

Service Engineering Methodology in Practice: A case study from power and automation technologies

by

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Agenda

- Context
- Service Engineering Methodology (SEEM)
- SEEM Application: ABB use case
- Conclusions

The research background

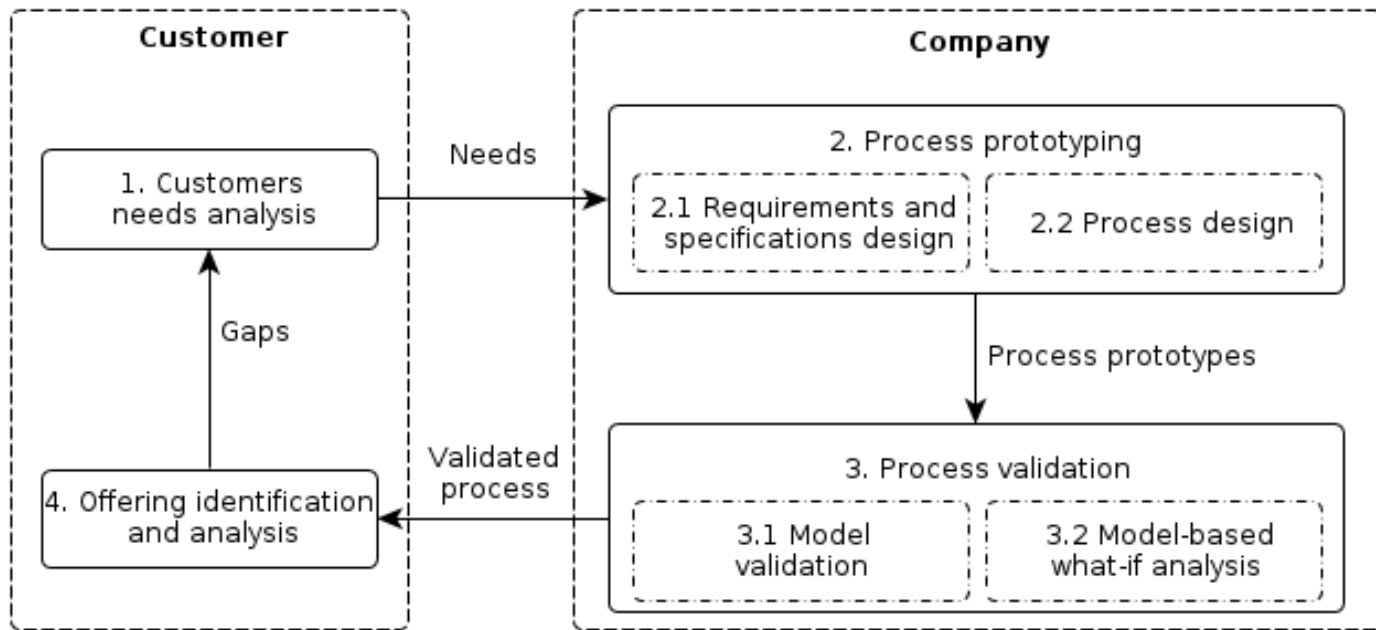
- When compared to physical products, services are generally under-designed and inefficiently developed (*Froehle et al., 2000*)
- Product engineering & design \neq PSS engineering & design
- Few methods available for designing and engineering services
- Needs for a framework for the systematic development and design of services
- Need to overcome the product-centric perspective



SERVICE ENGINEERING (SE)

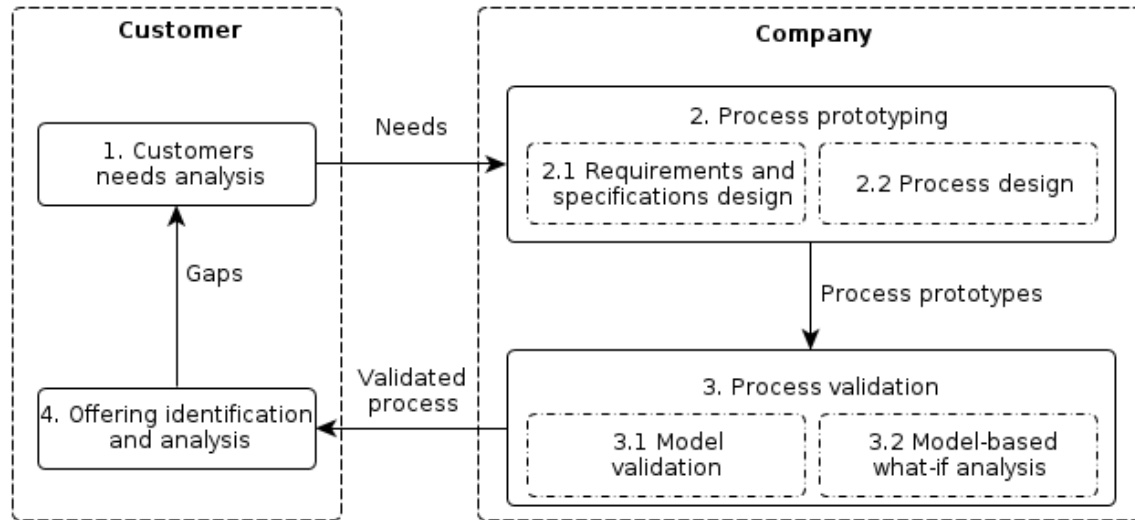
(Bullinger et al., 2003; Shimomura & Tomiyama, 2005)

The Service Engineering Methodology -SEEM



Balance among customer and company perspective

SEEM overview



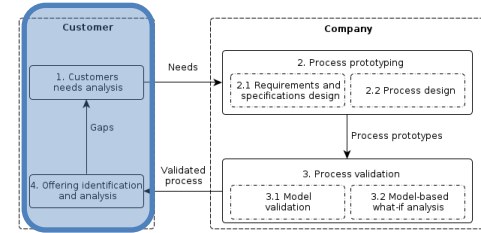
Customer perspective

- Obtain a clear understanding of customer needs, requirements and value determinants
- Analysis of the existing service offering

Company perspective

- Identification of the relationships between the customers needs and the provider's resources
- Definition and representation of the service delivery process
- Assess the overall process performance

Customer needs analysis



Customer needs analysis

Description of the customer features (segments, revenues, demand, ...)

List and rank of customers' needs:

- 1) Price
- 2) Quality
- 3) ...



