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Systems for support activities for the CAD engineer

Šimon Kovář
Deparment of textile and single-purpose machines

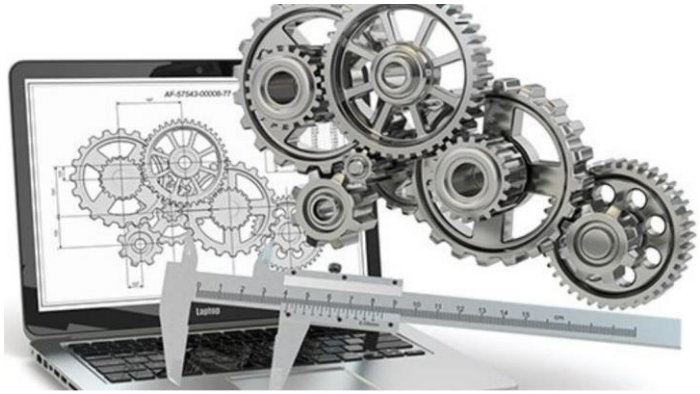
Introduction

The aim of this lecture is to familiarize the students with the three **CAD** tools of the designer that are used in the development of the new product and their interrelationship. These are **PLM** systems, **FMEA** and **ECR**.

Here's a good idea to ask a question :

Who is a **CAD** engineer?

http://f1news.autoroad.cz/technika/41430-jak-jsou-cad-systemy-vyuzivany-pri-navrhovani-a-vyrobe-vozu-f1



Who is a **CAD** engineer?

CAD – Computer Aided Design

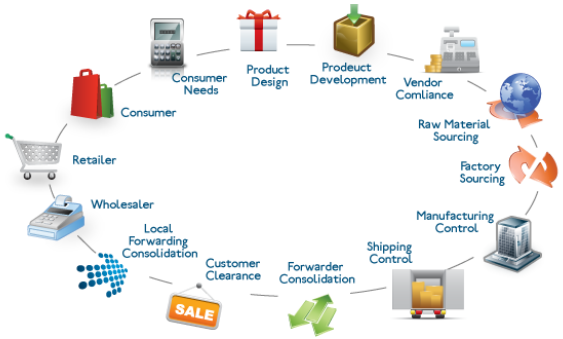
……. joint together all activities that are being used by **CAD** engineers in the product lifecycle. These include the creation and management of 2D and 3D documentation, **BOMs**, but also the use of other resources, including **PLM**, **ECR**, **FMEA**, **DXM**, etc.

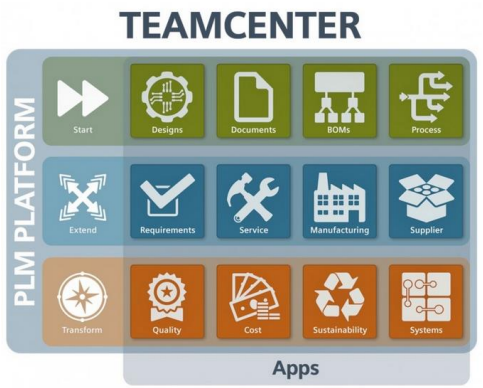
PML

Product documentation/lifecycle management (**PDM/PLM**) is the process of managing the entire lifecycle of a product from inception, through **engineering design and manufacture**, to service and disposal of manufactured products. PLM integrates **people, data, processes and business systems** and provides a product information backbone for companies and their extended enterprise.

Within PDM/PLM there are five primary areas:

- System engineering SE
- Product and portfolio PPM
- **Product design Cax**
- Manufacturing proces management MPM
- Product data management PDM





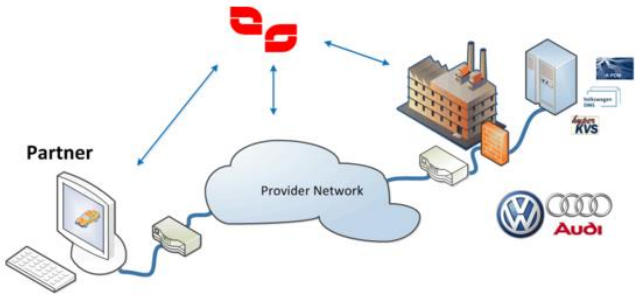
Hyper KVS (Connect)

