

Proactief productontwikkeling met behulp van FMEA

PLOT-ledenbijeenkomst Gevasol GoDare
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Dorien Lutgendorf

POWERFUL SOLUTIONS

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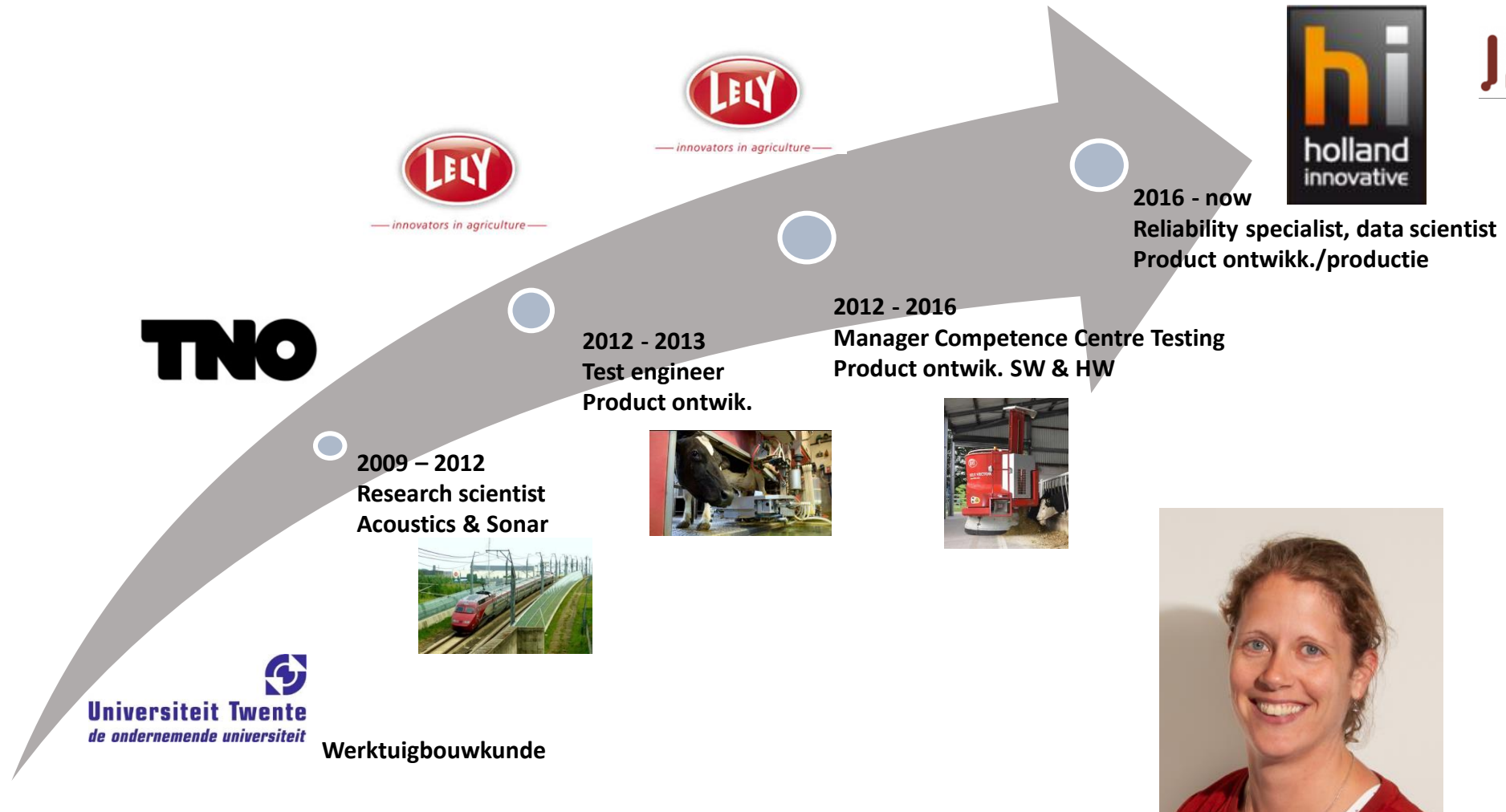
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Who are we? – Dorien Lutgendorf



Beat “the curse of FMEA’s”

“Seem to exist of endless team sessions”

“Are badly prepared (“let’s brainstorm”)”

“Look like repeating the same thing over and over again”

“Have too many participants”

“Often too late in the project”

“Under time pressure it becomes “fill-in” exercise”