Customer needs and segments

Service offering

List and definition of service categories and subcategories:

ABB service categories

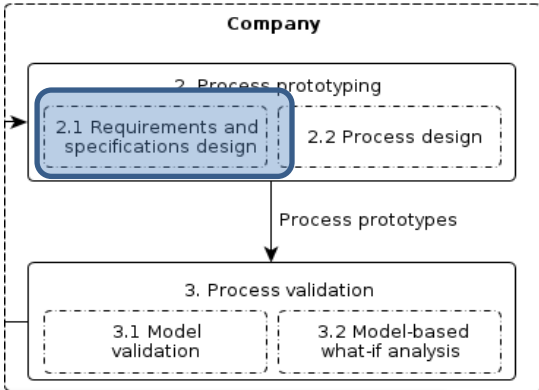
	2. Installation & commissioning	3. Training	4. Spare parts & Consumables	5. Maintenance	6. Repairs	7. Engineering & Consulting	8. Advanced services	9. Extensions & Upgrades	10. End-of-life services	11. Replacement
Installation	ABB University	Replacement Parts	Preventive maintenance	Workshop repairs	Engineering planning and specifications	Asset optimization	Software upgrades	Decommissioning	Replacement of active products	
Commissioning		Pre-owned parts	Predictive maintenance	On-site repairs	Engineering system integration	Op. excellence	Hardware upgrades	Resale	Replacement of non active products	
Simulation		Parts Kits	On-site condition monitoring	Corrective maintenance	Technical support	Environmental compliance	Extensions	Disposal and recycling	Replacement of third party products	
Programming services		Consumables	Remote condition monitoring	Life cycle assessment	Remote trouble-shooting	Engineering configurations	Recalls			
		Exchange units	Inspections & diagnostics	Parts and inventory management	Refurbishment/Reconditioning services	Benchmarking and audits	Energy Efficiency			
		Extended warranty	Project management			Project management	Maintenance Management			
							Cyber Security			
							Software as a service			
							Data back-up services			
							Data engineering			



Gaps and Challenges

SEEM overview – SRT

Needs (N): needs express the customer necessity (i.e. short downtimes)

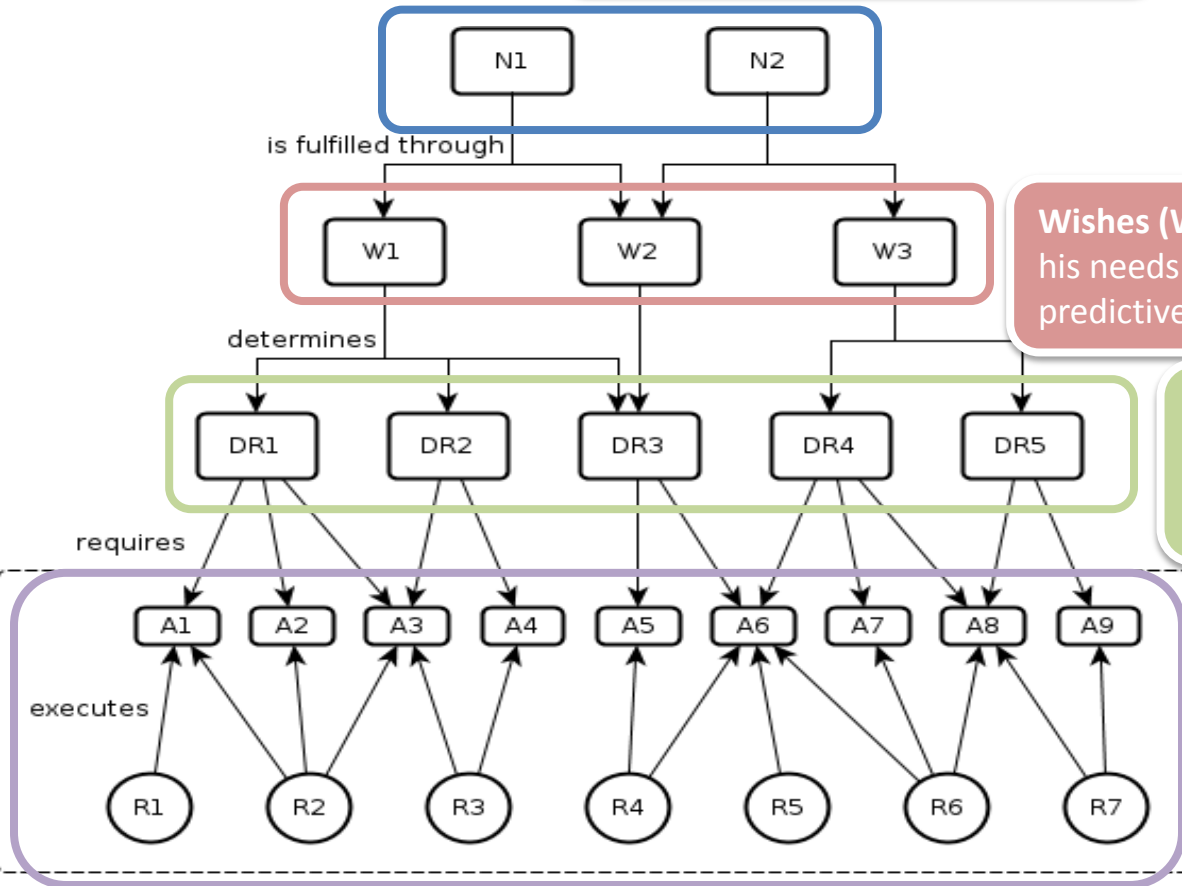


Needs

Wishes (W): how the customer wants to satisfy his needs (i.e. reducing repairing time, improving predictive maintenance...)

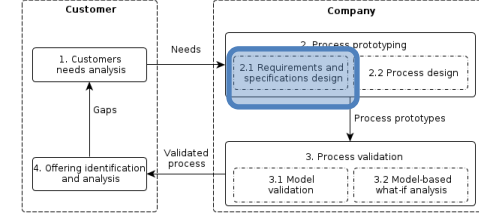
Design Requirement (DR): how the company can satisfy the customer wishes (i.e. quick maintenance team response, advanced failure data analysis...)

Design Specifications (DS): a design specification represents what a service process is intended to do to deliver the design requirement (i.e. data collection process, spare parts mngt process, remote control process...)



Resources (R): needed for the execution of the process' activities (i.e. technicians, warehouse operators, call center operators...)

