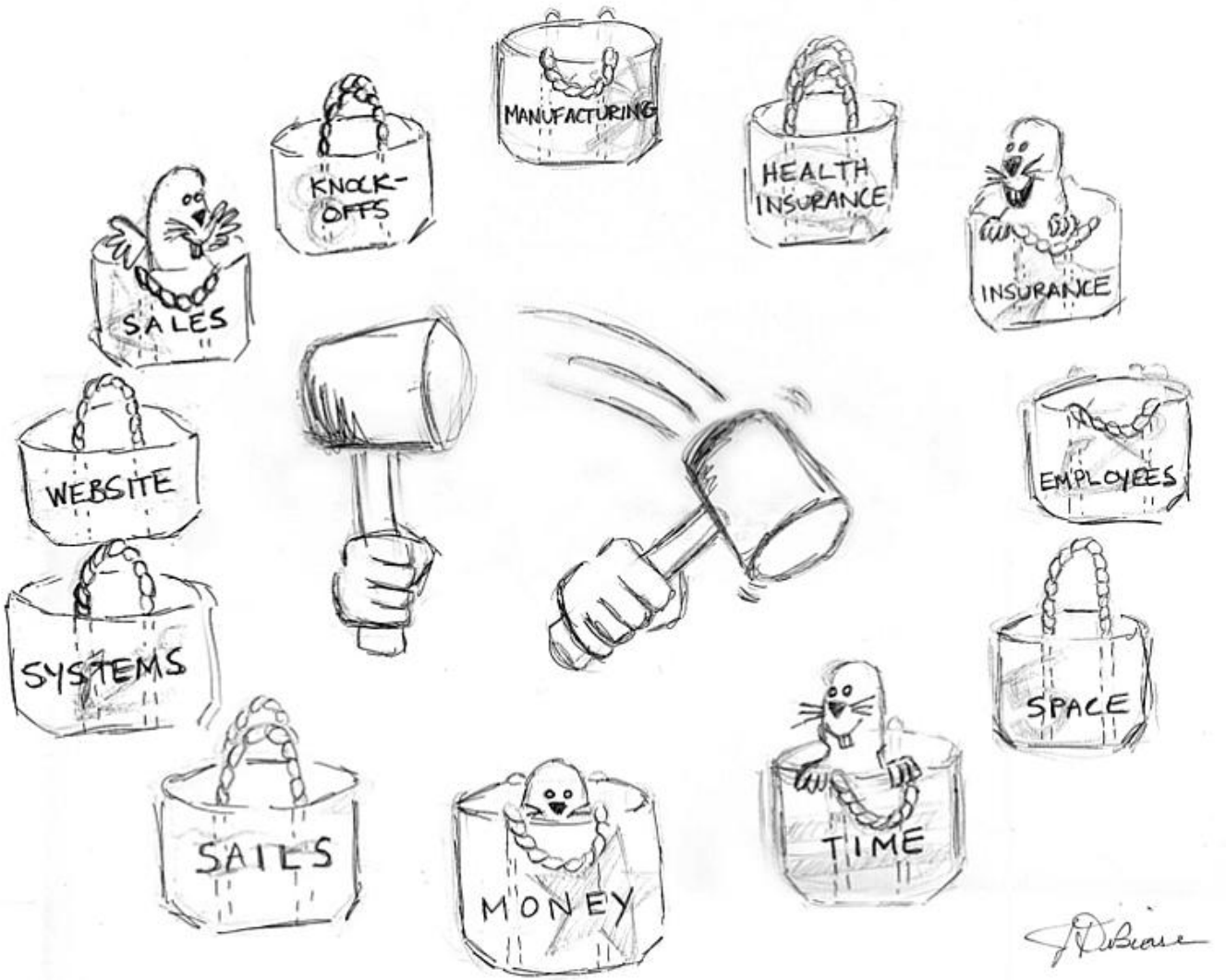
	Choice A	Choice B	Choice C	Choice D	Choice E	Choice F	Choice G	Choice H
Generating Function	Wind Energy	Geothermal Energy	Nuclear Energy	Solar Energy	A+B	A+B+C+D	B+C	A+B+C
Charging Config Function	110V, 20A	220V, 200A	A+B					
Billing Function	Pre-paid	POS, Post-paid or Pre-paid	Post-paid	POS				
Real Time Update Function	On mobile phone	Online	Manual	A+B+C				
Energy Transfer Function	G2V+V2G	G2V	V2G					
Security Function	Basic Access Authentication	Digest Access Authentication	HTTPS	A+B	A+C	B+C	A+B+C	

