



CAD & FEA in the automotive industry

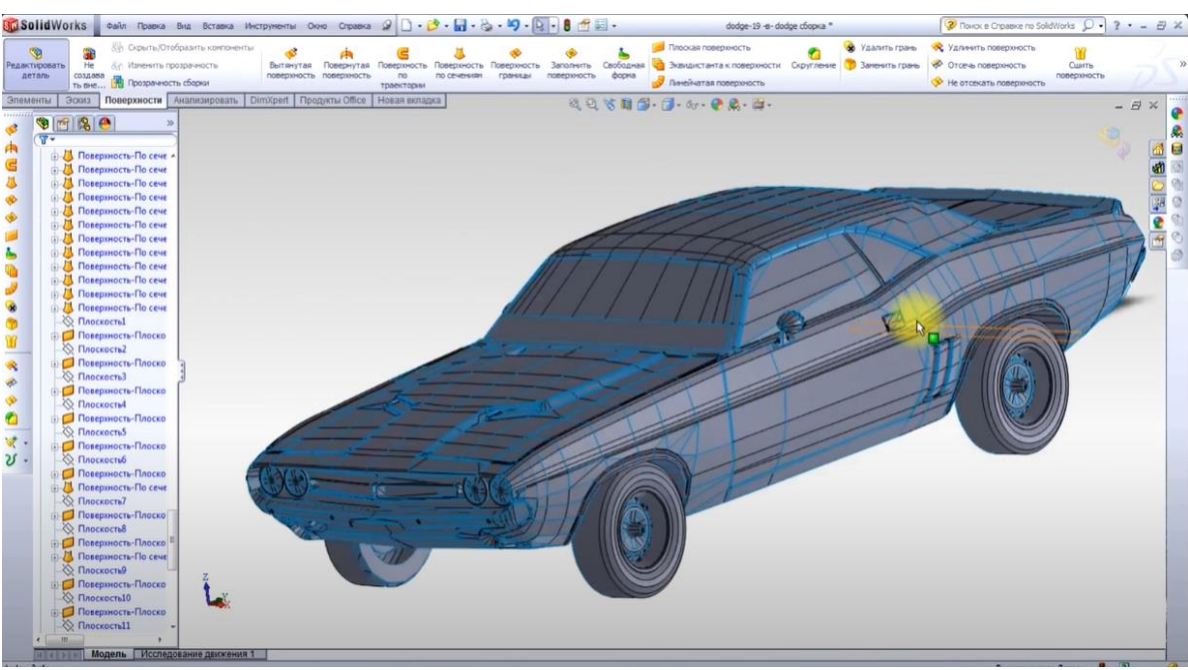
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Introduction

Computer aided design (**CAD**) and Finite element analysis (**FEA**) are both integral to the automotive industry, allowing for advancements in design and structural analysis in a variety of different automotive parts.



(Max sevik,2012)

CAD and **FEA** foster innovation within the automotive industry these tools help solve complex design challenges enhancing vehicle safety and performance overall.

CAD

Has shifted automotive engineering from hand drawn technical drawings to digital/3d design. It is done using software such as **AUTOCAD, INVENTOR & SOLIDWORKS**.

CAD allows for:

- **2D sketches** enabling the drawing of **basic shapes** and applying **dimensions** to them **effectively**.
- **3D modelling** by way of extruding 2D sketches into **3D shapes**, allowing engineers to **build components** layer by layer..
- Assembling **component parts** into a **full assembly**.
- Team **collaboration** as **multiple designers & engineers** can share one file

FEA

Finite element analysis saves time & money by **reducing** the need for manufacturing physical **prototypes**.

FEA takes complex shapes and converts them into **finite shapes**, making it easier to calculate the relevant **equations** to predict how the entire assembly behaves under various **conditions** and **stresses**.