Definition of the SRT



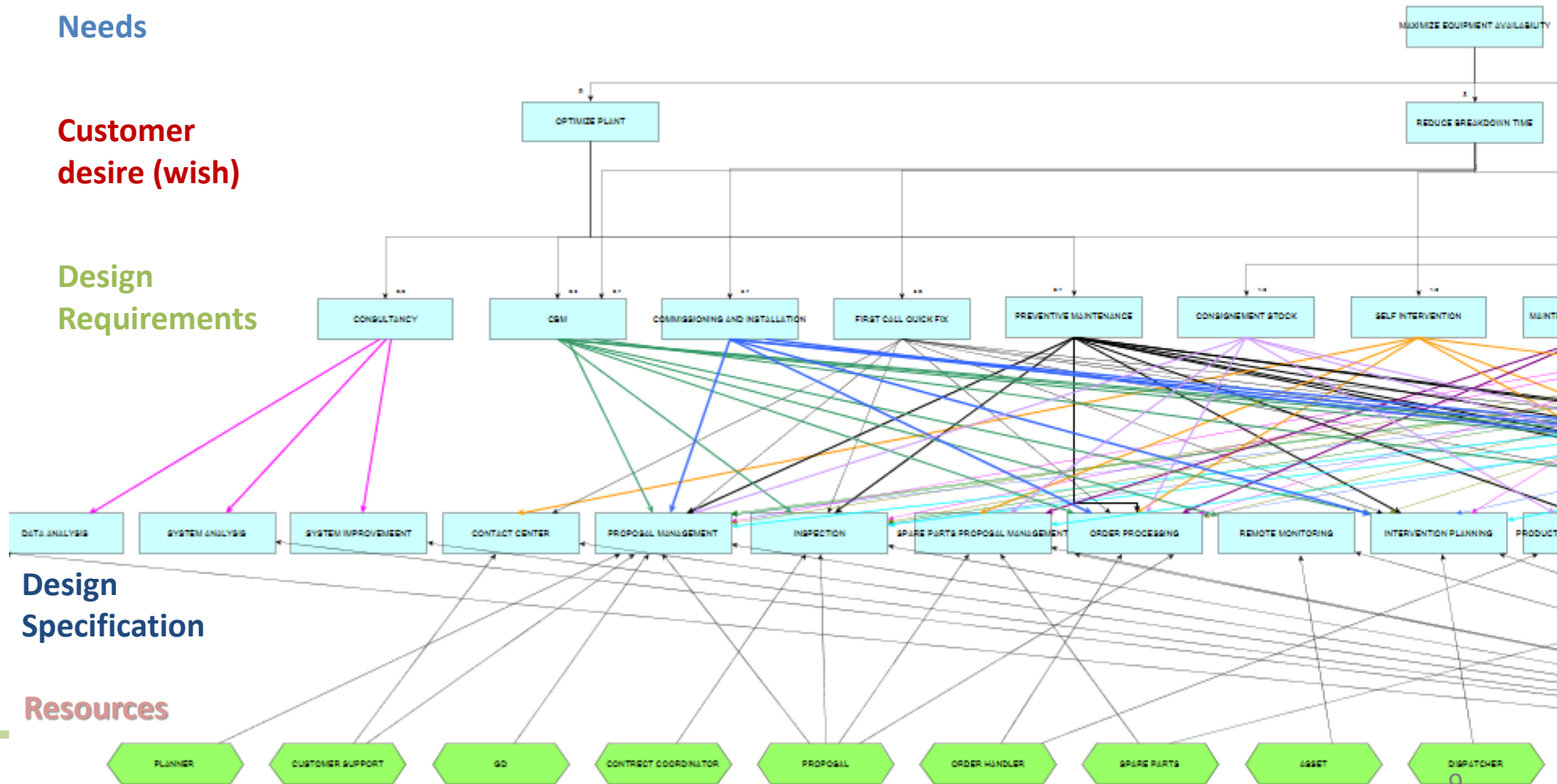
Needs

**Customer
 desire (wish)**

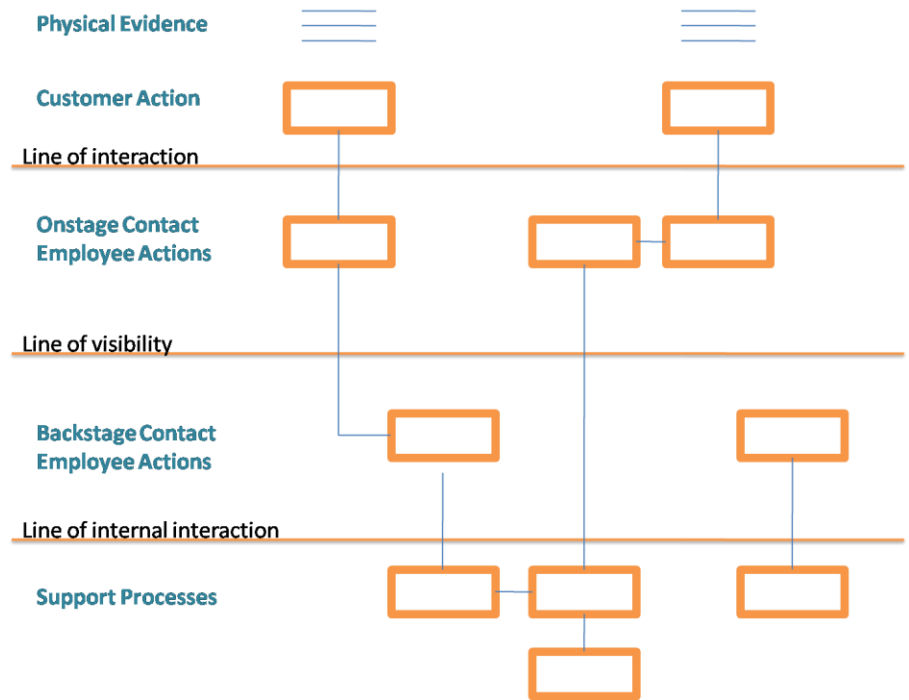
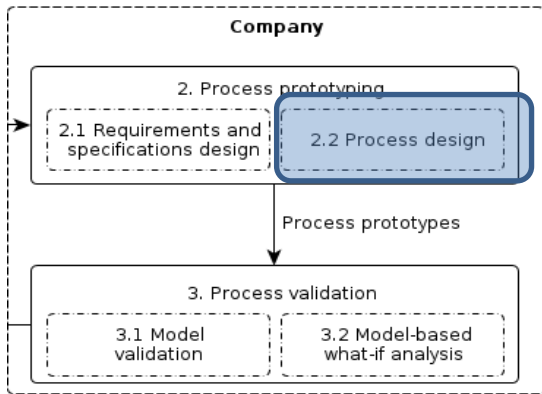
**Design
 Requirements**