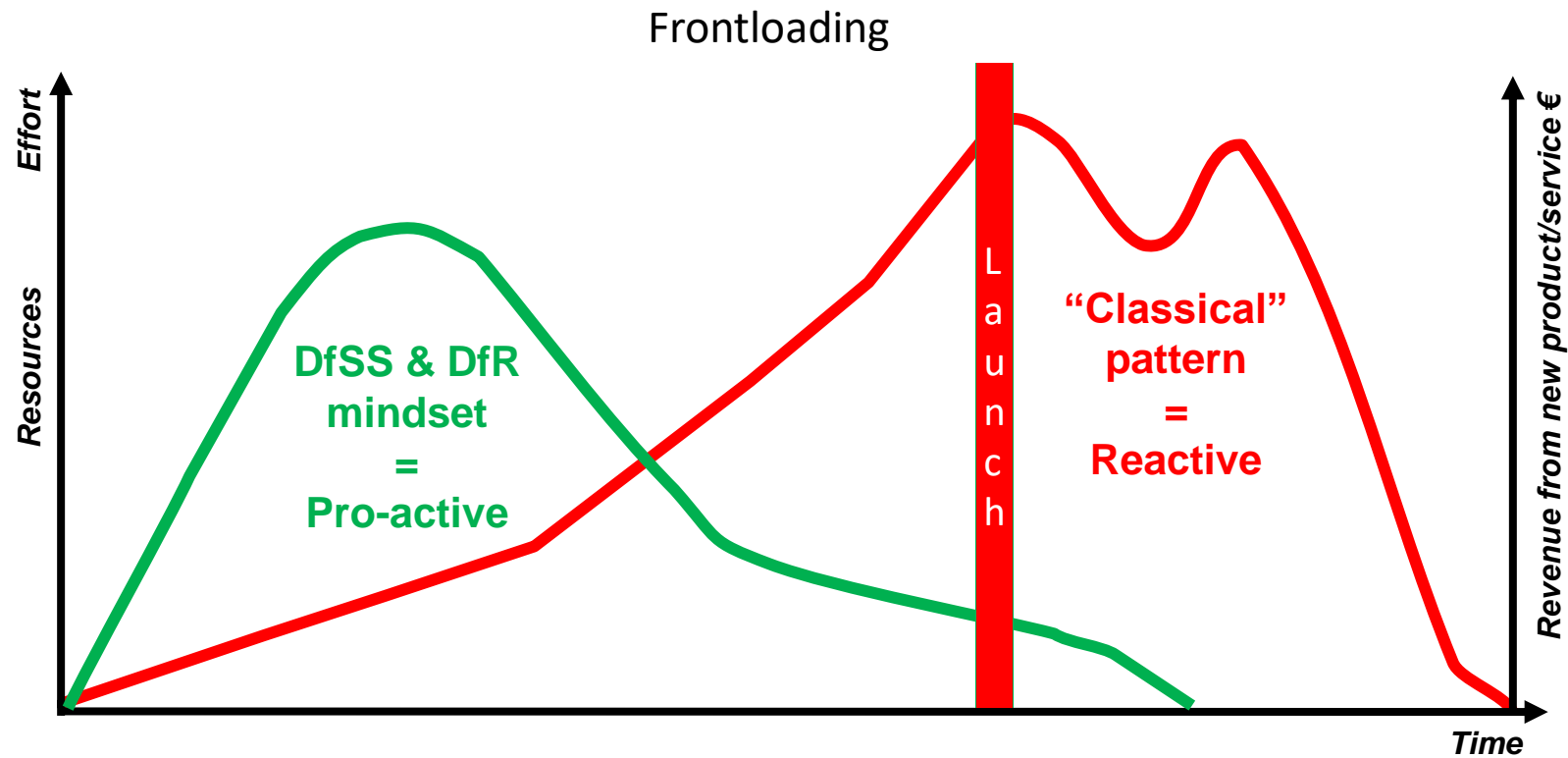
“Link to test activities is missing”

“Not used as a working document”

Sounds familiar?