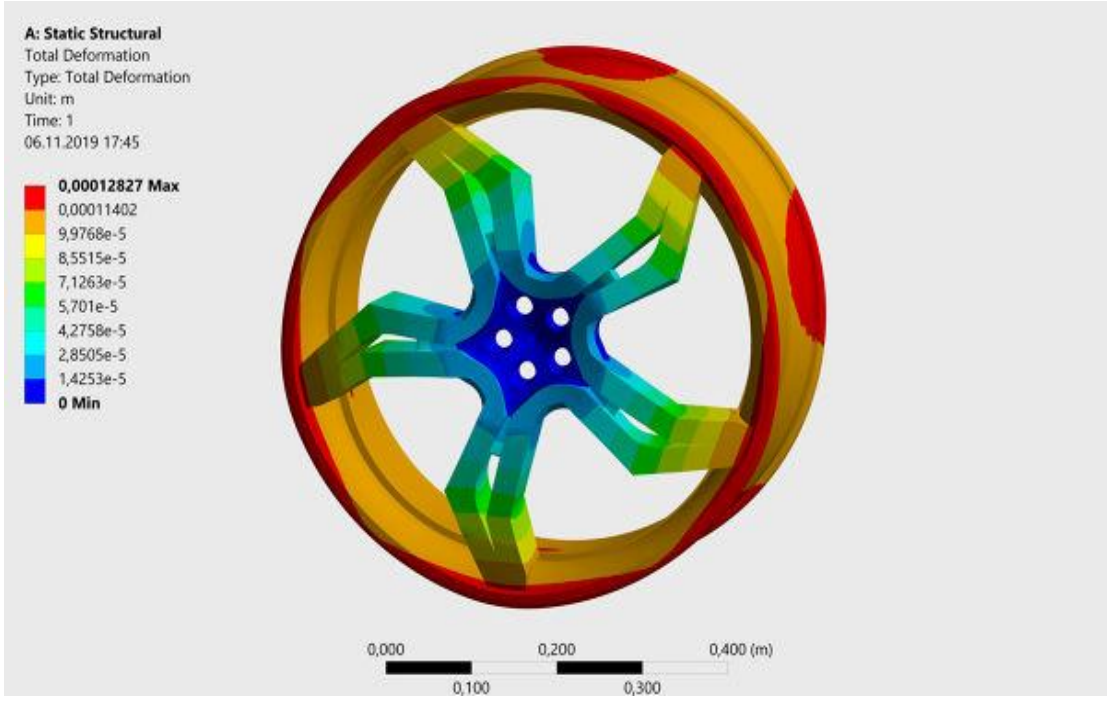


FIGURE.1 Car wheel structural analysis using fea using ANSYS Workbench (Payne. M, 2019)

