Online Course: Automated Vehicles in Logistics

Lesson 1 Introduction to AGV's

Module 4 Use Case Description

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Introduction | Use Case Description

Lesson overview

1. Features of the AGV
2. State of Art
3. Advantages and disadvantages
4. Use case description
   a) Criteria for use case selection
   b) V-Model for management of the integration process
   c) Critical to Quality to determine relevant criteria
   d) Requirements specification for your use case

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Paper factory
1# Logistical use case

Assumed Logistical Situation

- 24/7 operations
- Decreasing paper demand
- Increasing operating costs
  - Personnel
  - Fuel

Logistical situation

- Multiple production line output gates
- Always same route, 2+1 km trip
- Crossing of public route
- Many logistical docks to warehouse
- Normal volume (20ft container), low weight (10T)
- Forklift loading/unloading

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Paint factory
2# Logistical use case

Assumed Logistical Situation

- 12/5 logistical operations 24/5 production
- Increasing demand for products
- LEAN cost saving programs, pay-back time 4 years

Logistical situation

- 1 production line output
- Always same route, 1 km trip
- On site logistics, with people
- 1 unloading bays in logistics area
- Normal volume, 20T weight, 1 trailer/hour
- Electric semi auto-loading track
- Fork lift unloading

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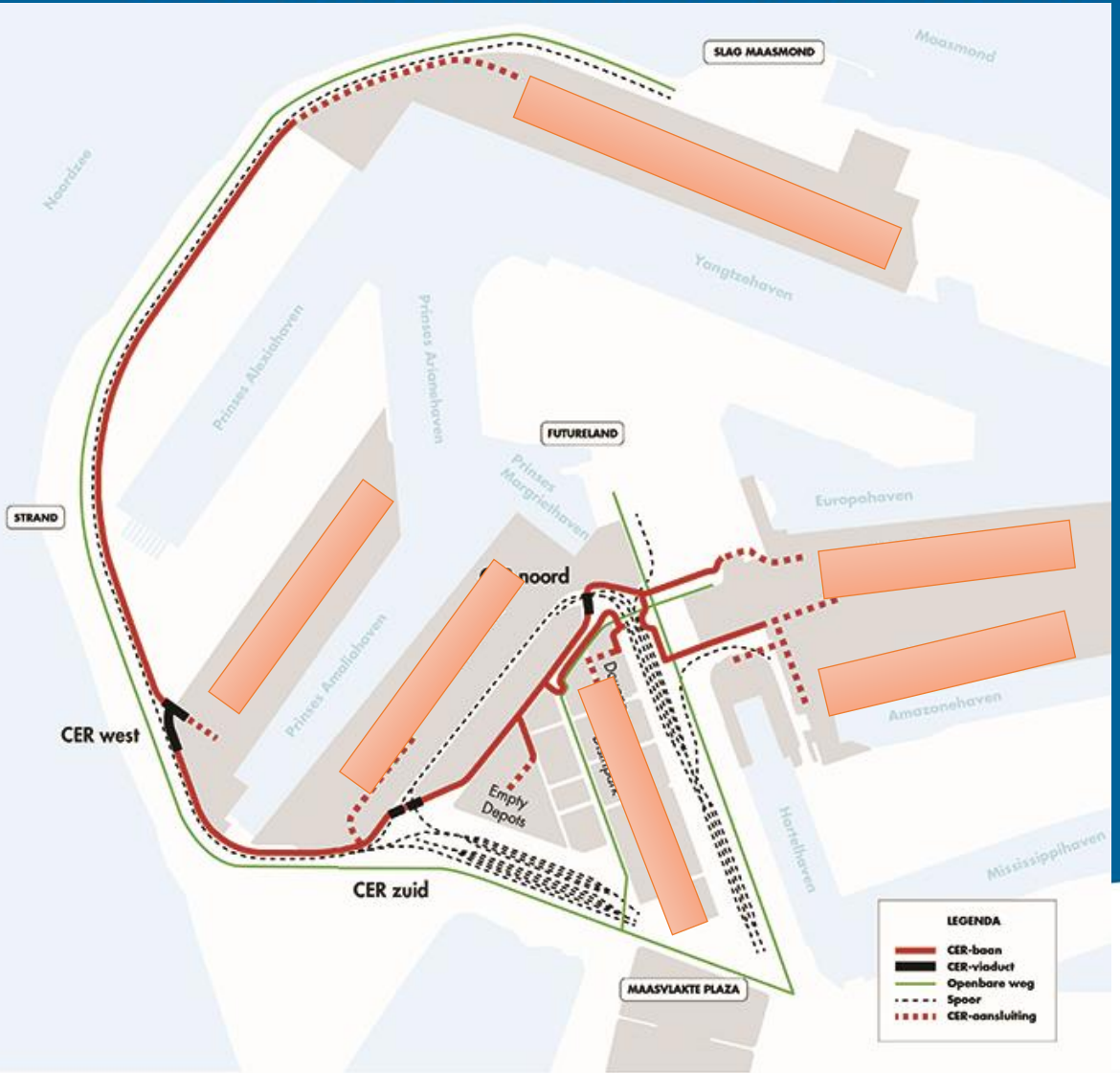
Port of Rotterdam, Container Exchange Route
3# Logistical use case