…within the overall context

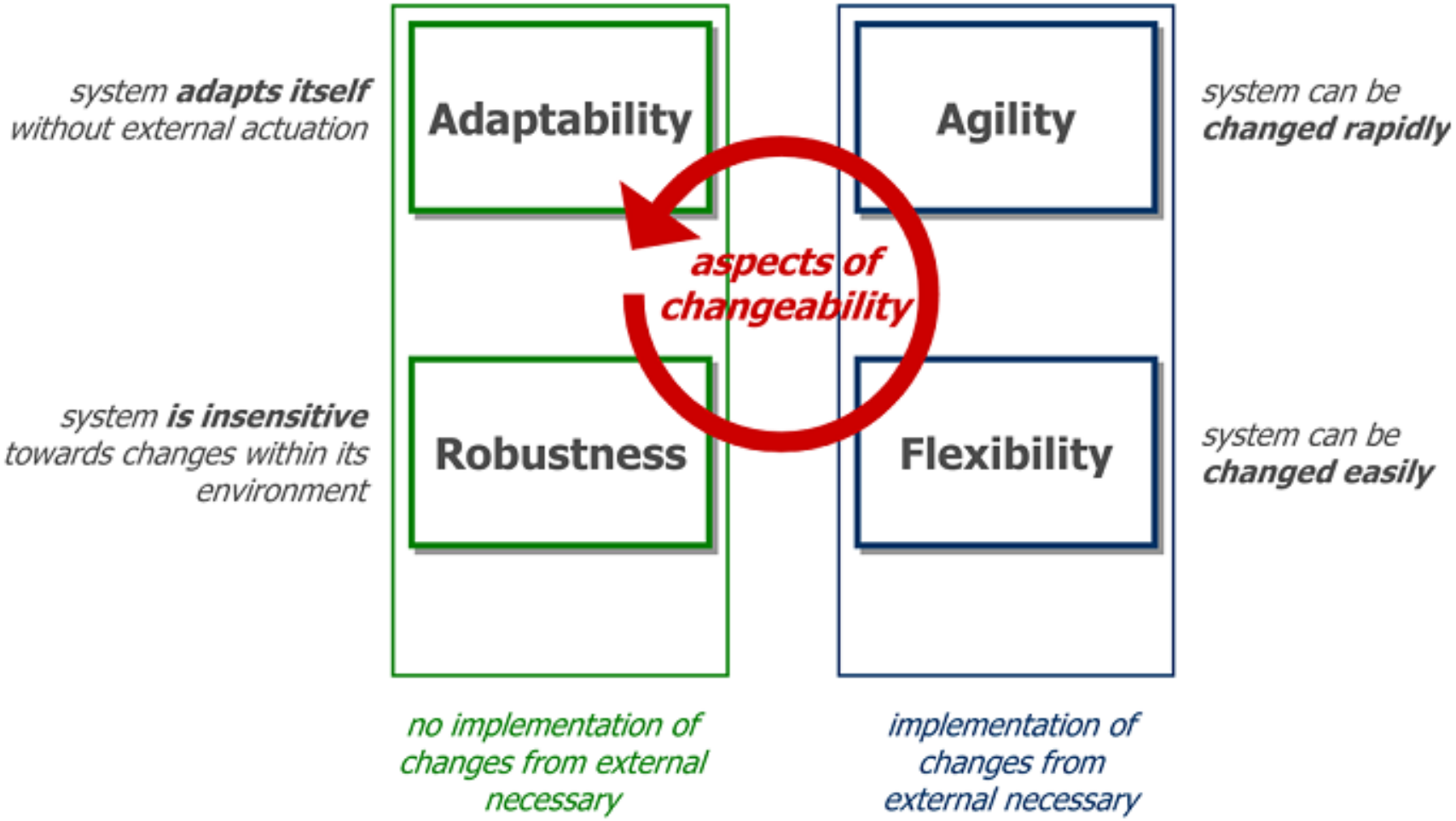


Tools for evaluating system architecture

Whack-a-mole!