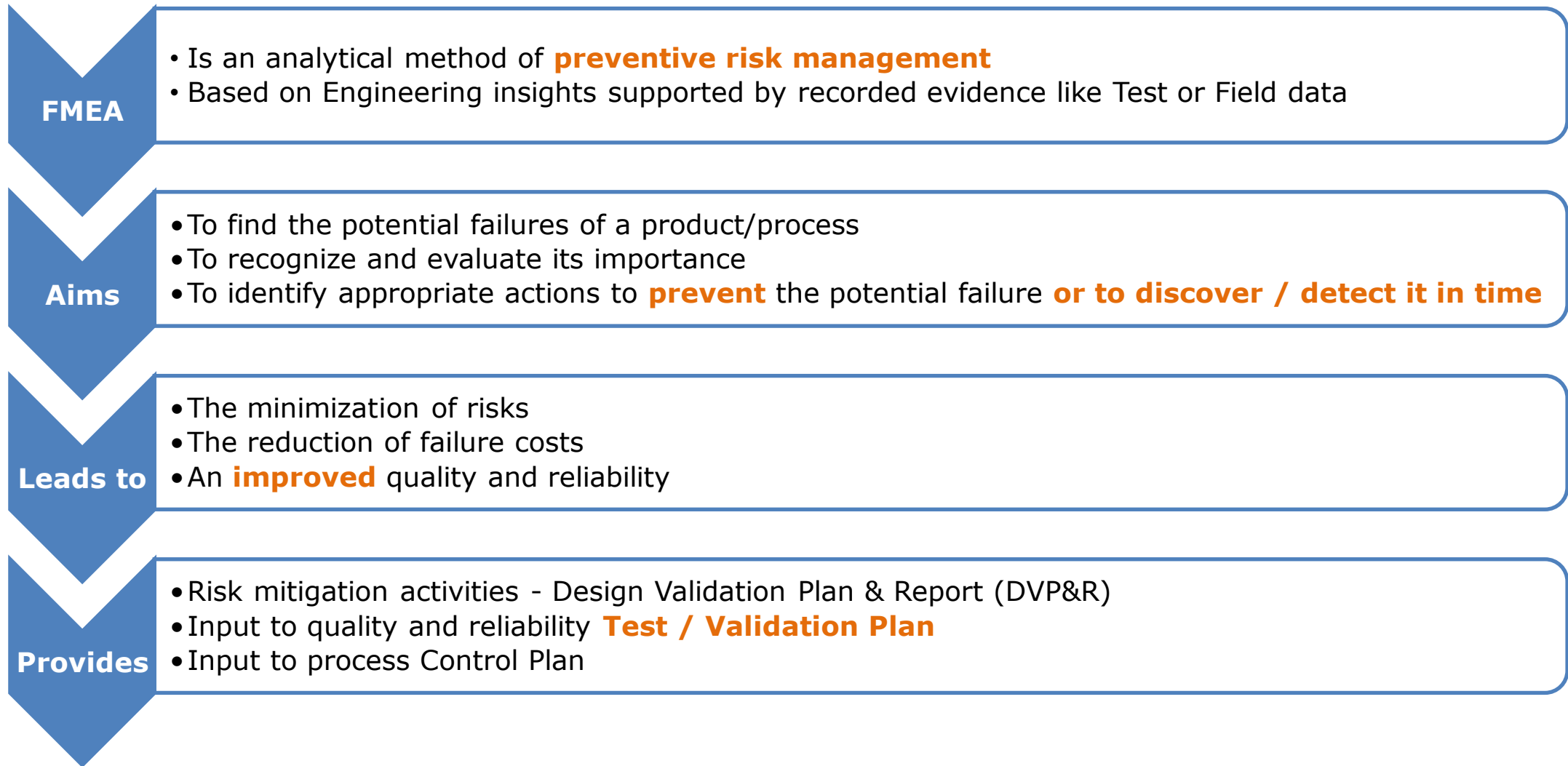
The challenge is to change this!

Pro-active vs. Reactive mindset



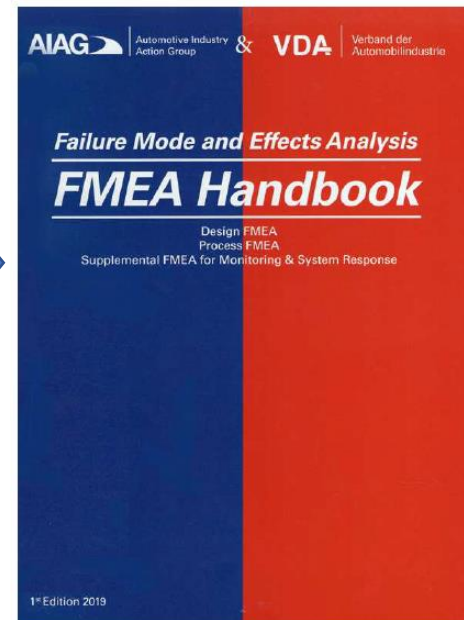
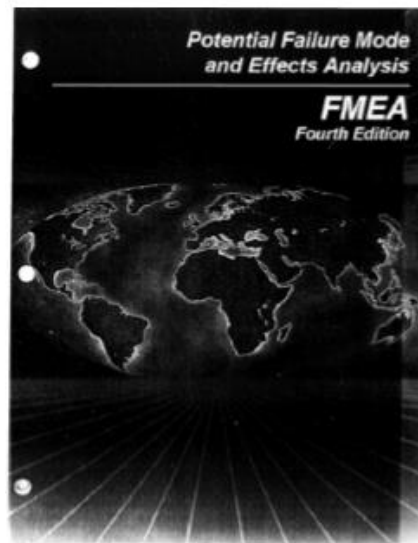
**Pro-active DfSS & DfR way of working as early as possible
by "Frontloading" in PCP Projects**