**Design
 Specification**

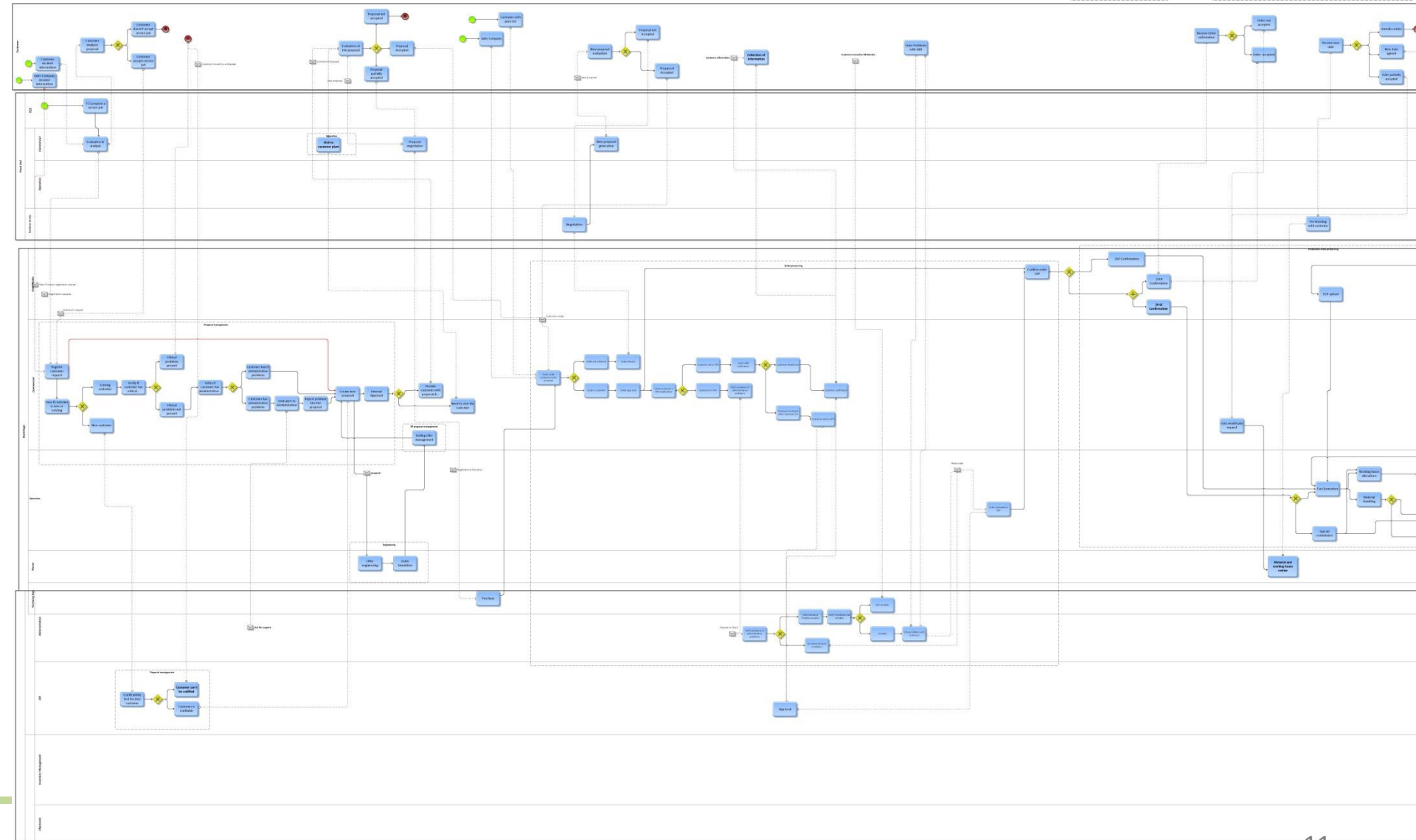
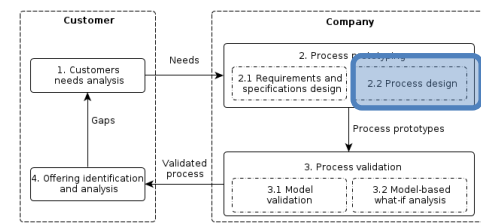
Resources



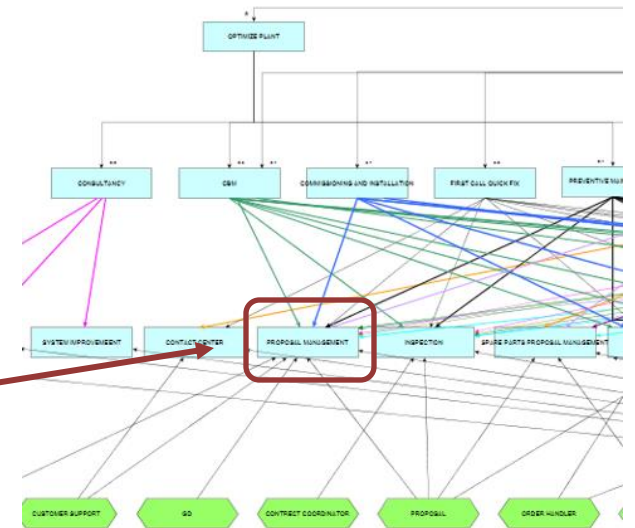
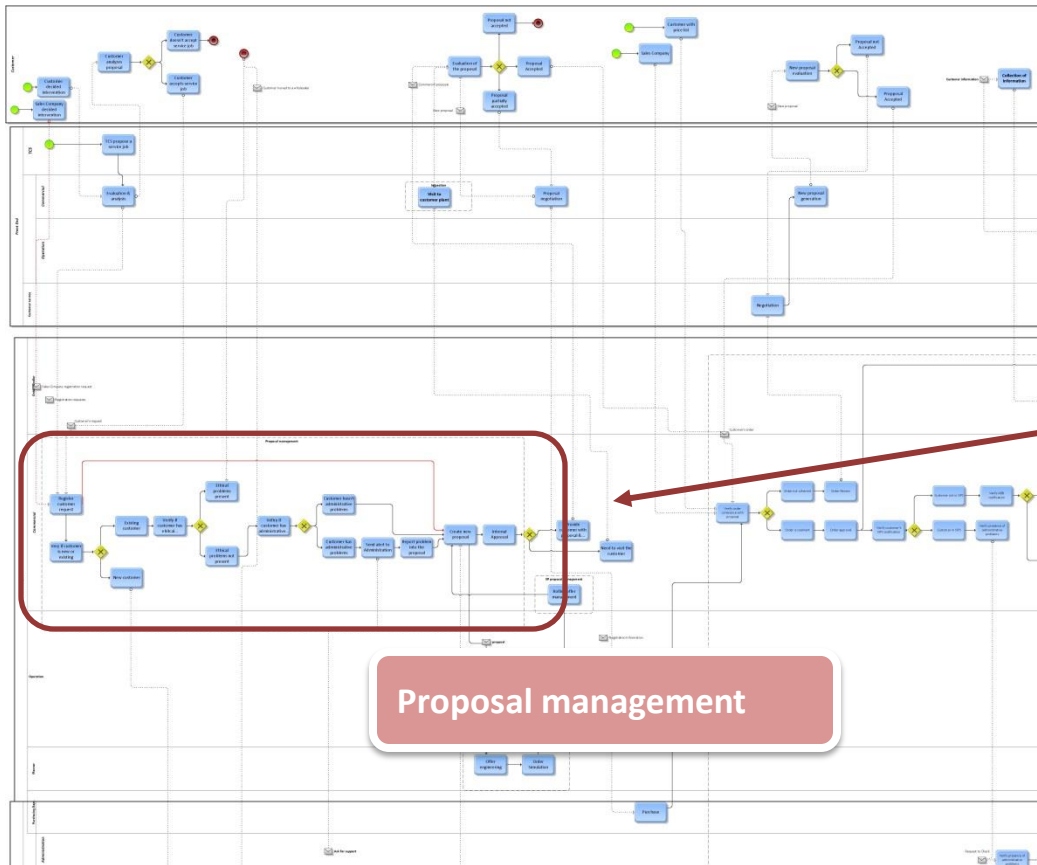
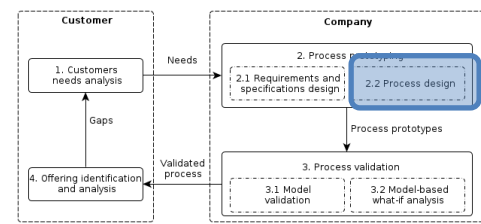
SEEM overview – Blueprinting