MANUFACTURING
KNOCK-OFFS
HEALTH INSURANCE
INSURANCE
SALES
WEBSITE
EMPLOYEES
SYSTEMS
SPACE
SAILS
MONEY
TIME

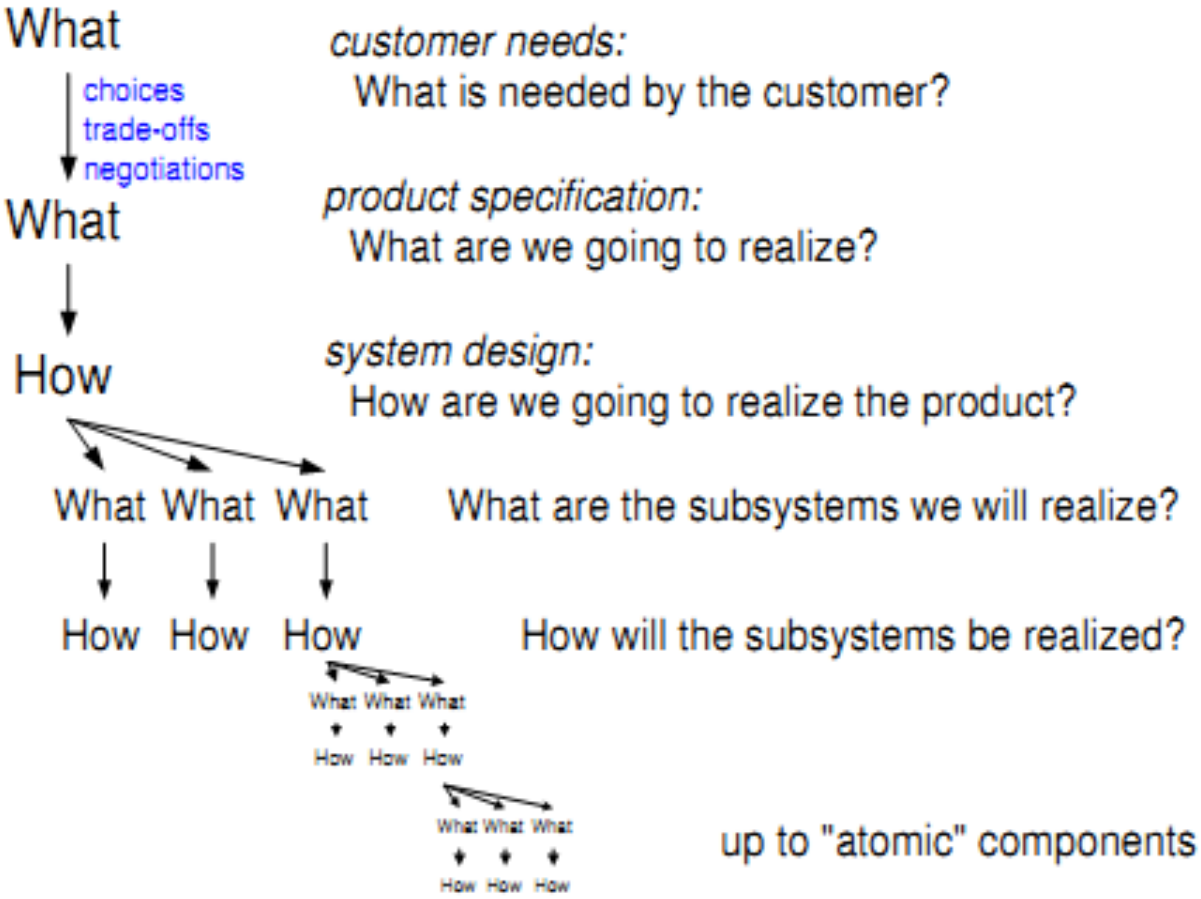
Design for Changeability



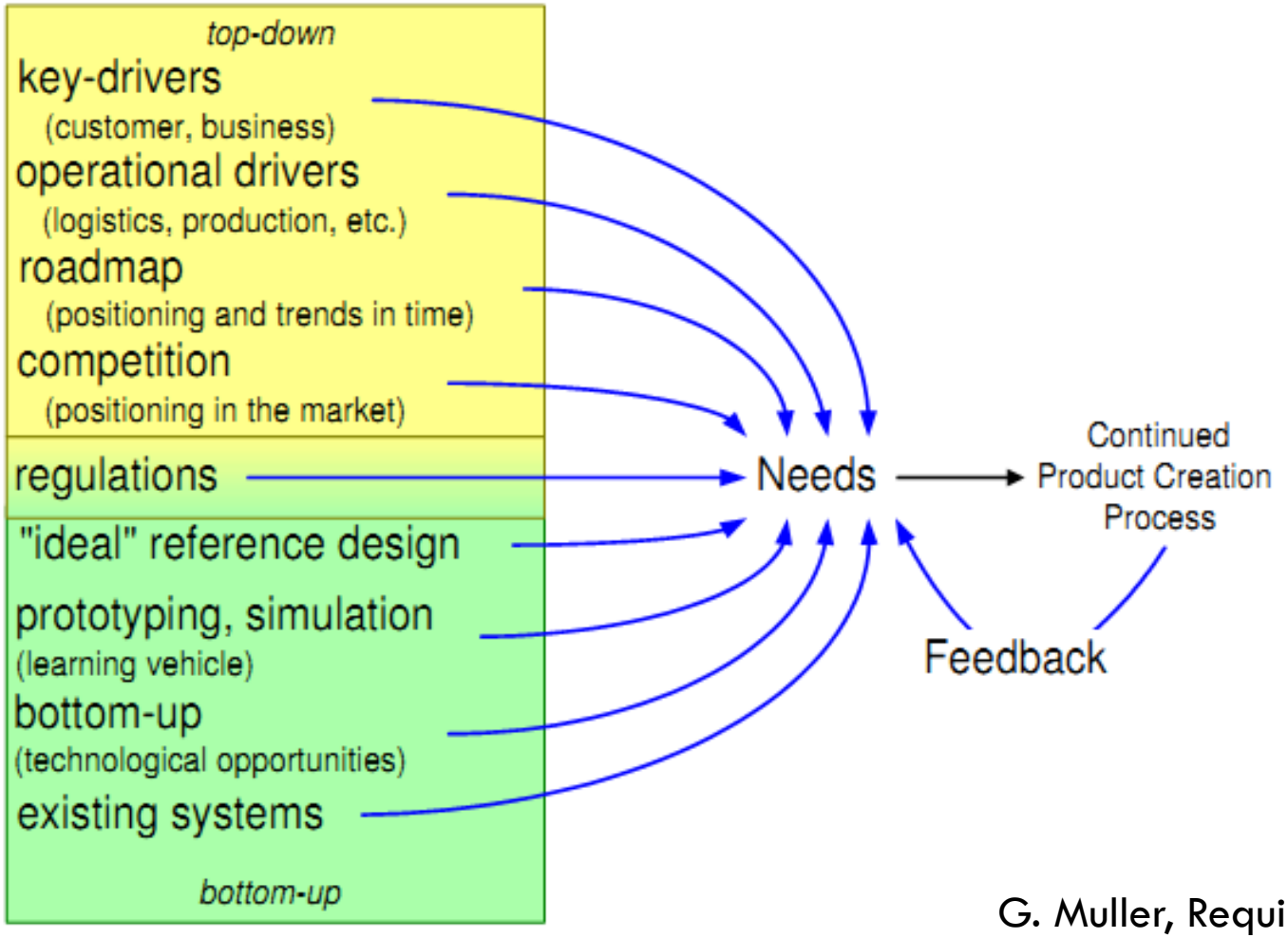