Scope/Objectives FMEA

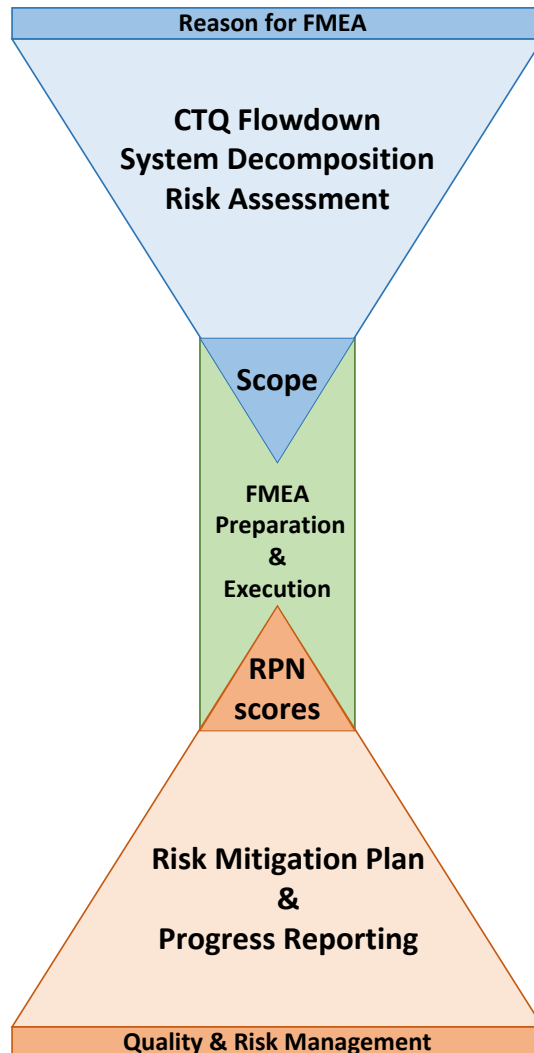


AIAG-VDA Standard

- Previously two standards with similar approaches for FMEA studies
- Some customers required suppliers to follow either the AIAG or the VDA standard.
- As of Q1 2019 a harmonized AIAG-VDA FMEA standard which provides consistent direction and guidance to all



FMEA: The Drill Down ...



Scope
Preparation
and Prioritization

FMEA session

Preparation &

Execution

Risk Mitigation

Design Validation Plan

Workshop “Bouw een robuust en betrouwbaar wagentje”

POWERFUL SOLUTIONS



Opdracht introductie

Doel van de workshop:

Creëer en optimaliseer in drietallen een wagentje met behulp van FMEA aanpak aspecten. Beproof het wagentje op de testbaan, en controleer de gevonden faalvormen.

Programma

3 voorbereidende FMEA gerelateerde opdrachten

1 bouw & test sessie (50 minuten)

1 evaluatie

Hoofdfunctie van het wagentje:

“Vervoeren van een last (knikker a X gr) over een afstand van 2 meter over een voorgeschreven ruw terrein”

Gebruiksomgeving

- Opgaande en neergaande hellingen tot max 30 %
- Verticale val tot max 6 cm
- Water tot max 2 cm diepte
- Ruw terrein:
 - Zand (1-2 mm)
 - Kiezel fijn (2-5 mm)
 - Kiezel middel (8-16 mm)
 - Kiezel grof (16-25 mm)



Beschikbare hoofdcomponenten

- Batterijhouder met batterijen
- Motor met overbrenging
- Assen
- Wielen
- Frame
-

Bouwmaterialen en tools

- a. Plaatmateriaal (figuurzagen, (laser)snijden)
- b. Lijm (lijmpistool)
- c. Tape
- d. Tie-wraps
- e. Elastiek
- f. Ijslollystokjes
- g. Alle tools die op de werkbanken/tafels liggen

Opdracht 1: Functies

- Bedenk een allereerste **high level design concept**
 - Welke componenten wil je gebruiken & schets hoe ze ongeveer samenhangen
 - Schrijf van alle componenten de belangrijkste functie op
 - *Gebruik voor deze oefening een leeg A3 papier.*
- Voeg waar mogelijk een requirement toe aan de functie. Bijvoorbeeld:

“Ondersteunen van balvorming object van x gram en afmeting x bij x mm”

In plaats van

“Ondersteunen last”

