HSLU Hochschule Luzern

Technik & Architektur
Master of Science in Engineering
Specialization in Business Engineering

Master- Thesis in Business Engineering

Digitalization Concept for Production Quality Control

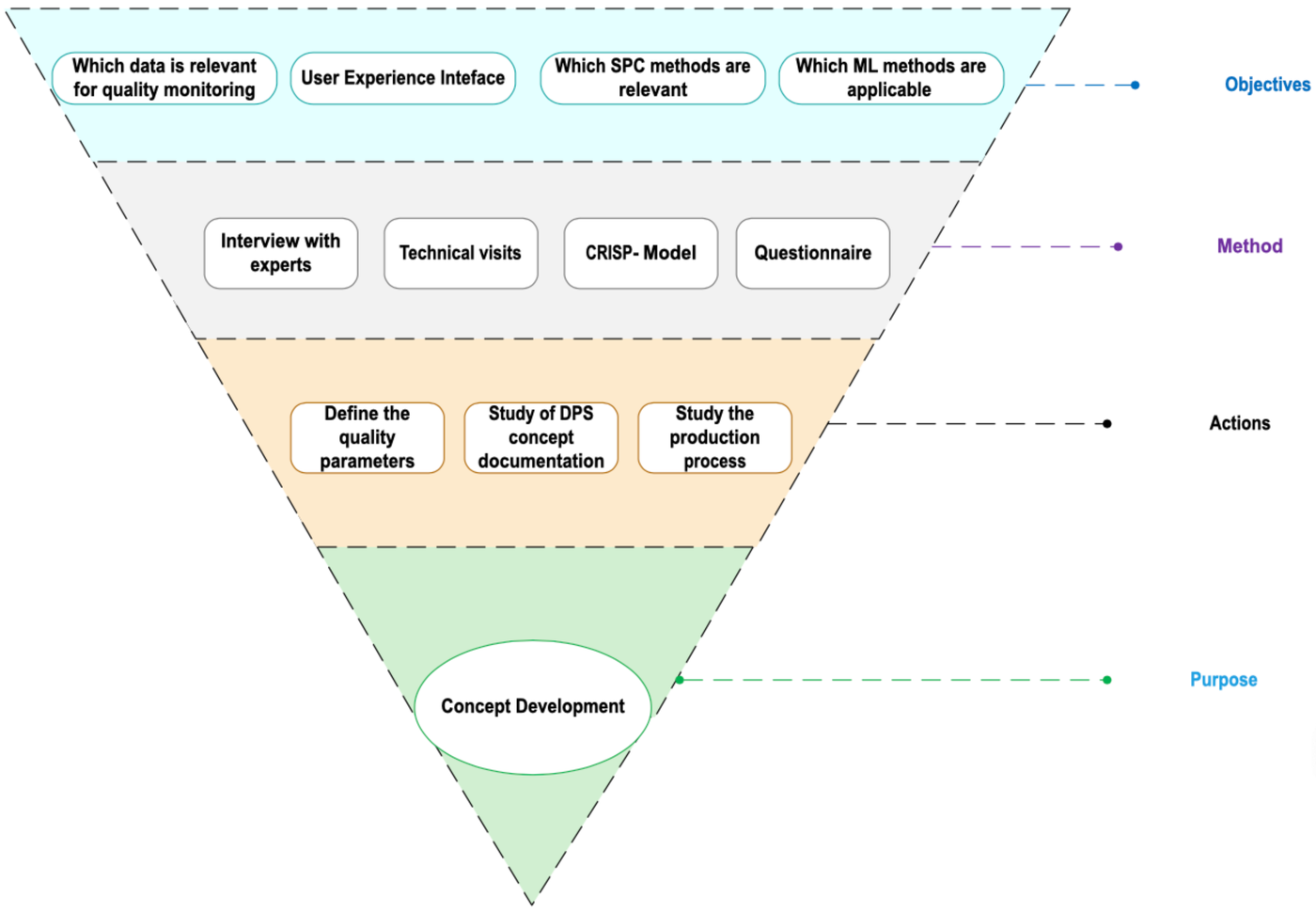

Fig. 1. Overview of the project plan

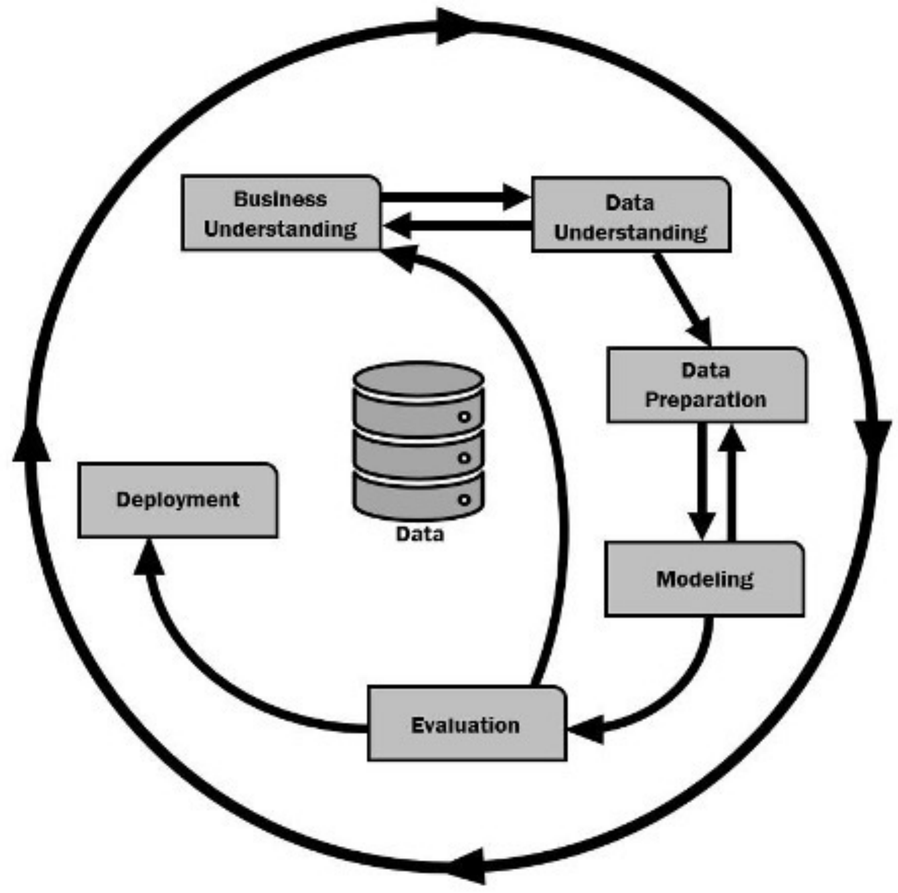

Fig. 2. CRISP model cycle developed for data mining and adapted for the concept of this thesis.

Problem Description

A sink manufacturer is currently implementing a Digital Production System (DPS) in one of its plants. Initially, the DPS is focused on production and production optimization. The company has future plans for a complete automation of their production lines, including the quality control and monitoring system, which currently involves manual inspections by shop floor operators.

To effectively automate this monitoring system, the head of quality of the enterprise has expressed the intention to use SPC and ML systems (integrated into the DPS) to monitor the quality of their processes and products. However, considering the huge amount of data and parameters involved in production and machines, the company needs to determine: Which data related to the sink's manufacturing process is relevant for a Statistical Process Control (SPC) and Machine Learning (ML) system, and what is necessary to collect or measure this data?

Solution Concept

The overview of this thesis plan is illustrated in Fig. 1. This project investigated the sink manufacturing process to identify the quality parameters necessary for implementing an SPC/ML monitoring system. To achieve this objective, interviews with experts from the partner enterprise were conducted, and a questionnaire was distributed to shop floor operators.

This research not only identified the pertinent quality parameters but also offered suggestions on how to measure/obtain this data. Moreover, a step-by-step concept was developed, based in the CRISP-DM model (Fig. 2), indicating what data to collect, how to collect it, and how to store the data for future analysis. Furthermore, the project included a modeling overview, system evaluation, and deployment considerations.

Additionally, solutions such as machine visual inspections were proposed to address process issues and provide data for the monitoring system. Moreover, this research presented an explanatory overview of the types of charts and ML algorithms that can be used to monitor each parameter identified.

However, it is important to note that the modeling step could not be completed during this project due to a lack of data. Finally, to meet the information needs of managers and operators, a dashboard interface for the future monitoring and controlling system was suggested. This dashboard is just a suggestion of the information that should be displayed for stakeholders. Functionalities and other detailed interfaces could not be developed due to time constraints.

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