Assumed Operational Situation

- 24/7 logistical operations
- Fast reorganization over terminals, to minimize mooring time of ocean going vessels

Logistical situation

- 6 connected terminals
- Different loading/unloading
- Distances between terminals 2 – 15 km
- Standard containers volume, 35T weight, max duration 30 min
- Minimum terminal speed 30 kph
- Unfenced road

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Criteria for use case selection

1. Ability to manage the system
   a) No dependancy by 3rd parties
   b) Telecommunication coverage
2. Must be safe
   a) which means a safe combination of speed, load and environment
   b) Sufficient field of view for sensors
3. Tailored process for loading and unloading, no driver on board
4. Repetitive jobs, following the same track
   a) Maximizing utilization scale and so also profitability
   b) Minimizing the need to continuously adapt AGV software
   c) Allowing AGV software to be simple, robust and reliable

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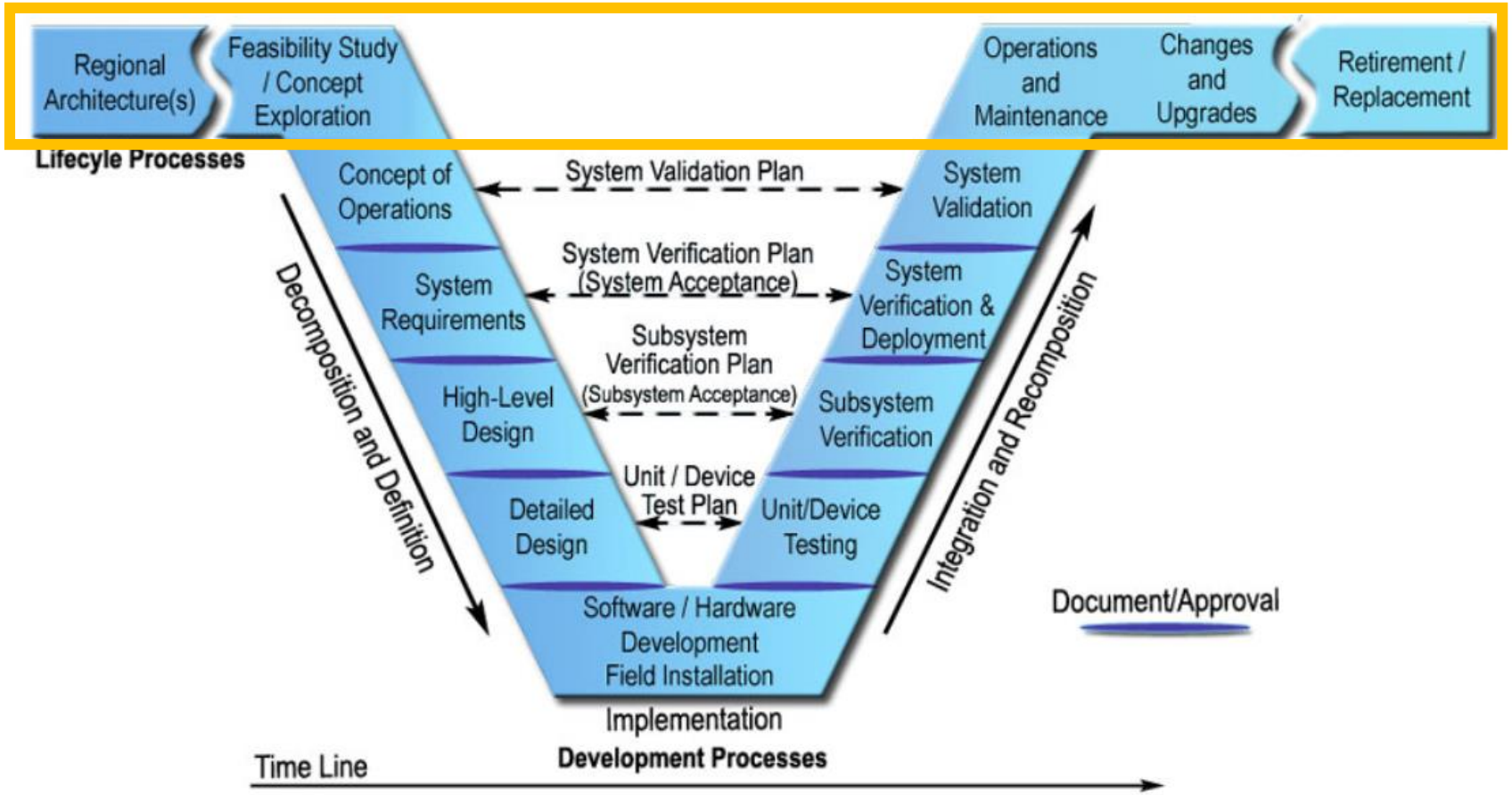
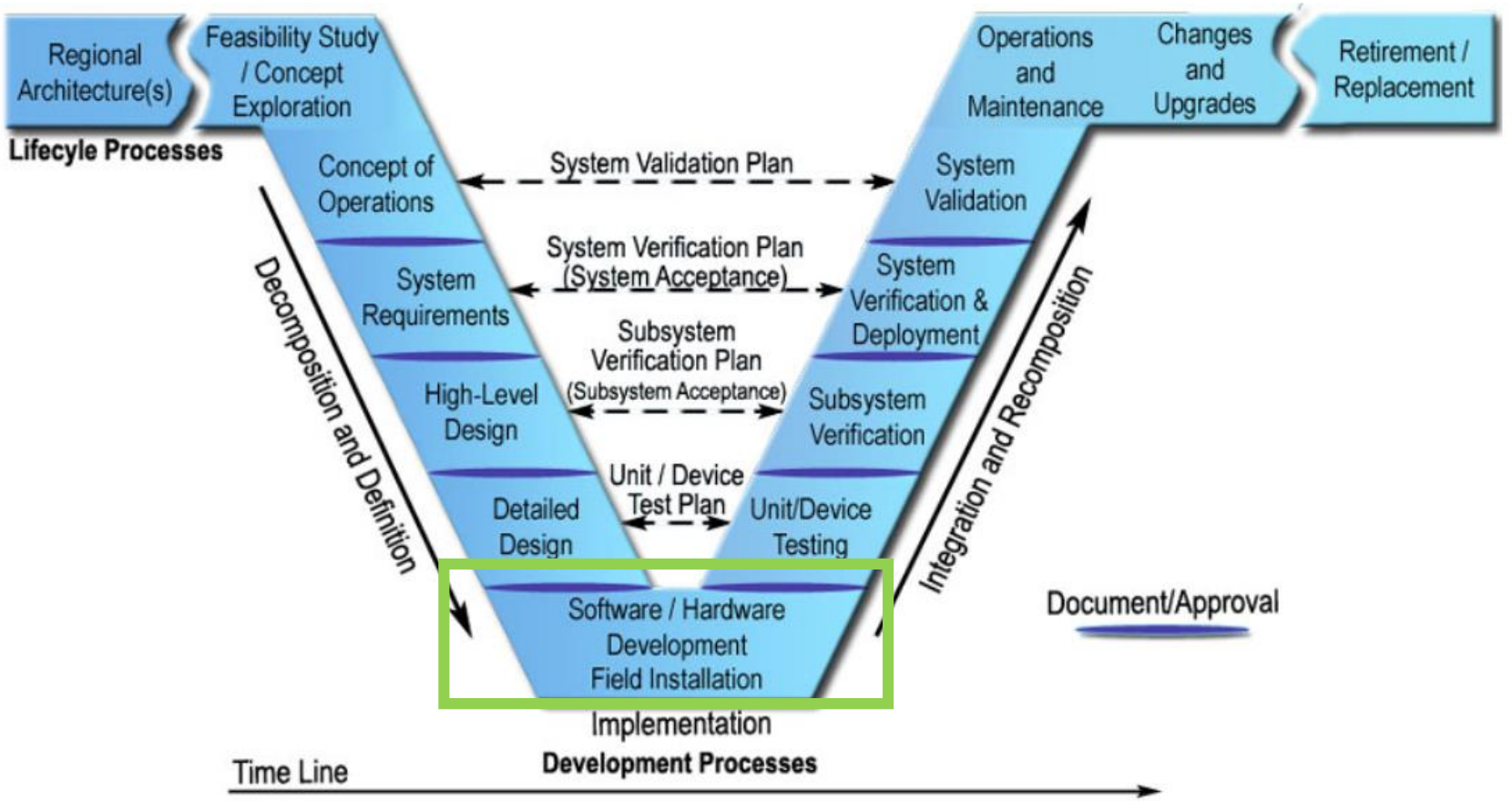
Introduction - Use Case description
V-Model Decomposition and definition