System Decomposition

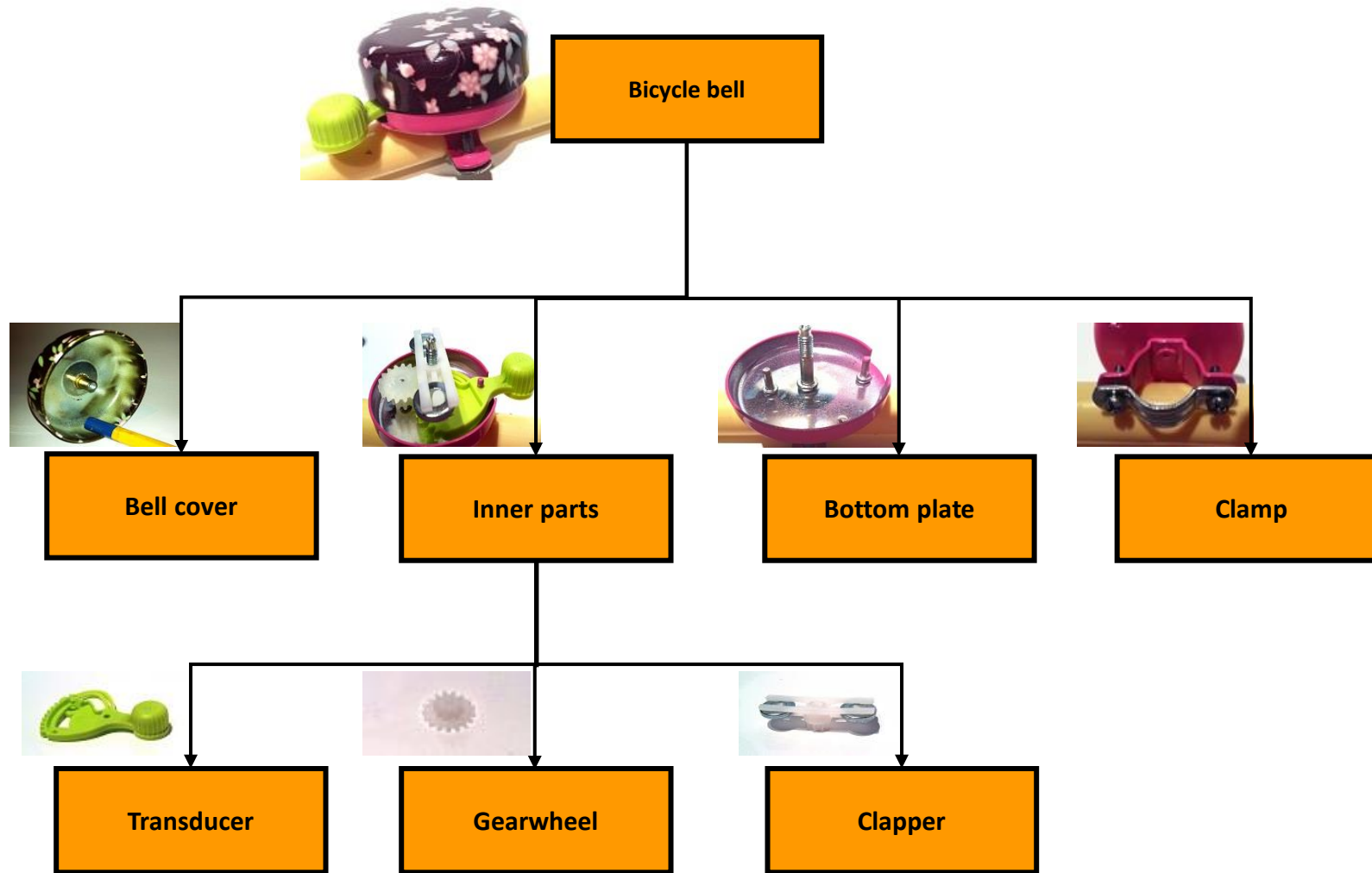
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High Level Product Description

An overview of your product, system, service or process

- Range that the product fits in (family)
- Target Market, Customers
- Main functionalities
- Layout, framework
- Main dimensions
-

System Decomposition – Bicycle example



Boundary Diagram (1/4)

Boundary Diagram of a product visualizes :

- The boundaries of product being analyzed
- Physical or logical relationships between the components of the product
- Interaction of components or subsystems within the scope of the design.

Generic interaction clusters:

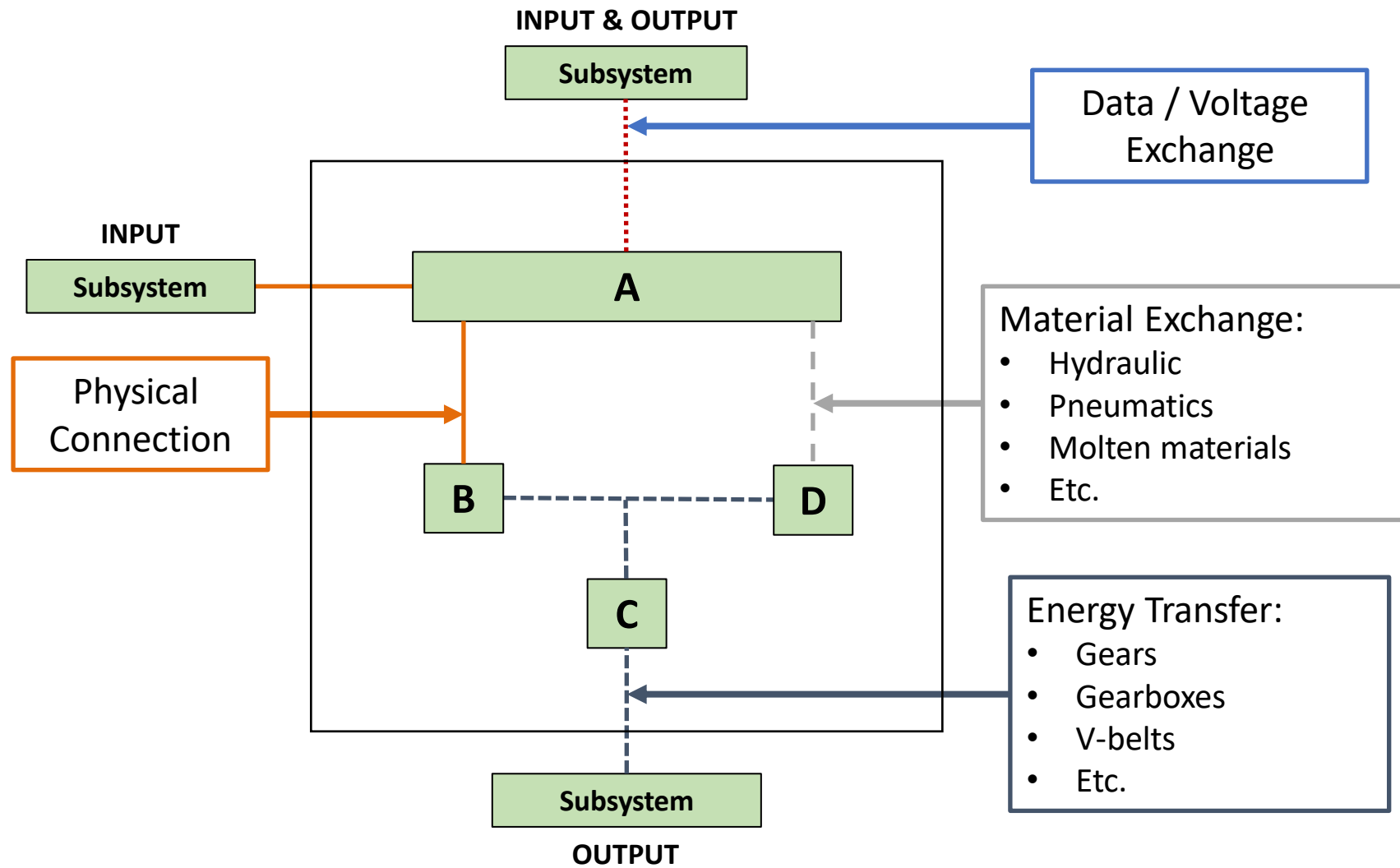
- Information, material, energy, Spatial, and movement* (see complete table in back of module)

