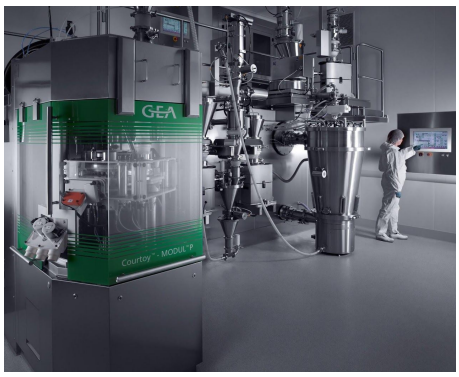
Digital Intelligent Pharmaceutical Manufacturing: Towards Faster Market Readiness



DIPharM

Digital
Intelligent
Pharmaceutical
Manufacturing

Project Partners

University of Sheffield
Siemens plc
IBM
Perceptive Engineering Limited
AstraZeneca

Project Plan

WP1 Project Management

WP2 Requirements and Route to Market Mapping

WP3 Development of Real-Time Data Visualisation / Analysis

WP4 DiPP Process Control and Monitoring

WP5 Machine Learning

WP6 Integration and Validation of Automated Network

WP7 Physical Production of Pharmaceutical tablets

WP8 Dissemination and Exploitation

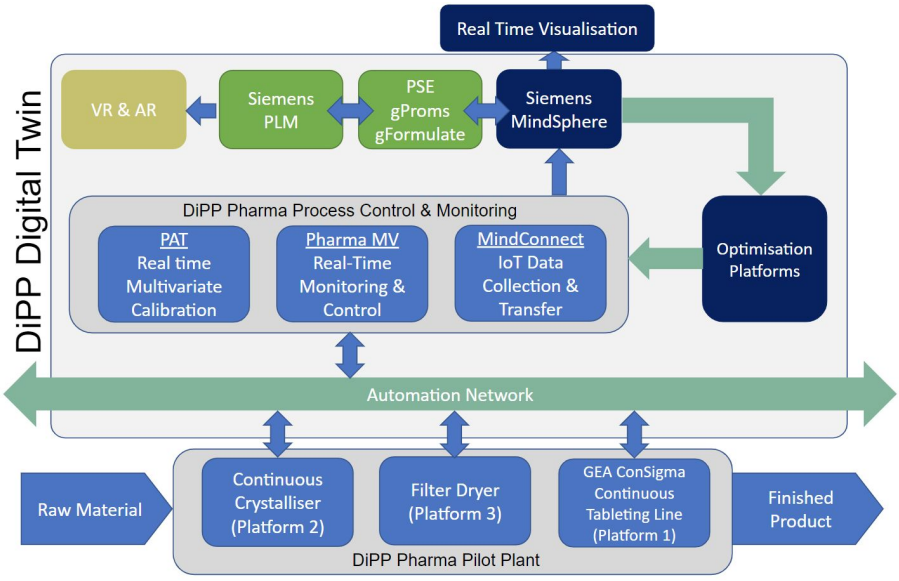
Project Cost

TBC

The world-leading Diamond Pilot Plant Industry 4.0 Demonstrator (DiPP) puts Sheffield and the UK at the centre stage of global research and teaching facilities in pharmaceutical process engineering. DiPP Digital Twin will leverage and enhance the DiPP facilities to enable the pharmaceutical industry to explore the benefits which IoT, data science, simulation and other digitalisation technology can bring to their existing plants, by offering:

- Demonstration facilities to test and validate potential IoT applications in the real world.
- Adopt a data-centric approach and automation, making knowledge about formulations, process and manufacturing of pharmaceuticals accessible and reusable.
- Cost-effective experimentation with production-class operational equipment, without the costly downtime and reduced output if that were to be done on actual production machines.
- An opportunity to access and optimise low-level control systems in a pre-competitive environment.
- Development of a service-oriented business model.

Siemens, Perceptive Engineering, IBM and AstraZeneca are collaborating with the University of Sheffield to supply the software, technology, services, engineering and knowledge to develop an intelligent advanced process control platform. The platforms will support the ongoing training, research and development activities on the GEA ConsiGma Tableting line, Nitech Continuous Crystalliser and AWL filter dryer. The platforms will also support the centre's industry 4.0 initiatives including linking Perceptive PharmaMV with PSE's gFormulated Products models, Siemens MindSphere, UoS Wiz and IBM Watson platform leading ultimately to building the state of the art advanced digital twin for the DiPP (Figure below).



The project will explore the potential commercialisation opportunities of the solutions developed during the DIPharM project and will be used to train the next generation scientists and engineers on the latest data-centric continuous manufacturing technology.