Structural data management system in the Volkswagen group. The system serves as a central documents archive for the global interchange of all corporate documents regarding construction data within process chains as well as respective description documents. The system stores all CAx data such as 3D models, 2D drawings and manually generated documents.

http://plm.t-systems.cz/en/cad-cam/other-products/hyperkvs.html

Key functions of the Hyper KVS system include:

- Search and information
- Data archiving, working with versions
- Data interchange with external partners
- Data translation into various formats




hyper KVS
Willkommen zum HyperKVS 3.6
AUDI AG
Login...
19.05.2004: Mit Einführung der HyperKVS Version 3.6.1 ist jetzt auch ein verschlüsselter Zugriff unter https://kvs.audi.de:8081 möglich.
Release 3.6.1.f
Was ist HyperKVS ?
Release-Hinweise
Release-Planung
Hotline
mailto:kvs@audi.de
Tel.: +49-841-89-43043
Fax: +49-841-89-84-43043
Benutzer-Anmeldung
Projektinformationen "Einführung HyperKVS bei Audi"
K.-Stand Assistent (KoStA)
Impressum
Audi
Audi A6
Das Konstruktionsdaten-Verwaltungs-System im Volkswagen-Konzern.
Copyright © 1994-2003 Volkswagen AG, Wolfsburg, K-DOE-5. All Rights Reserved.
Last updated: Wednesday, 25-Jun-2003 10:43:58 MEST

SAP

„Systems - Applications - Products in data processing“.