The objective is to understand:

- The requirements or inputs to the product, and the deliverables or outputs of the product
- The activities acting on the inputs or function performed
- The system, sub-system, and component hierarchy

* Tilstra, et al., 2012. A high-definition design structure matrix (HDDSM) for the quantitative assessment of product architecture.

Boundary Diagram (2/4)



Source: AIAG – VDA FMEA Handbook 1st 2019; p 36 - 37

Opdracht 2: Boundary diagram

- Schets het boundary diagram van je huidige concept design
- Geef aan wat voor een type interfaces er tussen de componenten zitten
- Pas waar nodig je design concept aan of detaileer het verder als daar reden voor is nav maken boundary diagram.

→ *Gebruik voor deze oefening een leeg A3 en (kleur) stiften*

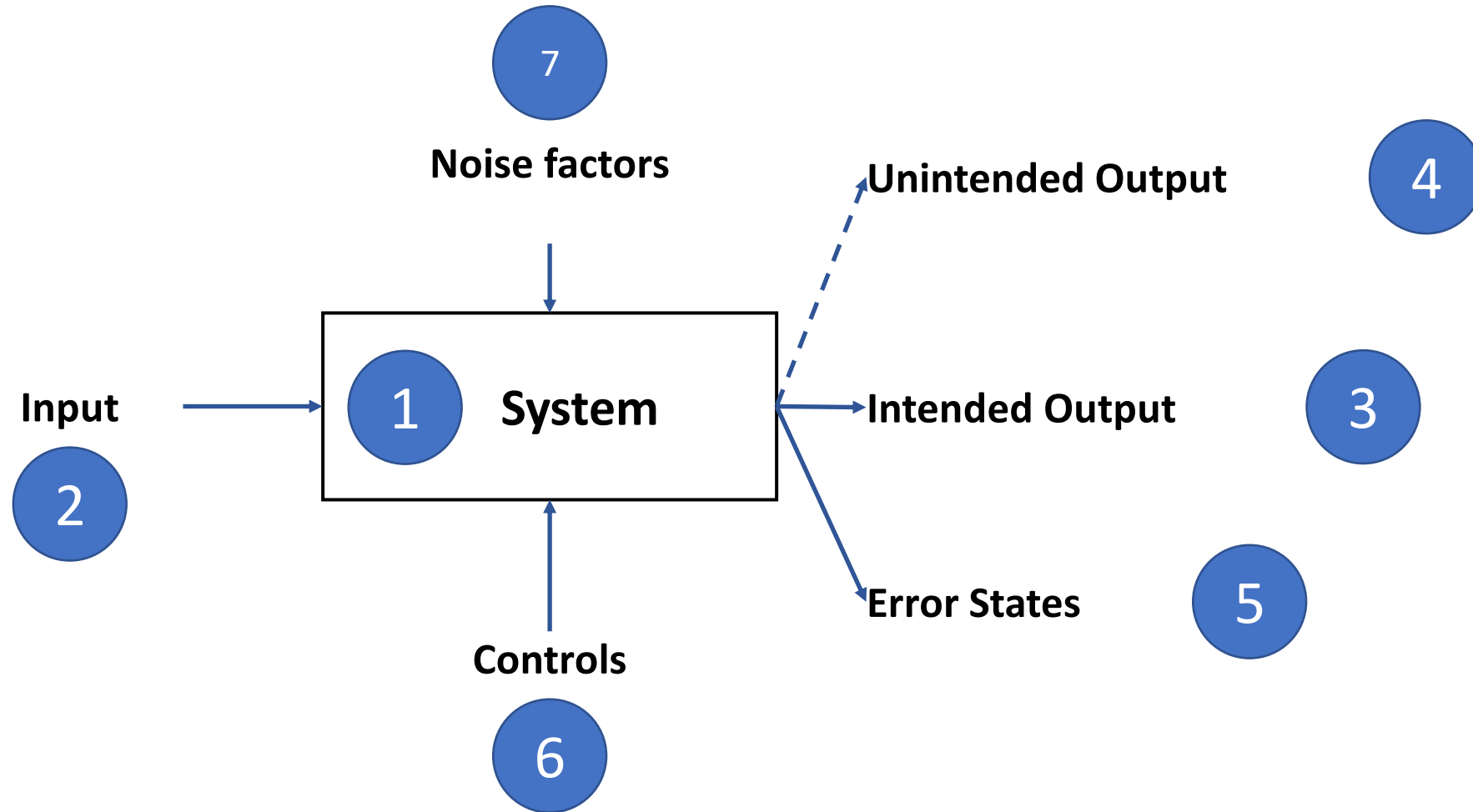
Physical Connection	—————
Energy Transfer	- - - - -
Material Exchange	- - - - -
Data Exchange