Introduction - Use Case description
V-Model Integration and recomposition



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1.4_Use Case description
Critical to quality for requirements

Quality is the ability to consistently meet customer and applicable statutory and regulatory requirements

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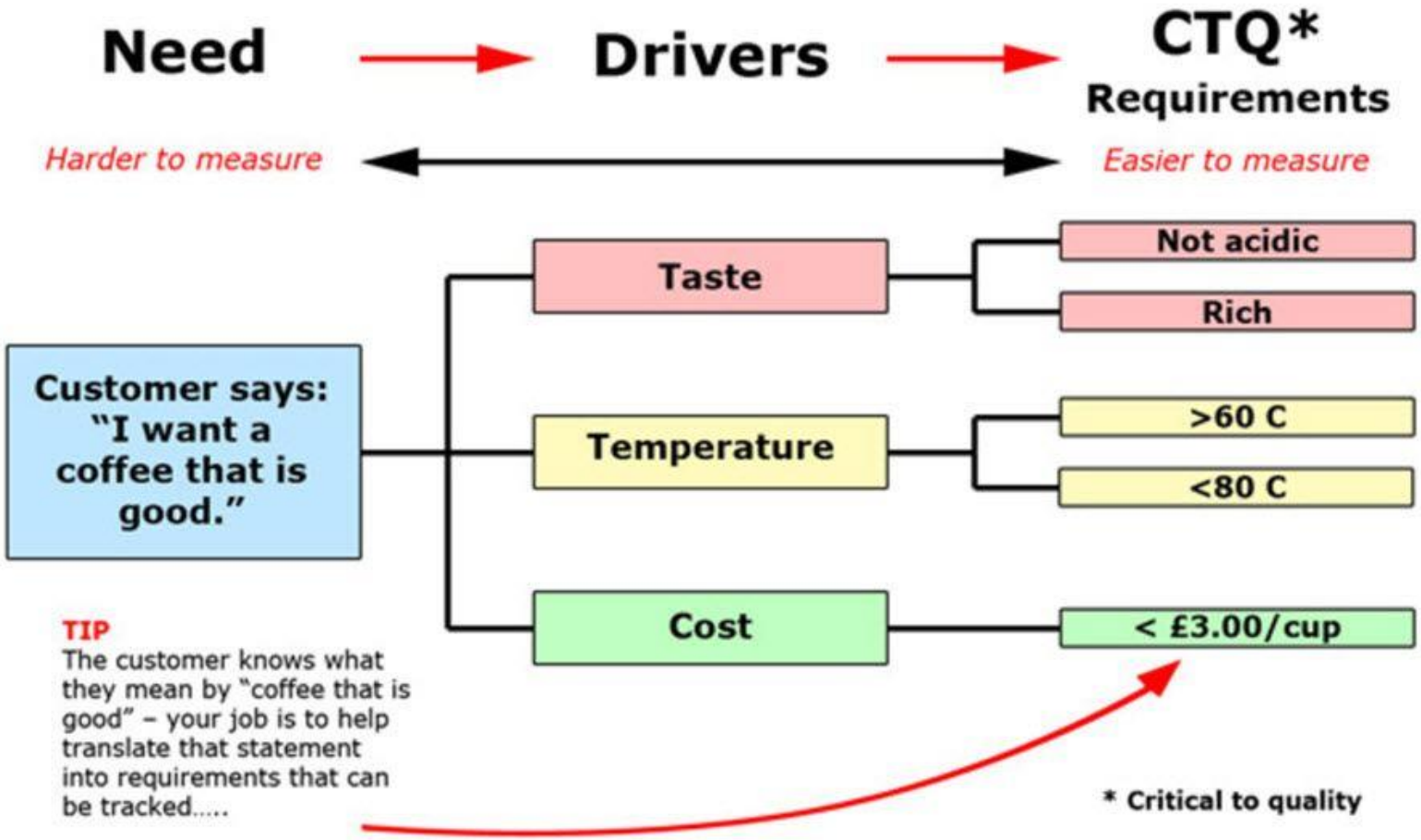
1.4_Use Case description
Critical to quality for requirements



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Critical for Quality for AGV

Envisioned advantage: 24/7 availability		
NEED	**DRIVER**	**REQUIREMENT**
	No need for buffers	- In balance with production line
		- Sufficient load capacity and speed
24/7 Available for logistics	No night shifts for personnel	- Capable of ahead scheduling
		- Alarms transferrable to smart phones
	Immediate fall back in case of failure	- Critical spare parts on stock
		- Back-up solution with driver

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Critical for Quality for AGV

Envisioned advantage: Low energy cost		
NEED	**DRIVER**	**REQUIREMENT**
	Net zero carbon production	- Energy efficient driveline
		- Self generation of energy
Low costs on energy and no carbon emission	Operational cost savings	- Lower costs than actual costs
	Independent from energy market prices	- Energy storage
		- Year long electricity generation (wind + solar)

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Critical for Quality for AGV

Program of Requirements		
Requirements	**Values**	**Validation method**
24/7 Available		
- Average driving speed	10 km/h	Measuring drive time for 10 trips, multiplied by distance (1,5 km/trip); 15km / time = speed
- Automatic loading	5 minutes	Stopwatch for loading cargo + 10%, 10 times
- Cargo	20 pallets, each 1000 kg	Measuring deflection in chassis, positioning accuracy, tire to road presuure
- Positioning accuracy	+/- 5 cm	Continuous accuracy logging, and performance displaying in dashboard

Introduction | Use Case Description

Summary and Outlook

- 3 Use cases
- Criteria for logistical use cases which enable AGVs
- V-model decomposition+definition and recomposition+integration
- Critical to Quality evaluation
- Program of Requirements

End of the introduction module

Complete the quiz for this module

Next module Overall AGV Operating System

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5GBlueprint project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 952189