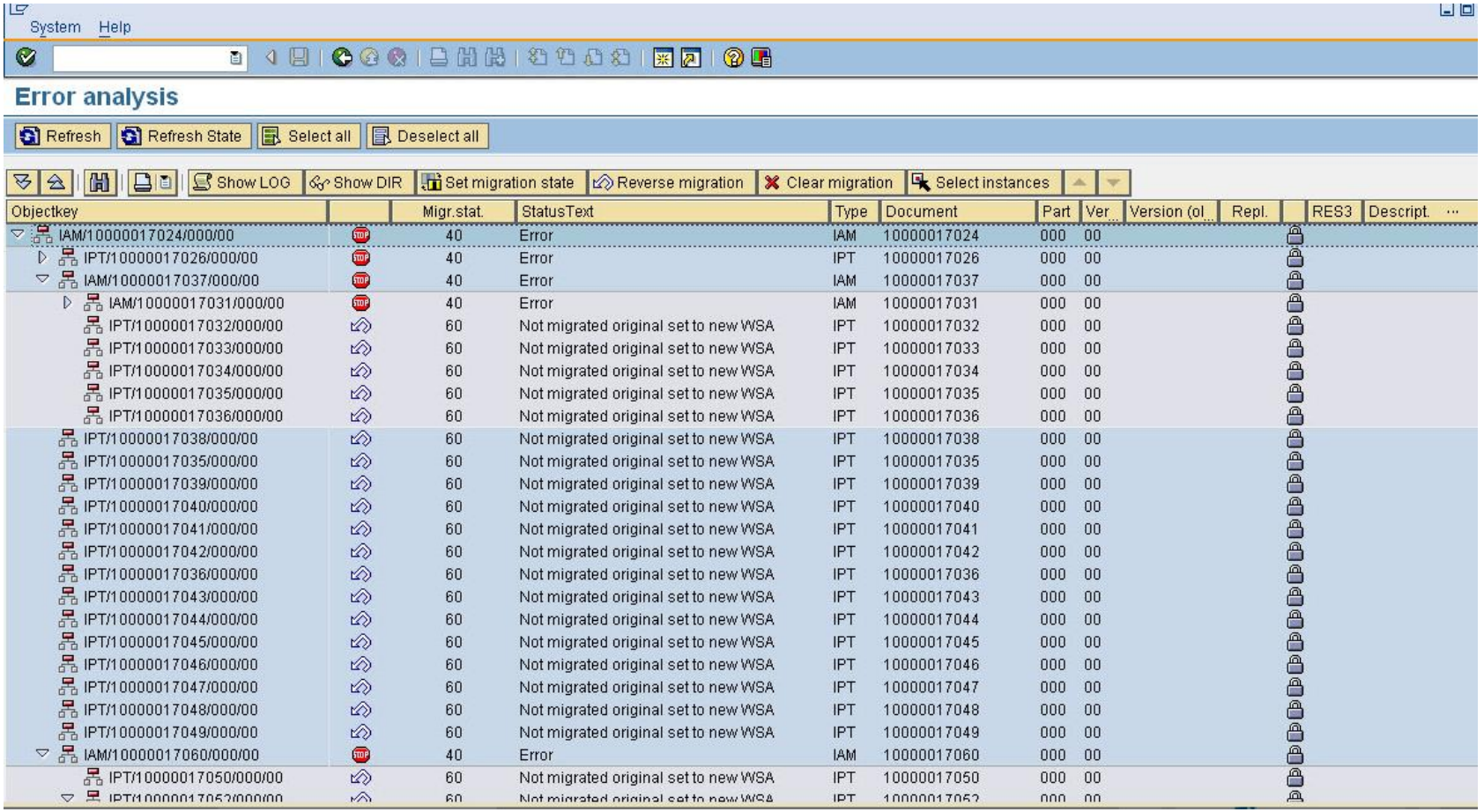
http://scn.sap.com/welcome

Example for name:

123456.TPM.000.00 - model

123456.TPB.000.00 - BOM

123456.TPD.000.AA - drawing



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IPT/10000017026/000/00	STOP	40	Error	IPT	10000017026	000	00					
IAM/10000017037/000/00	STOP	40	Error	IAM	10000017037	000	00					