Service Blueprinting

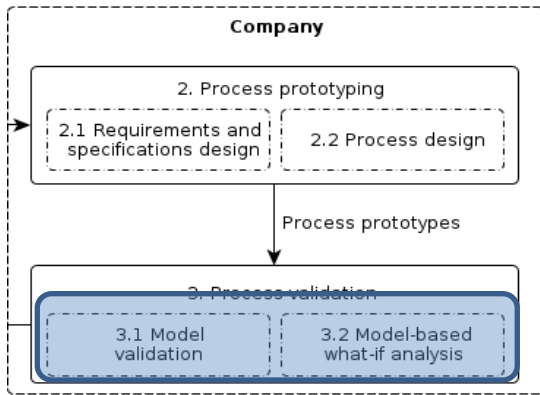


Connection between Blueprinting and DS



This link allows the connection between the «ideal» activities identified to satisfy customer need with the activity of the delivery process actually provided

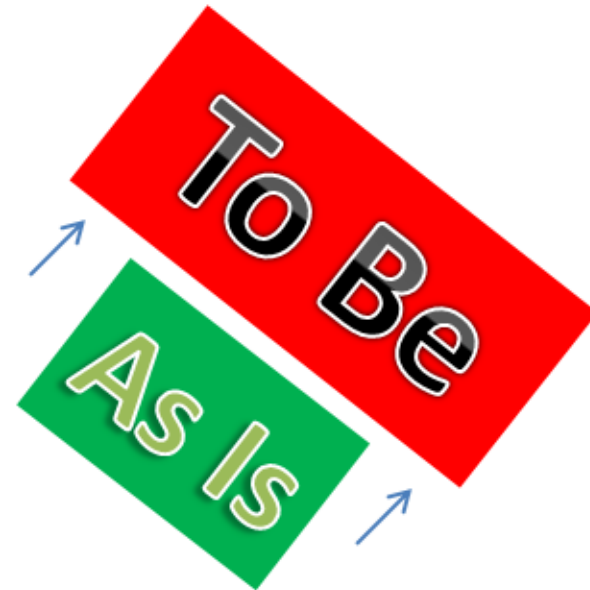
Process validation phase



The service delivery processes have been validated through the use of **Discrete Events Simulation**.

Simulation of service provision process

- Assess the performance
- Evaluate the effectiveness
- Support the selection
- Provide insights



SEEM application

ABB

~145,000 
employees

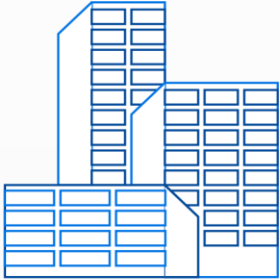

\$42 billion
In revenue
(2013)

Present
in

+100 
countries

Formed
in

1988


merger of Swiss (BBC, 1891)
and Swedish (ASEA, 1883)
engineering companies

Industrial Service at ABB

Rapid response



- Repairs
- Spares and consumables
- Replacement
- Training
- Service agreements

Lifecycle management



- Installation and commissioning
- Maintenance
- Extensions, upgrades and retrofits
- Replacement
- Training
- Spares and consumables
- End of life services
- Service agreements

Operational efficiency



- Engineering and consulting
- Maintenance
- Advanced services
- Extensions, upgrades and retrofits
- Training
- Service agreements

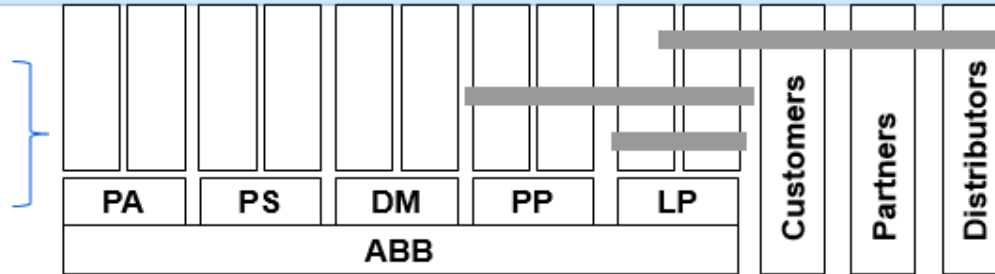
Performance improvement



- Advanced services
- Engineering and consulting
- Extensions, upgrades and retrofits
- End of life services
- Service agreements

Motivation from ABB

- Many players
- Shared resources
- Different roles
- Different values
- ...



