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| Title: AAS and Digital Twin |

3.1 What technical problem/task is your invention base on? What is the primary goal of the invention (e.g., protection of basic know-how, new product, new process)?

1. Interoperability of Asset Administrative Shell (.aasx) that helps **implementing digital twins for I4.0** that serves as a standardized method of file transfer between different tools that are required for different phases of manufacturing.
2. Establishing AAS as a standardized file format for data exchange across diverse manufacturing aspects is pivotal. This not only minimizes data redundancy and errors but also enhances production efficiency and customization in various areas such as designing assembly lines, planning throughput and capacity, managing production logistics and material flow, overseeing inventory, optimizing facility layout, allocating resources, ensuring clarity in work instructions, managing revisions, programming robotics and automation, improving build quality, and validating alternative raw materials.
3. The Asset Administration Shell (AAS), a fundamental element of the Industry 4.0 (I4.0) paradigm, facilitates industrial automation by emphasizing the benefits of highly digitized manufacturing. This approach underscores the advantages of a more comprehensive digitization, enabling end-to-end interaction between manufacturers and customers. The result is enhanced customization and improved product delivery in the manufacturing process.

Major Technical challenges,

1. Extraction of tool specific data from the Asset Administrative Shell package
2. Creation of Asset Administrative Shell for different kind of Asset corresponding to different process, data value, data-value-type.
3. Logging and versioning the end output of each process generated by tools used in different phases of manufacturing and storing them in standardised schema of Submode and SubmodelElements defined by IDTA.
4. Updating the real-time, timeseries data produced by the machinery of Industry into the AAS Package

3.2 Which technical features of your invention solve this problem or task?

Asset Administration Shell package (.aasx) could be a standard for file transfer between different tools that are required for different phases of manufacturing can be achieved by

programmatical generation of Asset Administrative Shell that helps to create a digital twin of a physical asset that is according to the description of RAMI 4.0 model along with support of AAS-server and Realtime database.It majorly helps in AAS creation and versioning of Asset Administrative shell that can be integrated with other tools where the final outcome will be a Asset Administrative Shell Package (.aasx based file).

End-to-End Manufacturer-customer interaction is achieved with the implementation of OPC-UA PubSub over MQTT, where the machine or the sensors are the Publisher of the data which are feed directly into the AAS Package that can be received by the Subscriber(Client) in Real-Time. Any Update made to the design or requirement by the end customer will be updated universally over the Manufacturers end and new line of product can be produced according to the need.

3.3 Are there already similar solutions to this problem or task? Please indicate the current state of the art and note that prior art and note that prior patent application from your GBU is also counted as the art. In what way has the problem previously been resolved (procedure, devices, and materials most similar to your invention)?

Search for similar patents / Reference papers etc.

* Digital Twin and AAS in the Industry 4.0 Framework
  + <https://iopscience.iop.org/article/10.1088/1757-899X/618/1/012001/meta>
* The role of the Industry 4.0 asset administration shell and the digital twin during the life cycle of a plant
  + <https://ieeexplore.ieee.org/abstract/document/8247583>
* File- and API-based interoperability of digital twins by model transformation: An IIoT case study using asset administration shell
  + <https://www.sciencedirect.com/science/article/abs/pii/S0167739X20302600>
* Towards an Asset Administration Shell scenario: a use case for interoperability and standardization in Industry 4.0
  + <https://ieeexplore.ieee.org/abstract/document/9110410>

3.4 What disadvantages do the known solutions have?

Gaps in the identified State of the Art

**ADD Your idea in details with all the Flow diagram and block diagram explaining the technical details**

3.5 What is the novelty of your invention?

Explain briefly your idea and how do you overcome identified technical disadvantages mentioned previously

**Interoperability Solution**: The emphasis on the Asset Administration Shell (.aasx) as a standardized method for file transfer addresses the need for interoperability between diverse tools in different phases of manufacturing. Helps in Improving Communication and Collaboration

**Comprehensive Digitization Impact:** The information underscores the broader impact of comprehensive digitization enabled by the Asset Administration Shell, affecting various aspects of manufacturing, from design and planning to logistics, resource allocation, and automation.

**Improved Customization:** improved customization in manufacturing processes due to Customer Manufacturer Interaction

3.6 What essential or additional advantages over the current state of the art are archived by your invention?

Advantages or the benefits of your idea

3.7 Where has the invention already tested, and with what results? Please indicate, preferably citing a number of examples (descriptions of test, technical documentations, samples), which comprise a mandatory part of patent application.

3.8 Have there been any problems with the testing so far? How and by when will these be overcome?

3.9 What keywords (German and English) can you use to describe your invention (important for patent search)?

English Keywords:

Asset Administration Shell

AAS

Industry 4.0

Digital Twin

Manufacturing Automation

Standardized File Format

Interoperability

Data Exchange

Production Efficiency

Customization in Manufacturing

Graphical user interface, text, application, email

Description automatically generated

5.1 What application will this invention be used for? Which customer benefit occurs?

The information about the Asset Administration Shell (AAS) and its role in Industry 4.0 is likely to be used in the context of manufacturing and industrial automation applications. Potential applications include digital twin implementations, design of assembly lines, production planning, logistics management, inventory oversight, facility optimization, resource allocation, work instruction clarity, robotic programming, and automation processes.

Customer benefits:

Increased Efficiency

Enhanced Customization

Streamlined Operations

5.2 Have information, publications, deliveries or notifications been forwarded to third parties or is any of the above planned? Was an NDA completed beforehand

5.3 Other remarks or explanation regarding the invention

5.4 Please indicate the USP (Unique Selling Proposition) of your invention

The Unique Selling Proposition (USP) of the provided information lies in highlighting the pivotal role of the Asset Administration Shell (AAS) as a standardized file format in Industry 4.0. It emphasizes how AAS enables seamless communication and data exchange between diverse manufacturing tools

The USP lies in the efficiency gains, improved customization, and the comprehensive digitization it brings to various aspects of the manufacturing process, contributing to enhanced productivity and streamlined operations.

5.5 Describe your invention using a maximum of three sentences, such that it can be understood by anyone.

The Asset Administration Shell (.aasx) is a standardized file format crucial for seamless communication between different manufacturing tools in Industry 4.0, ensuring efficient data exchange.

By establishing the Asset Administration Shell (AAS) as a standardized format, it minimizes errors, reduces data redundancy, and enhances production efficiency across various manufacturing aspects.

AAS, a fundamental element of Industry 4.0, facilitates industrial automation, enabling comprehensive digitization and improved customization in the manufacturing process.