IAM/10000017031/000/00	STOP	40	Error	IAM	10000017031	000	00					
IPT/10000017032/000/00		60	Not migrated original set to new WSA	IPT	10000017032	000	00					
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IAM/10000017060/000/00	STOP	40	Error	IAM	10000017060	000	00					
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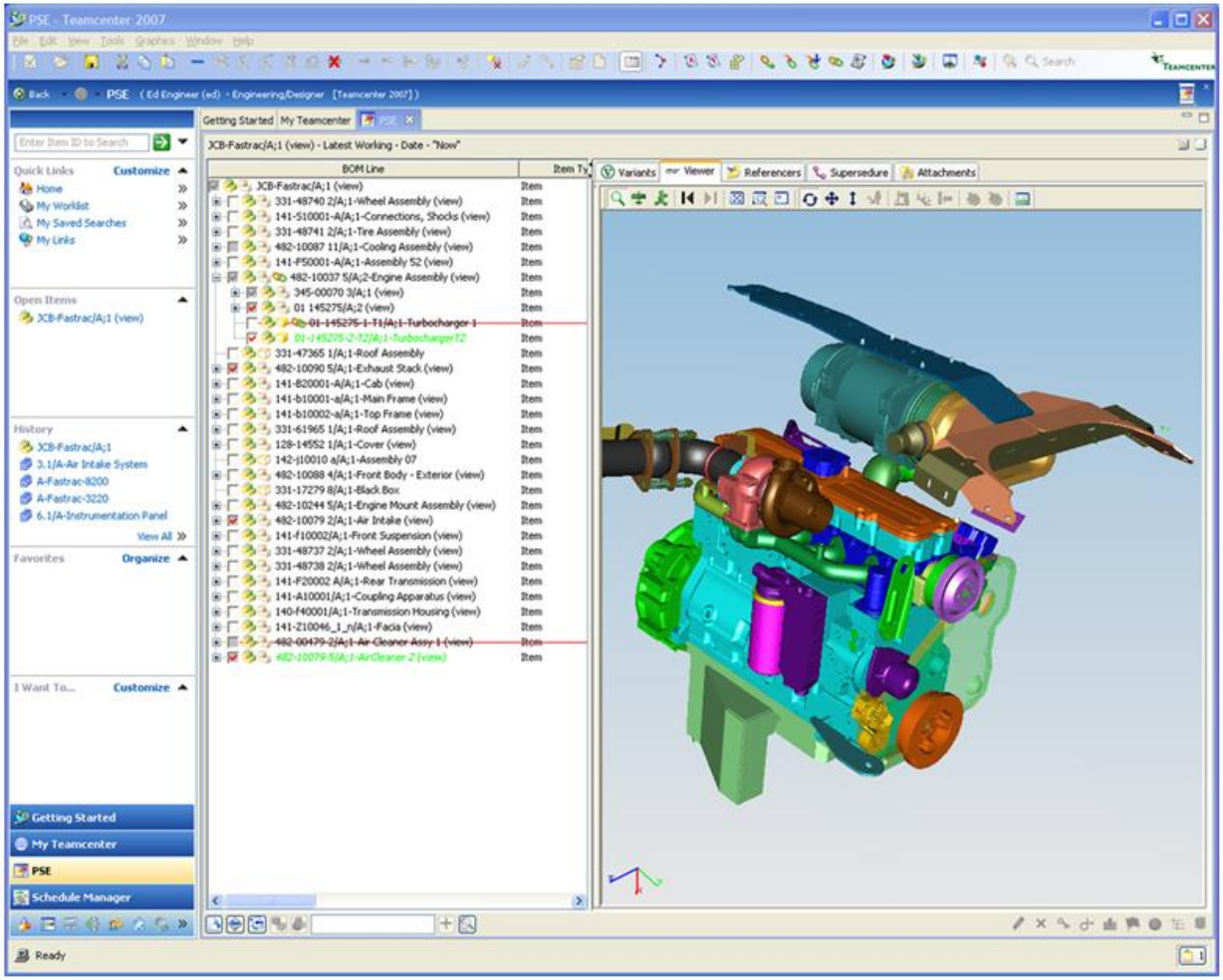
TeamCenter