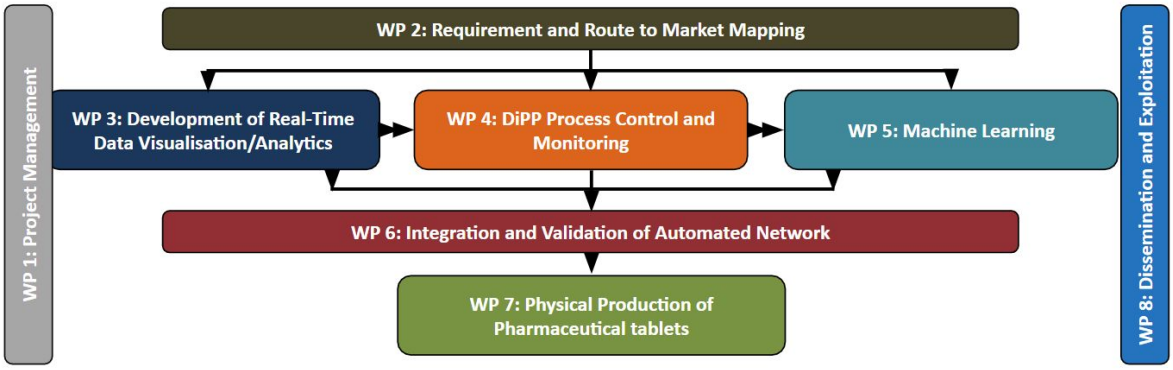


Figure 1: Structure of the project and the work packages.

The work proposed here will leverage and enhance the DiPP facilities to enable understanding and visualising the data in real-time. We have developed an interactive big-data visualisation tool to address both fronts by allowing exploration of data beyond what typical data analytic tools can offer. Built-in Python, the software called Wiz combines the accessibility of web applications with the robustness to interactively analyse datasets up to 5 dimensions (5D).

The project demonstrates the power of big data that can be directly queried by designers for decision-making. The data collected from different DiPP units can be analysed (in MindSphere) for revealing the hidden trends that cannot be uncovered based on a single source of data. This will be followed by incorporating our data visualisation tool to present data in a more explicit fashion. Ultimately, the goal of the project is to apply data analytics and/or advanced machine learning techniques to improve the DiPP digital twin's cognitive ability so that certain decisions or recommendations can be made automatically.

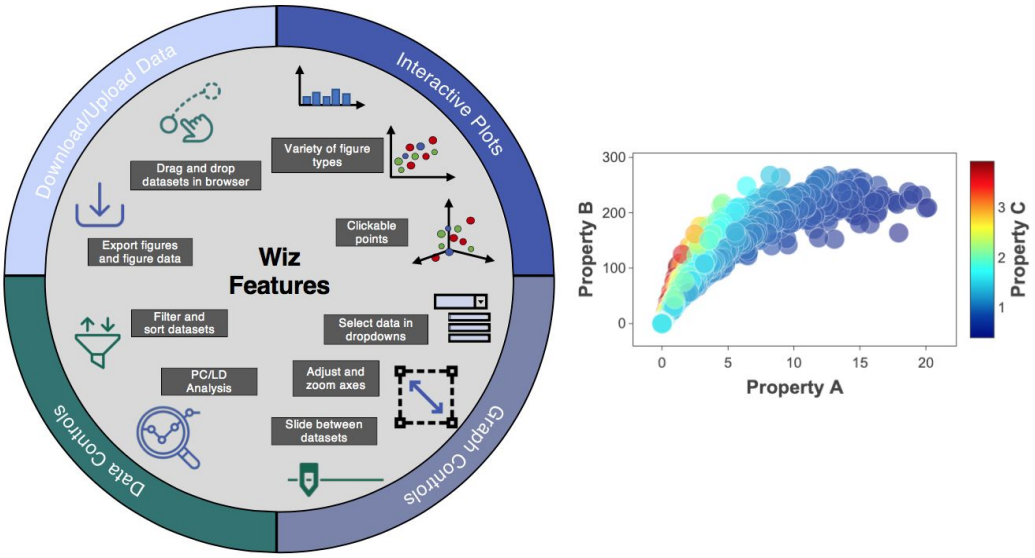


Figure 2: Graphical overview of Wiz. Diagram of the main features of Wiz (left). These features work together to make the user experience of visualising and interacting with their data easier than ever. Prototypical plot produced in the Wiz app (right).

Prof M Zandi m.zandi@sheffield.ac.uk