Ecosystem



Customer Segment

- Different needs
- Different expectations
- Different values
- ...

Service offering portfolio

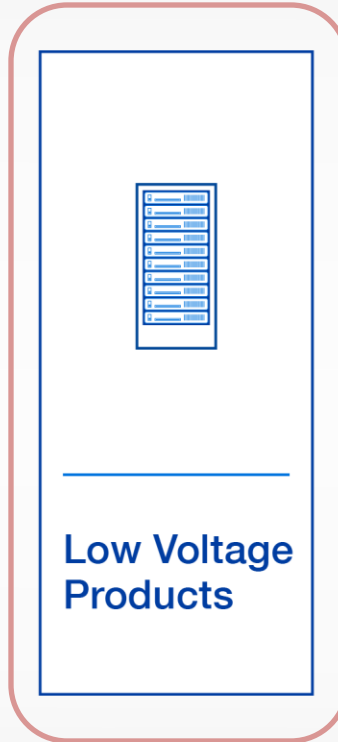
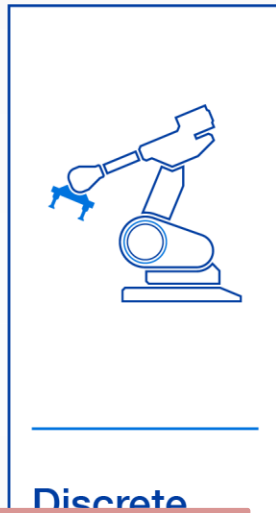
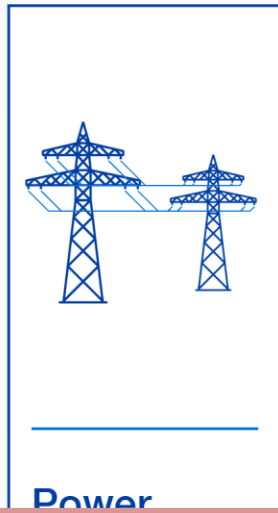
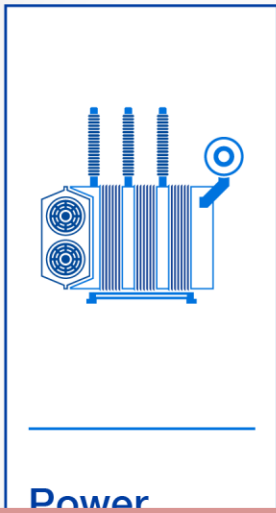
1. Service Agreements										
2. Installation & commissioning	3. Training	4. Spares & Consumables	5. Maintenance	6. Repairs	7. Engineering & Consulting	8. Advanced Services	9. Extensions, Upgrades & Renovation	10. End-of-life Services	11. Replacement	
Installation	ABB University	Parts	Preventive maintenance	Workshop repairs	Engineering planning and specifications	Asset optimization	Software upgrades	De-commissioning	Replacement of active products	
Commissioning		Pre-owned parts	Predictive maintenance	On-site repairs	Engineering customization	System performance	Hardware upgrades	Resale	Replacement of non active products	
Simulation		Parts Kits	On-site condition monitoring	Corrective maintenance	Engineering configurations	Energy Efficiency	Extensions	Disposal and recycling	Replacement of third party products	
Programming services		Consumables	Remote condition monitoring	Technical support	Benchmarking and audits	Cyber Security	Retrofit			
		Exchange units	Life cycle assessment	Remote Troubleshooting	Project Services	Software as a service				
		Extended warranty	Inspections & diagnostics		Process Safety	Data back-up services				
		Parts and inventory management	Replacement/Reconditioning Services		Operational Excellence	Data engineering				
					Integrity Management					
					Process software engineering					
					Environmental services					
					Maintenance Management					

500+ Service Products

Relentless execution in service delivery requires careful operational planning

The focus of the case study

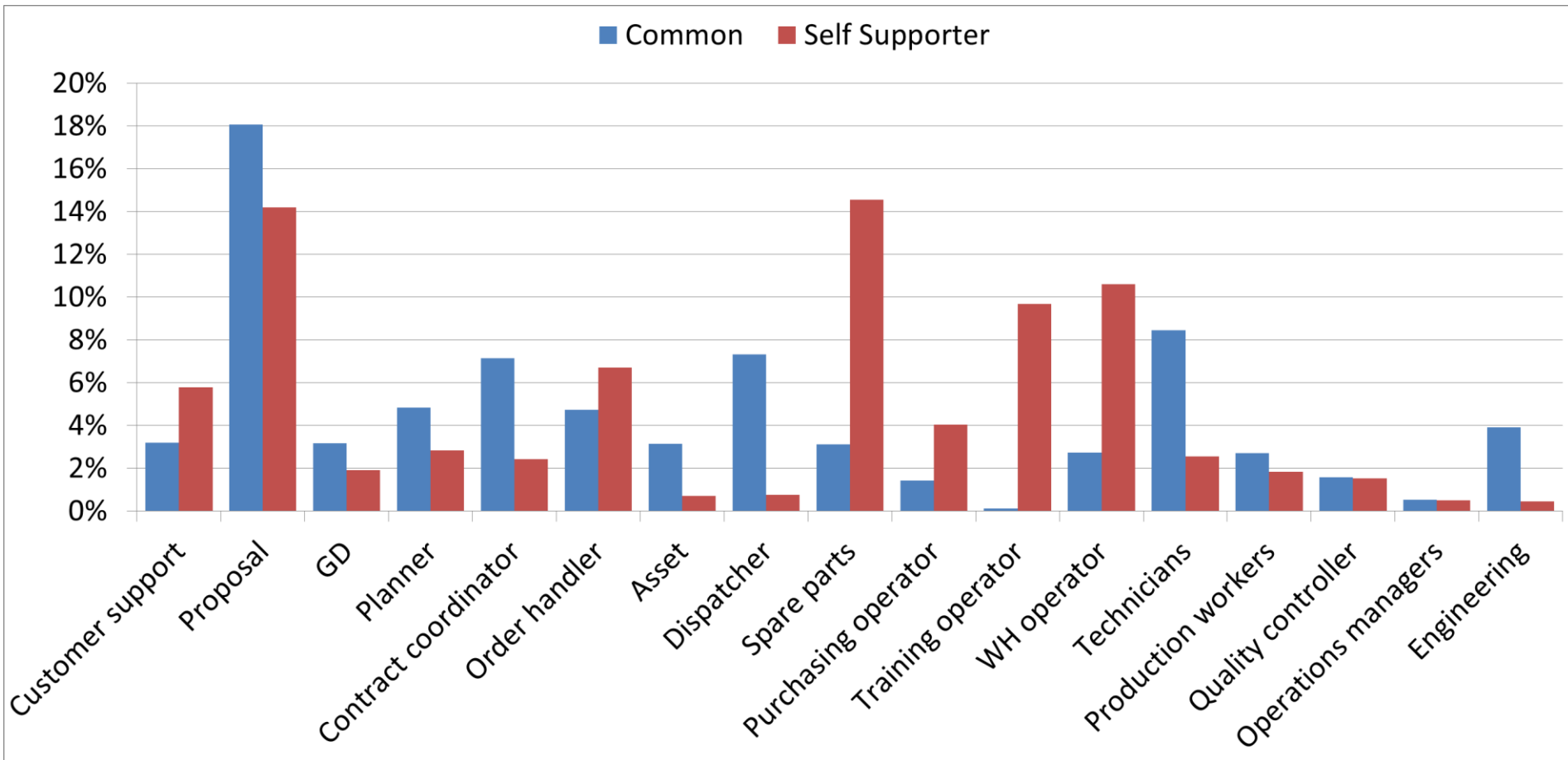
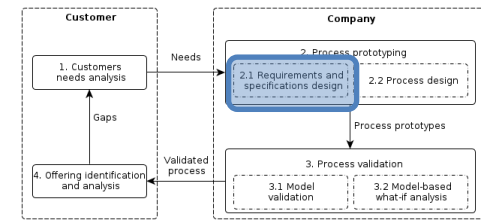
Low Voltage Breakers and Switches Business Unit located in Dalmine Italy.