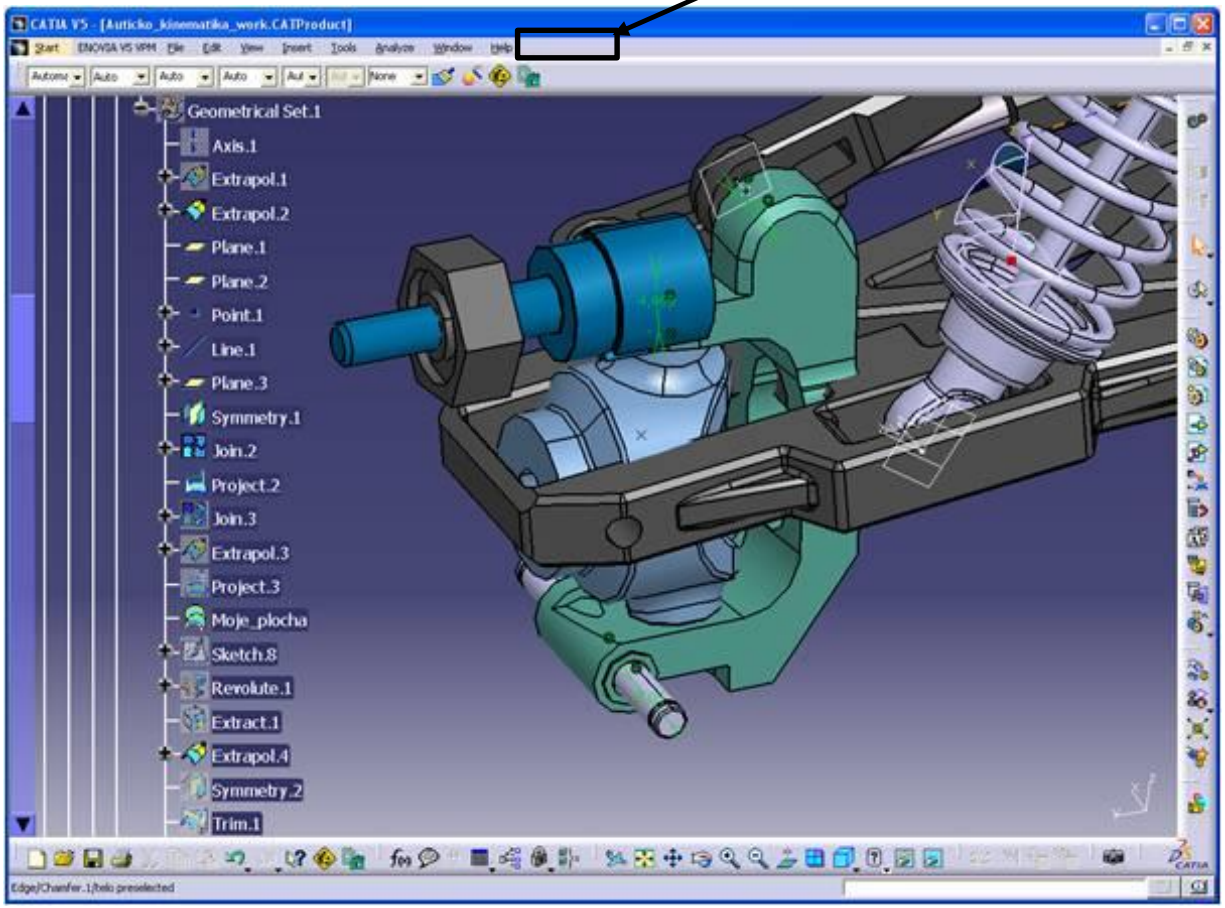
TeamCenter brings together your company's product, process, manufacturing and service knowledge in a single, comprehensive PLM environment to support global collaboration. TeamCenter helps you capture and deploy experience and best practices. You can realize rapid return on your PLM investment by quickly deploying TeamCenter's tailored domain and industry-specific solutions. TeamCenter delivers all relevant product information to decision-makers throughout the product lifecycle to better synchronize efforts, increase productivity and achieve greater innovation.
http://www.plm.automation.siemens.com/en_us/products/teamcenter/