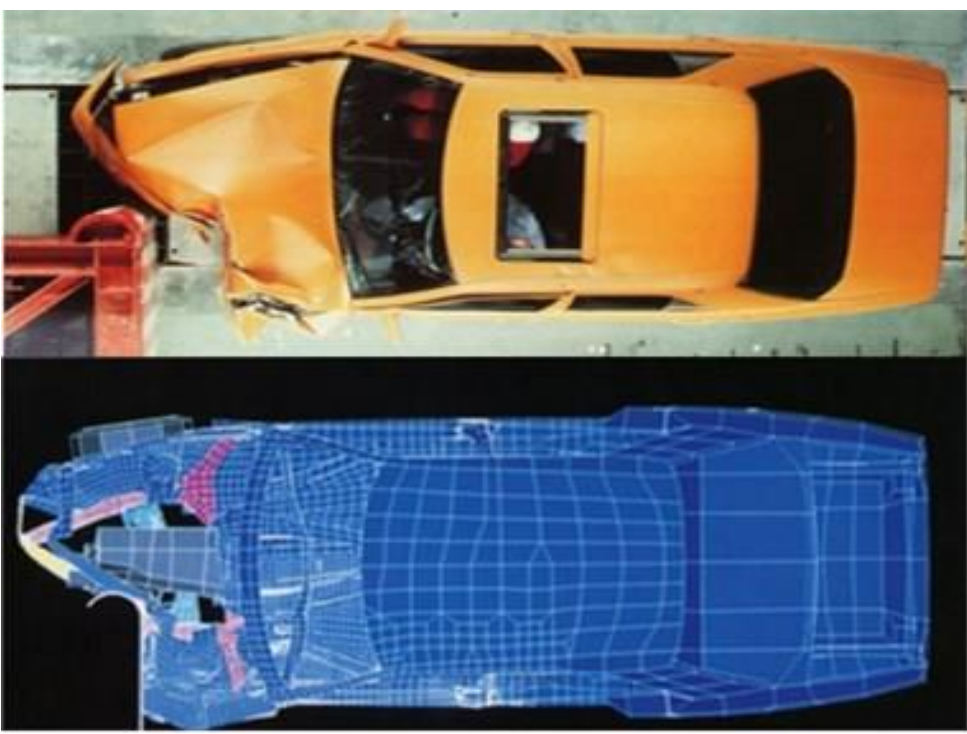


FIGURE.2 COLLISION MODEL APPLIED PHYSICALLY AND UNDER FEA ANALYSIS (Ozcan. F, 2019)