Focus on the 95% of the service business:

- Onsite preventive and corrective maintenance
- Workshop preventive and corrective maintenance
- Replacement
- Retrofitting
- Spare parts provision

QFD Analysis



The validation of the service delivery process

The model has been validated through the comparison of the «AS-IS» simulation results with real process data.

«AS-IS» OK The simulated model fits the reality

«TO-BE» ? What is going to happen in three years?

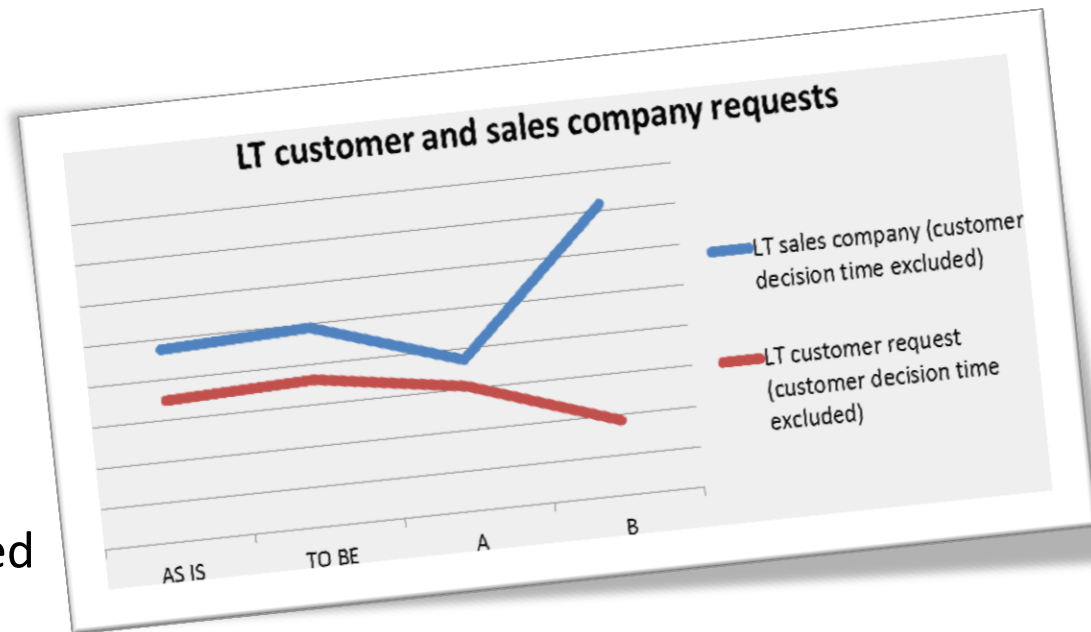
what if?

- Will the demand of this kind of services increase/decrease?
- Will the number of available resources be enough to deliver an appreciated service?
- Will the customer wait more time before being served?
- **How can the process be improved?**

Simulation results

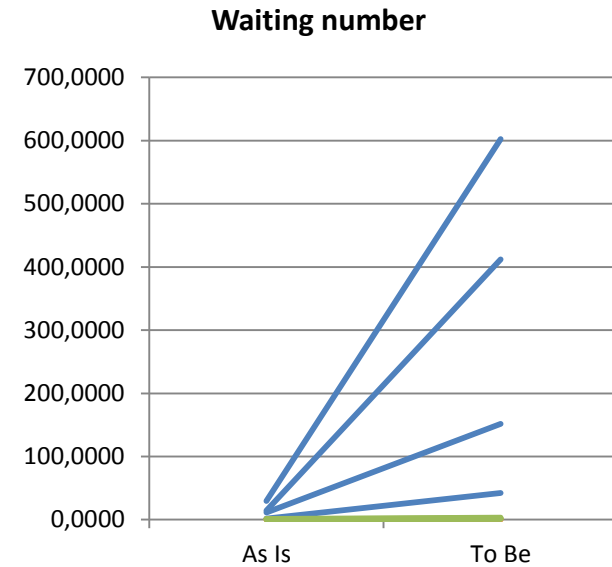
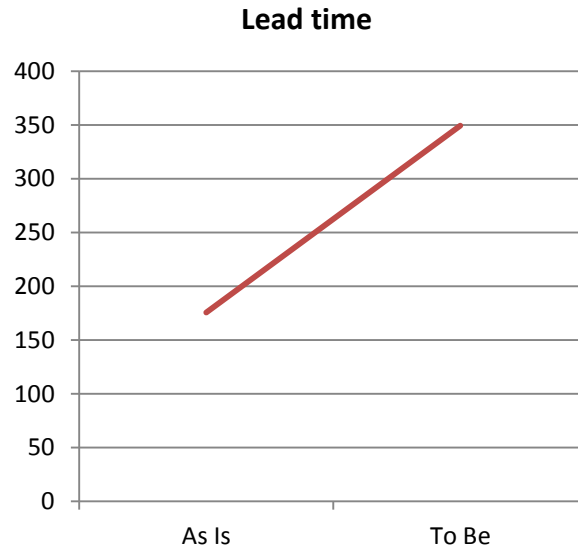
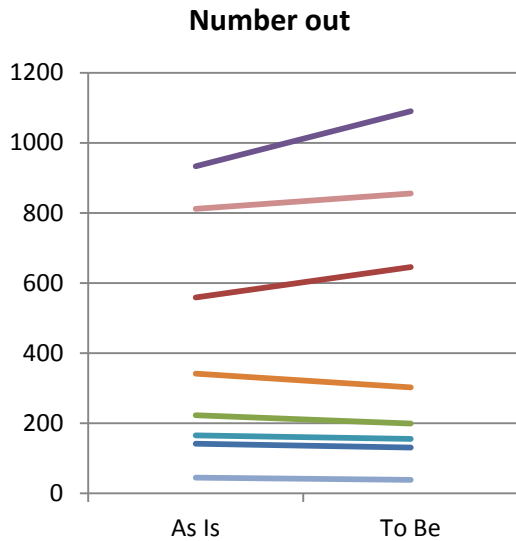
The main variables considered in the analysis are the following:

- Number of completed service jobs in one year;
- Lead time to complete a service job, split for the different services;
- Utilization of the resources;
- Customer perceived performance, mainly measured in terms of time or waiting time needed to perform the macro activities of the DSs



What-if Analysis

What happen when the 2017 ABB targets are set in the simulation model?



Lead time, queues, resource utilization drastically increase and the number of request satisfied is lower than expected

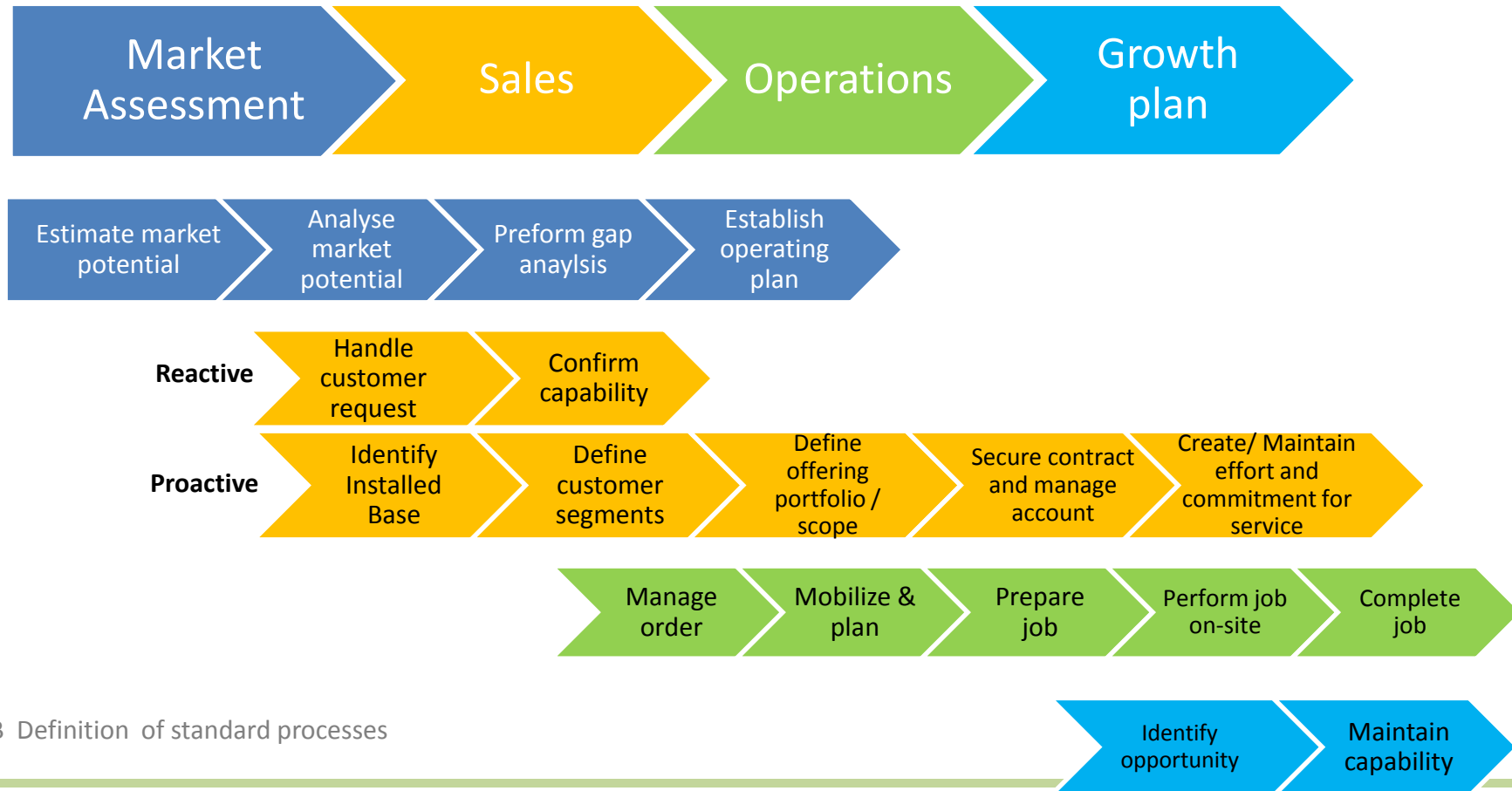
Simulation results

16 scenarios have been developed before obtaining those really providing an improvement

	SCENARIO A	SCENARIO B
Change in the process		
Change in the proposal process- Higher standardization	50% reduction of the time to define a standard offer and 25% reduction of the development time of a complex offer	-
Change in the analysis of the order - Higher standardization	Reduction of 50% of the time to check order coherence with the proposal	-
Change in the working hours of resource (Hours)		
Proposals	-	Increase of 12 hours per day
Dispatcher	Increase of 2 working hours per day	Increase of 6 working hours per day
Technicians	Increase of 21.5 hours per day	Increase of 29.5 hours per day

Managerial Implications

Process standardization



Source: ABB Definition of standard processes

Managerial implications

- SEEM methodology revealed as a good support for decision making in relation to service delivery process
- It allows monitoring internal performances (i.e. resources utilization) and also the waiting time perceived by the customer
- The simulation model allows testing many different scenarios in a very short run time (2min per run)

Conclusions

- To study PSS delivery there is the need to integrate the SEEM with product features enabling service
- Need of an integrated tool supporting all the phases of the methodology
- Additional cross cases should be performed for generalization of the SEEM concepts

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