TeamCenter


PSE - Teamcenter 2007
Getting Started
My Teamcenter
PSE
Schedule Manager
Ready

Integration of PLM systém to CATIA (CREO, UG …)

PML integration (sap,kvs..)



Statuses of documents – example

IW - In work
CI - Check in
U - Internal usage
P - Prototype
S - Serial product
O – obsolete document

FMEA

FMEA is an analytical methodology used to ensure that potential problems have been considered and addressed **throughout the product and process development cycle**. Involves reviewing as many components, assemblies, and subsystems as possible to identify failure modes, and their causes and effects. For each component, the failure modes and their resulting effects on the rest of the system are recorded in a specific FMEA worksheet. There are numerous variations of such worksheets.

A few different types of FMEA analyses:

- Functional
- **Design**
- Process

FMEA - functions

- Discover the potential **failures**, their potential cause mechanisms and the risks designed into a product or process
- Develop actions that reduce the **risk of failure**
- Follow-up and evaluate the results of actions on the risks that were discovered

SFMEA - *System Failure Mode Effects Analysis,* analyzing systems and subsystems in the early (conceptual) stage and focuses on the interaction between systems and system elements.

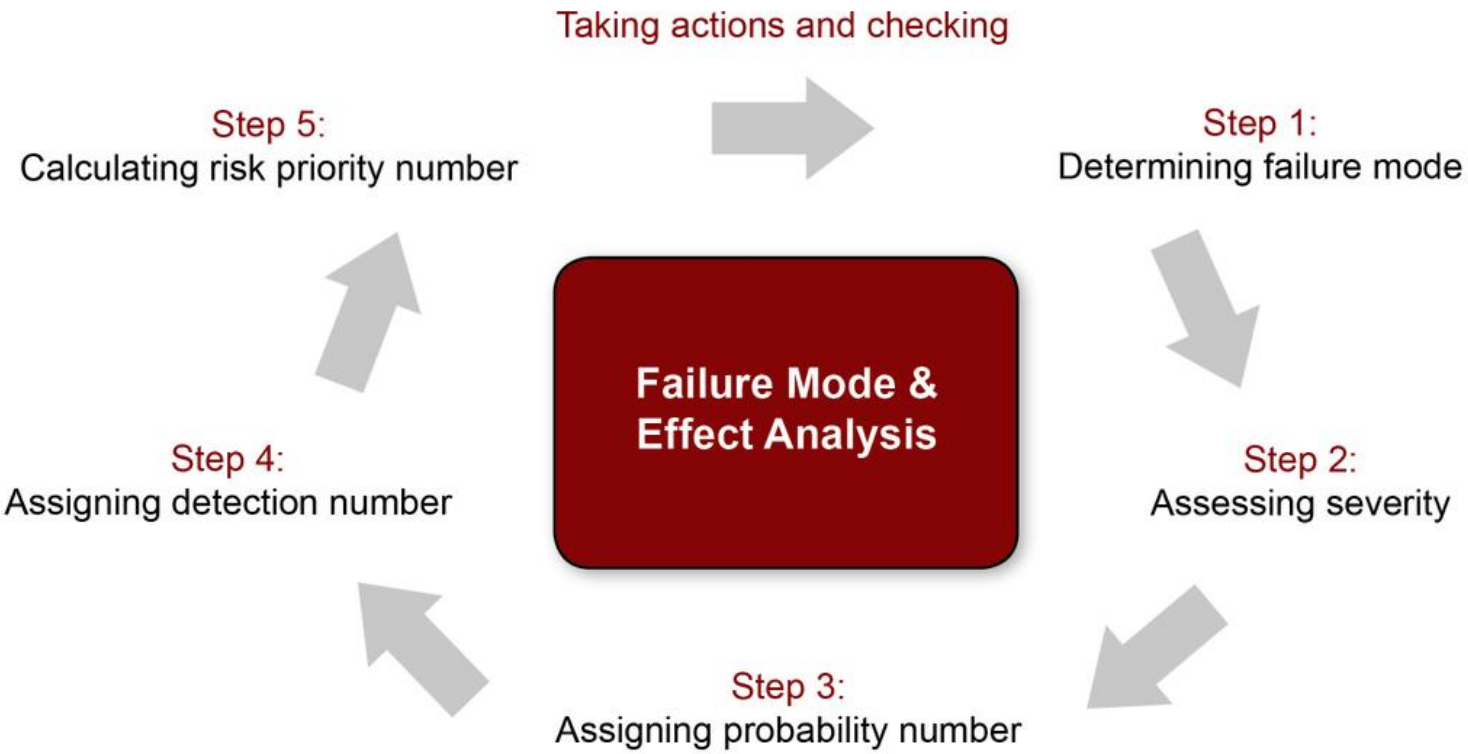
DFMEA - *Design Failure Mode Effects Analysis ,* analyzes the product before production starts. It focuses on the types of defects caused by deficiency in the design of the (draft).

PFMEA - *Process Failure Mode Effects Analysis,* analyzing manufacturing and assembly processes, the process deficiencies manufacture or assembly.

Example:

#	Current Design Controls	Control Type	Item	Function	Potential Failure Mode	Potential Effect(s) of Failure	Potential Cause(s)/Mechanism(s) of Failure
1	Vehicle general durability test veh. T-118 T-109 T-301	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Upper edge of protective wax application specified for inner door panels is too low.
2	Vehicle general durability testing - as above.	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Insufficient wax thickness specified.
3	Physical and Chem Lab test - Report No. 1265.	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Inappropriate wax formulation specified.
4	Design aid investigation with nonfunctioning spray head.	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Entrapped air prevents wax from entering corner/edge access.
5	Laboratory test using "worst case" wax application and hole size.	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Wax application plugs door drain holes.
6	Drawing evaluation of spray head access.	Detection	Front Door L.H.	- Ingress to and egress from vehicle - Occupant protection from weather, noise, and side impact - Support anchorage for door hardware including mirror, hinges, latch and window regulator - Provide proper surface for appearance items - paint and soft trim	Corroded interior lower door panels	Deteriorated life of door leading to: - Unsatisfactory appearance due to rust through paint over time - Impaired function of interior door hardware	Insufficient room between panels for spray head access.

FMEA steps:


Taking actions and checking
Step 1:
Determining failure mode
Step 2:
Assessing severity
Step 3:
Assigning probability number
Step 4:
Assigning detection number
Step 5:
Calculating risk priority number
Failure Mode &
Effect Analysis