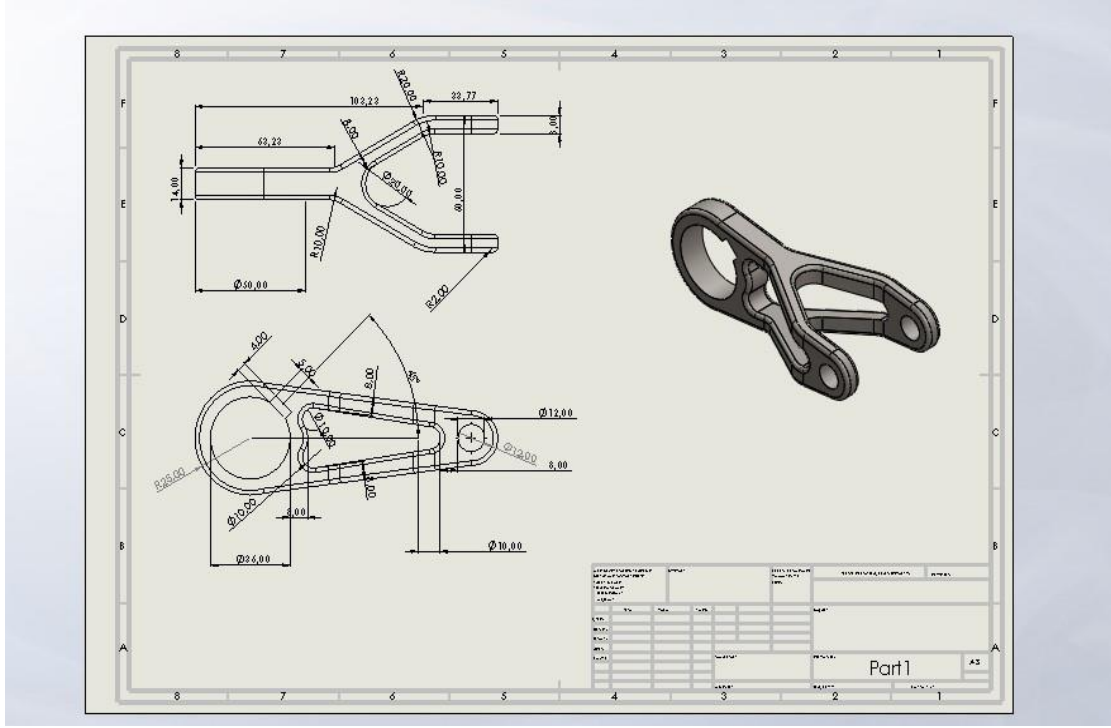
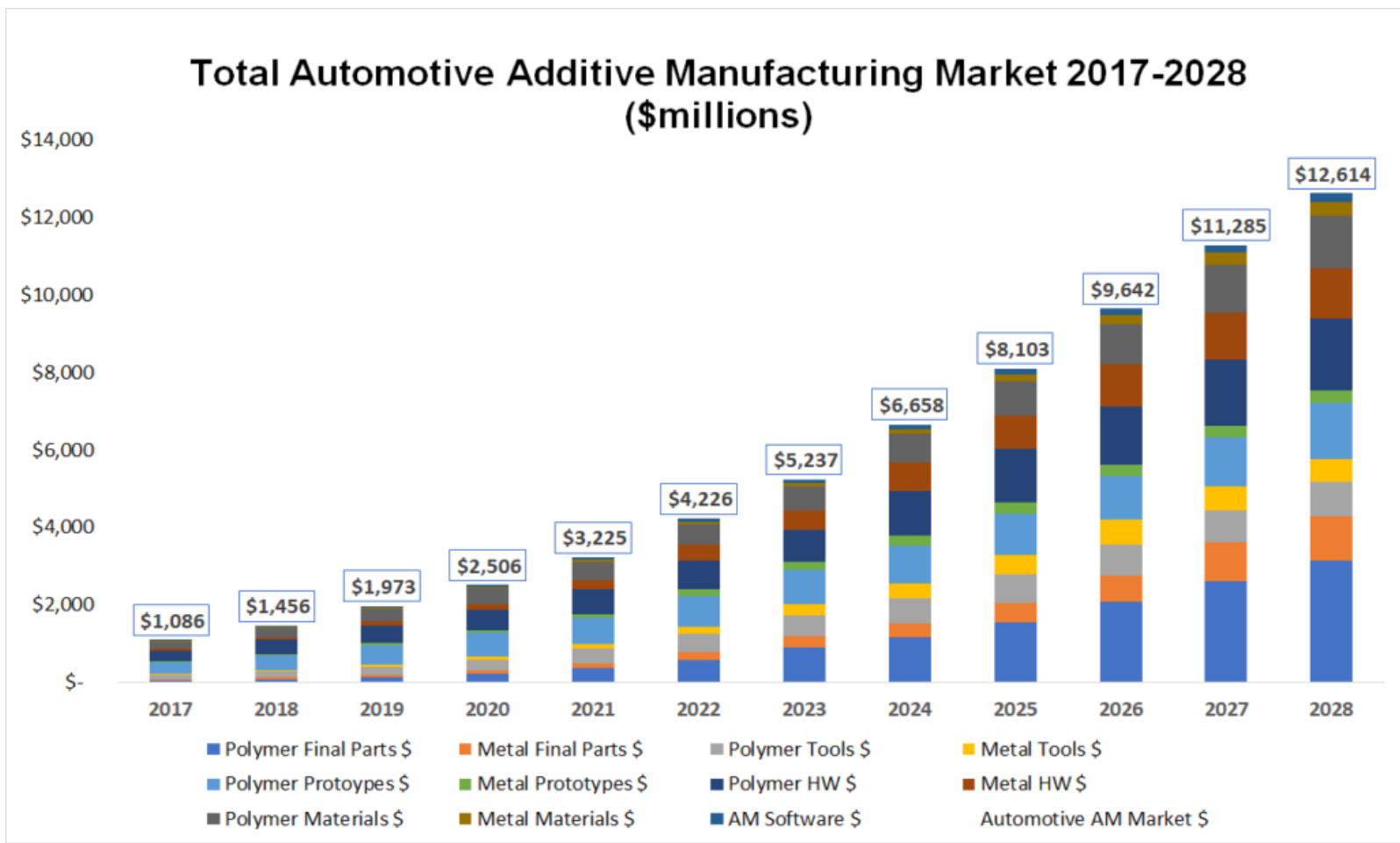
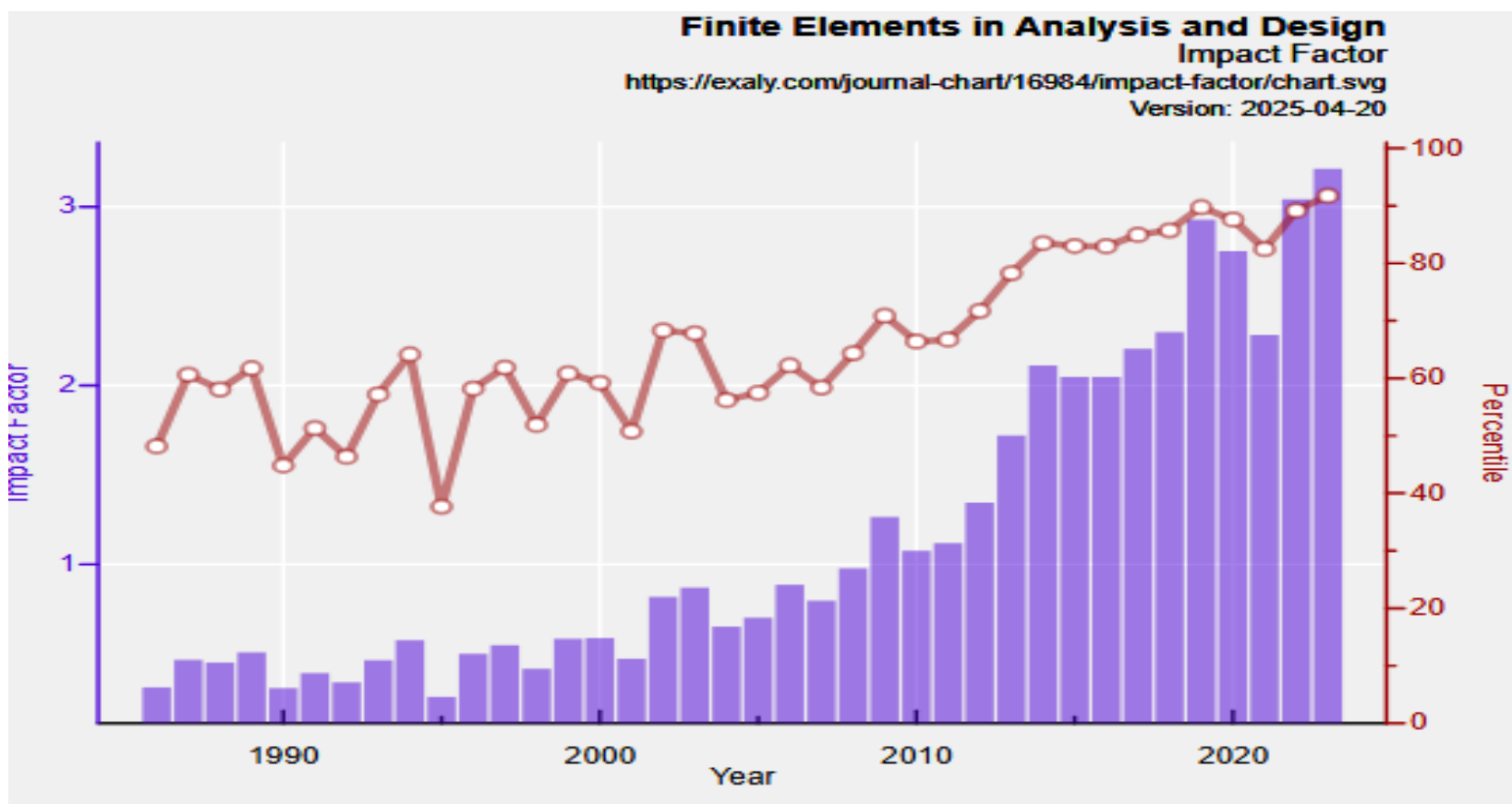


FIGURE.3 EXAMPLE OF CAD PRODUCING TECHNICAL DRAWINGS WITH SOLIDWORKS (HALİL TEKE, 2022)



This graph shows projected growth of 3d printing in the automotive sector in the years 2017-2028 (beamler,2018)



This graph shows the changes in the impact factor of finite elements in analysis and design in the 1990 – 2020 (exaly,2025)

Learning **FEA** and **CAD** can allow engineers to work faster and smarter, being able to design, improve parts quickly and test without huge halts in a project's timeline.

Below is an image of a Cable Car I personally modelled and constructed for a CAD assignment the project was my first time using CAD and 3D printing software practically and independently.



Acknowledgements

I would like to acknowledge the use of the PDF document titled "**Introducing SolidWorks**", which provided significant insight and information when researching Computer aided design & Finite elements analysis.

References

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