Parameter Diagram

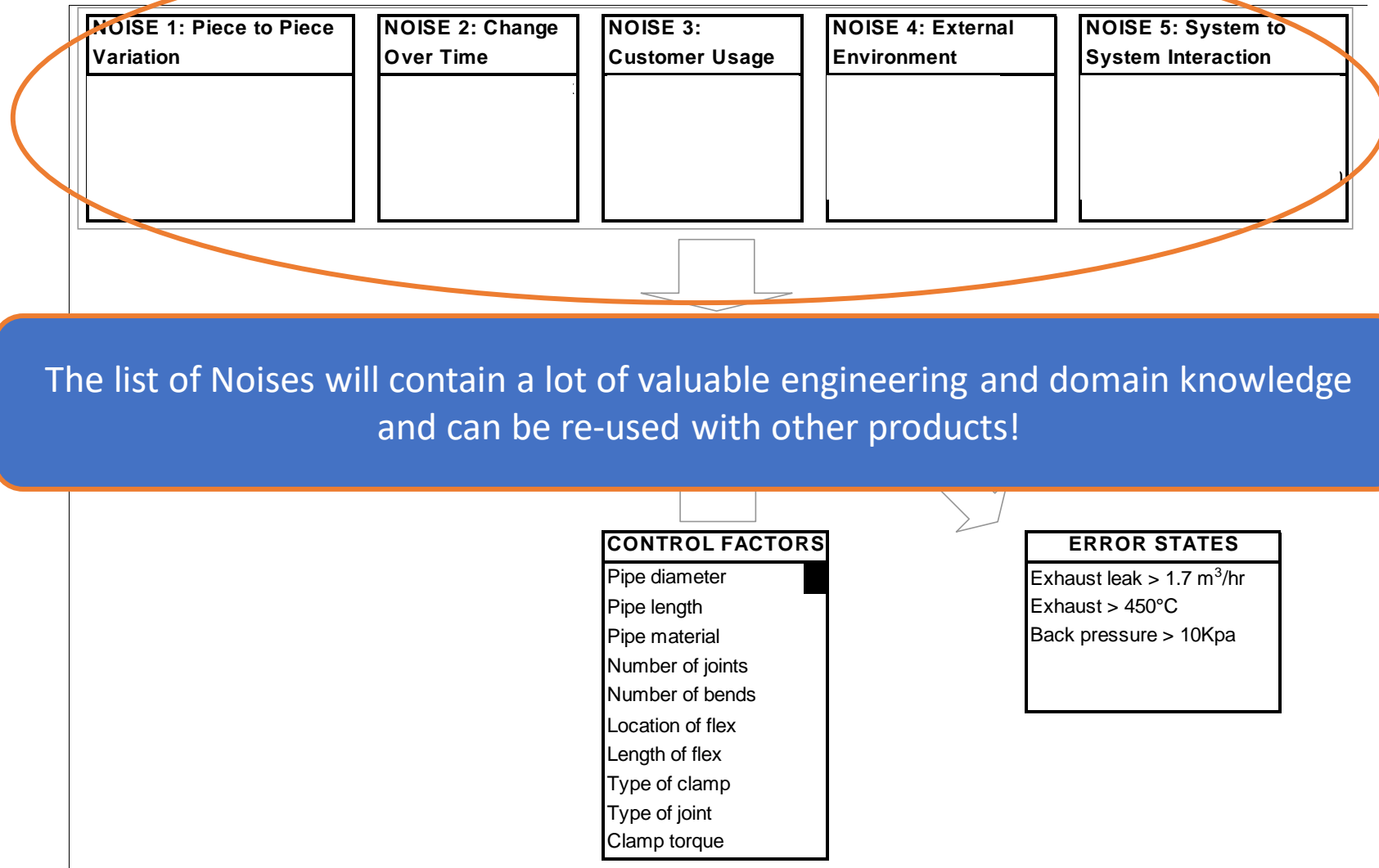
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Parts and procedure