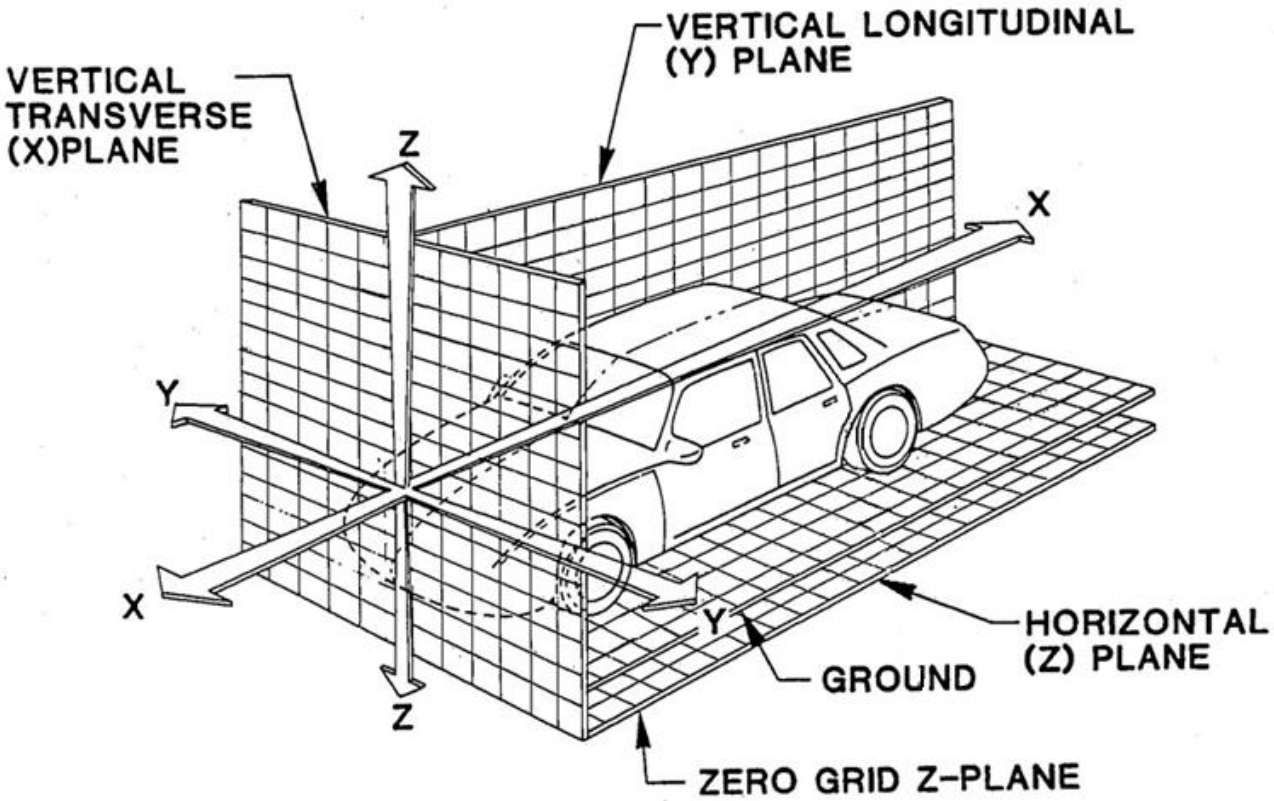
ECR - engineering change request

An engineering change request form is used to describe a suggested enhancement or problem with a product. The form initiates **the change process** — it promotes discussions within the organization to help determine the impact of a change and the **best possible solution.** The ECR form is circulated and reviewed among key stakeholders. It is the predecessor for an engineering change order (ECO - engineering change order), which describes the details of a change and may specify how a change should be implemented.

CONSTRUCTION OF LARGE ASSEMBLIES

- Central coordinate systém
- Designing of components and assemblies
- Sceleton model
- Data sharing

Car coordinate system or central coordinate system



Skeleton model

Skeleton model we use for definition position and connection areas. Skeleton model may include:

- hard points
- connection areas
- control curves

and other general information which we need for designing of components and assemblies

They serving for creation of local coordinate systems, positioning of standard components or modeling components in central coordinate systém.

Conclusion

In today's globalized world it is necessary to use these systems to work as a CAD engineer. Together with many other activities, they are an integral part of working in development creative teams. It is currently not possible to work effectively without them..

Questions:

- What is a PLM system?
- Which PLM systems do you know?
- What is ECR (engineering change request)?
- For what purpose we use the FMEA system?

Topic of the next lecture:

„ Modern materials“

Thank You

Used literature and sources of information:

https://www.systemonline.cz/clanky/zmenove-rizeni.htm

http://www.vlastnicesta.cz/metody/fmea/