E. Fricke, BMW

Considerations while evaluating future changes

The Flow of Requirements

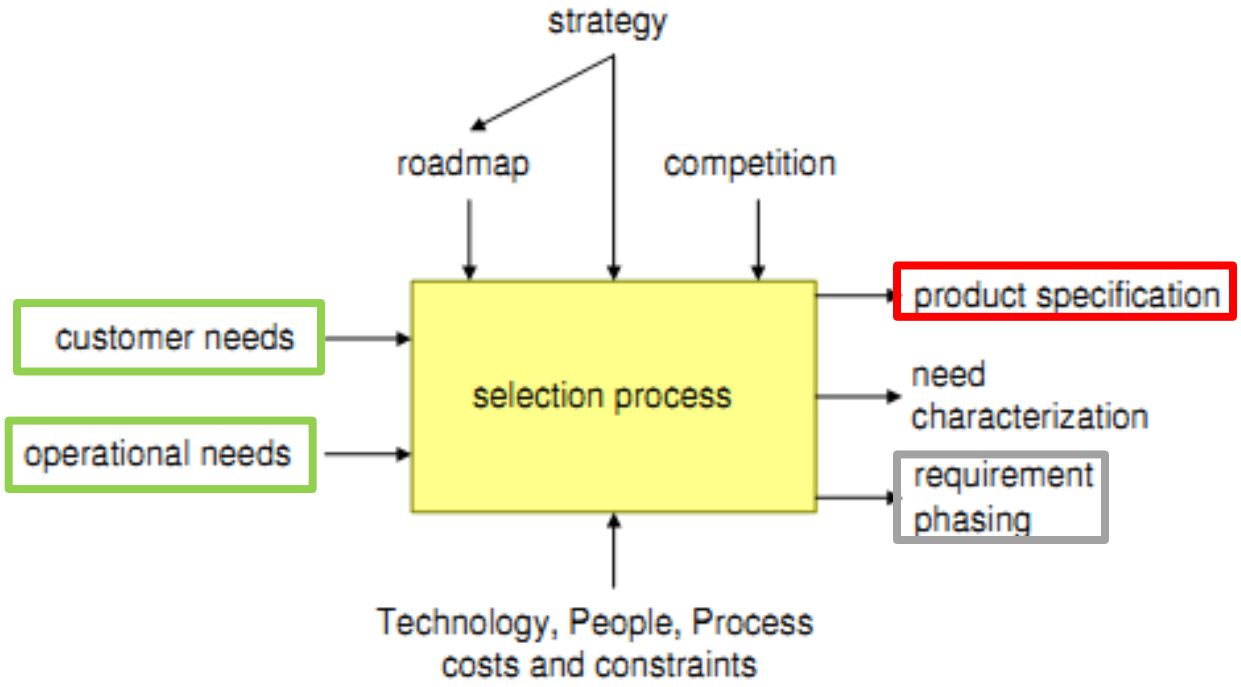


Complementary Viewpoints: Needs

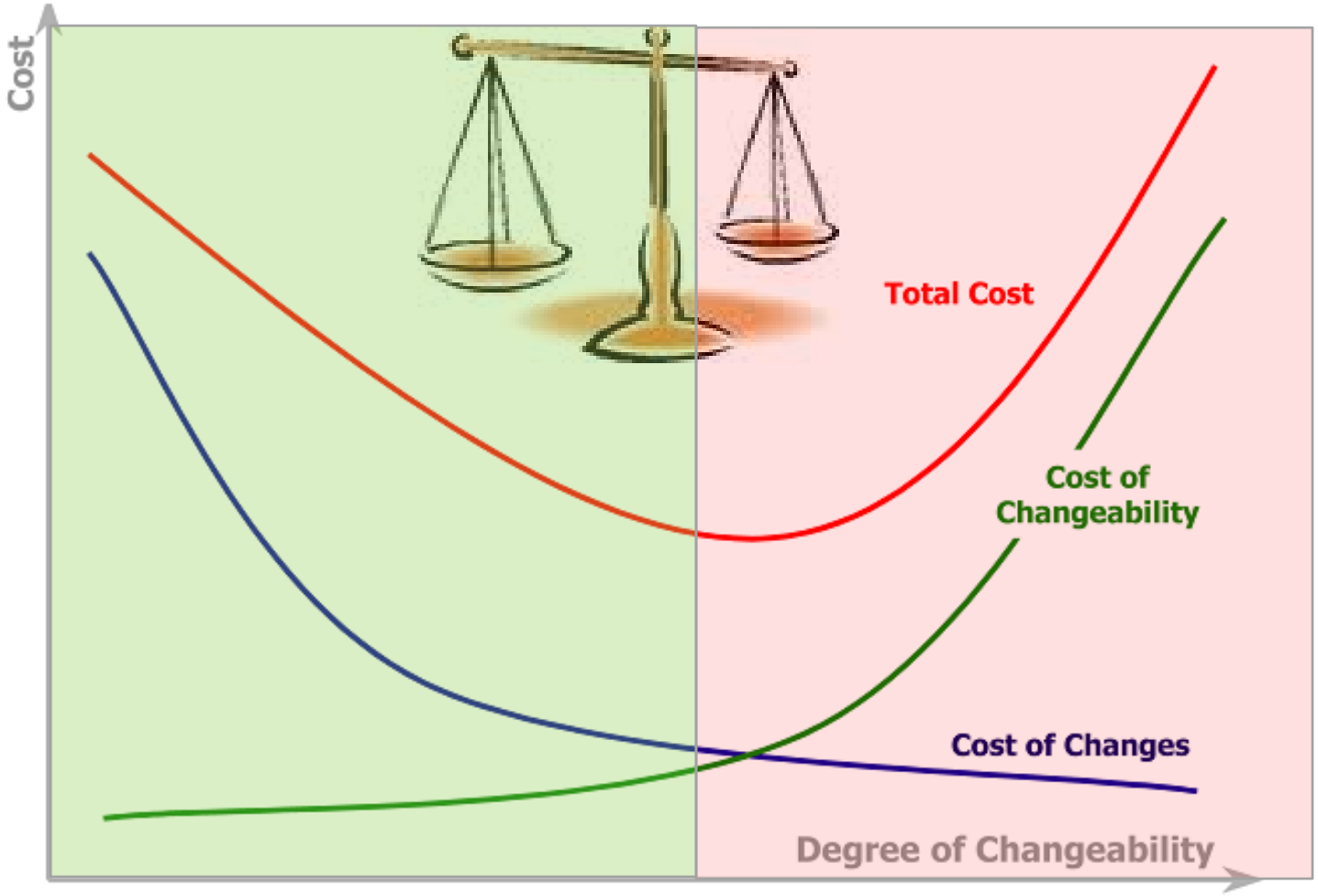


G. Muller, Requirements Capture

The architectural selection process



But don't go *too* far with flexibility!



Why are we doing all this?

Understand tradeoffs in design practice.

Recommend improvements in Mobi.E design.

- Any showstoppers in current design?

Extract best practices from industry.

- Integrate them into theory & future design.
- Where are the biggest gaps between theory and practice???

THANK YOU!