- Parameter diagram relates the physics to the functions of the product



Noises



Opdracht 3: P-Diagram

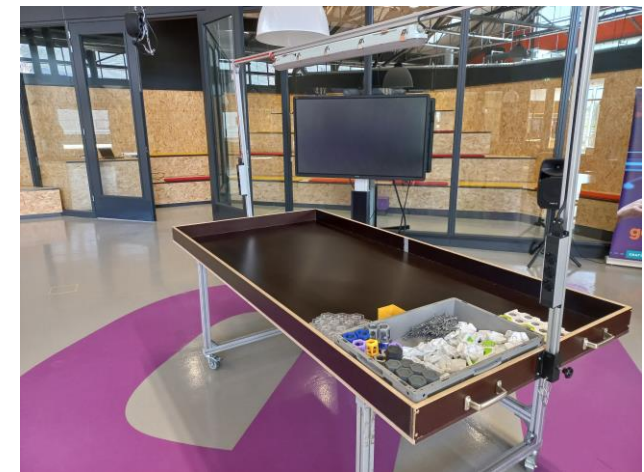
- Pak het deels ingevulde sjabloon van het P-diagram van het wagentje en hou je boundary diagram bij de hand om naast de componenten ook de interfaces te beschouwen.
- Brainstorm welke **noises** van toepassingen zouden kunnen zijn op het wagentje. Vul in noise category 1, 2, 4 minstens 2 noises in.
- Brainstorm welk engineering **controls** er van toepassingen zouden kunnen zijn in jullie ontwerp. Vul er minimaal 3 in.
- Pas waar nodig je design concept aan nav de P-diagram oefening.

Opdracht 4: Bouwen, testen en itereren

Bouw je huidige design en test je wagentje om te zorgen dat het zijn functie succesvol kan volbrengen. Bij problemen kan je een design iteratie doen.

Tijdens dit bouw en test proces hou je de volgende zaken bij:

1. Hou de **failures** bij in het failure logbook (zie sjabloon). Noteer de versie van je ontwerp en natuurlijk de failure mode & mechanisme
2. Noteer je **design iteraties** in je design iteratie logboek.



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- Heb je tijdens de voorbereidende opdrachten je design aangepast?
- Hoeveel failure modes ben je tegengekomen tijdens het testen?
- Had je die al in de voorbereidende stappen herkend? Of had je ze kunnen herkennen indien je meer tijd had gehad? Zoja, hoe?
- Hoeveel design iteraties heb je doorgevoerd tijdens het bouw en test process?

Holland Innovative Academy



We offer a 4 day FMEA facilitator training. More info on our website or contact our sales representatives!

<https://www.holland-innovative.nl/academy/fmea/>

FMEA Facilitator Training

Follows the 2019 AIAG-VDA methodology



New products, processes and systems need to be developed faster and with increasing quality and reliability levels. Production losses, rework, warranty claims, or even brand image loss need to be prevented. Learn how to execute and facilitate risk analysis using good FMEA's as an integral and effective part of your product creation process. Reduce the time to identify the high risks and to generate a risk mitigation plan. Get enthusiastic involvement of engineers, architects, managers to increase FMEA effectiveness and completeness. The AIAG membership allows Holland Innovative to be the first to learn about developments in risk management.



Identify and mitigate your relevant risks well in time!

Register: www.holland-innovative.nl

Integration in the Product Creation Process

The FMEA, Failure Mode and Effects Analysis, is considered to be the heart of risk management of any development process,

providing a clear link between Design for Six Sigma and Design for Reliability and therefore ensures state-of-the-art products. In this training, the reference book "Effective FMEA's" from Carl Carlson is complemented with the Holland Innovative structural way of working, gained by years of experience. Goal is to reduce waste of time and effort, making FMEA's more fun to do and get focus on all the high risks. You will learn how to facilitate these effective FMEA's including the transformation into a risk mitigation plan. The FMEA will be turned into a "living document" and a risk tracking tool.

Training objectives

Apart from FMEA fundamentals, philosophy and the conventional way of filling out an FMEA format, this training focuses on a structured preparation to optimize the effort and time for the actual FMEA process. A smooth and effective FMEA creation process is dependent on a clear definition of the scope, as well as a structured prioritization, a solid operating profile and an overview of influences. This will lead to the main risks and the most relevant failure mechanisms. Moreover, the training will discuss the steps after the FMEA is completed. The defined controls and activities will be transformed into a risk mitigation plan. Risk tracking will then give insight in the risk reduction progress during the project validation phase. After this training the students are able to implement the structured FMEA way-of-working in companies and can facilitate complex FMEA's in an efficient, effective and even pleasant way for all attendees.

Course duration and number of participants
2 modules of 2 days each. Maximum group size: 12 participants
Teachers Marcel Logger MSc, Ir. Dorien Lutgendorf

Location and costs High Tech Campus, Eindhoven. The costs are € 2.990,- (ex. VAT) per participant, including course material (PDF) 24/7 accessible and downloadable through our digital platform, "Effective FMEA's" by Carl Carlson in e-book format, the AIAG-VDA FMEA handbook, 1st edition in hardcopy format, several Excel templates, forms & checklists and lunch.

Dates, registration and more information
See www.holland-innovative.nl under Academy, where you can also sign up.

Contact Team HI Academy, tel. +31 40 85 14 611, academy@holland-innovative.nl



Questions?

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