

## **Thesis Defense**

# **UTILIZATION OF INDUSTRY 4.0 TO INCREASE THE EFFECTIVENESS OF MANUFACTURING OR SERVICE OPERATION: COBOTICS & SIMULATION**

Midhun Ram Thulasiraman, Industrial and Systems Engineering, MS

Candidate

May 17th, 2022, at 10:00 AM - 11:00 AM

[Zoom Link](#)

### **Abstract**

The aim of this thesis study is to investigate the potential advantages of utilizing Industry 4.0 drivers that have an increased publicity in the manufacturing or service industries. Diverse customer needs necessitate greater transparency, adaptability, and flexibility in manufacturing or service industries which challenges the conventional manufacturing methods to change. In order to achieve these standards, the Industry 4.0 drivers are aiding in increasing the productivity of the industries. Two of the important elements of Industry 4.0 such as Cobots and Simulation software can be effectively utilized by the industries to maximize their performance. These tools can aid in taking over the tasks that are often considered to be tedious, repetitive and hazardous in nature for a human worker to perform. One such driver are Collaborative robots, a type of industrial robot that can be deployed to perform a task with or without human interventions. In contrast with the traditional robots, the Cobots are small in size, easy to program, high ROI and the most important part is having no safety cage around the robots which enables a collaborative mode of workspace. The advanced technological capabilities in these robots makes it desirable for the industries to adapt them, thereby improving the capacity and productivity. As there is a need for a high-performing robot with precise placement accuracy and repeatability in an era of high customer demands, two Cobots were used in this thesis to validate their performance specification by conducting a process capability study. This study was also aimed at investigating the placement accuracy of these robots and identifying the extent to which these process factors affect the placement accuracy of the Cobot. A Design of Experiments (DOE) was performed using a full factorial design method to study various factors affecting the placement accuracy of the

robot. Also, in order to better understand their application capabilities, the simulation software can be a viable solution for simulating the robots. There are many user-friendly simulation software available in the market that a user with novice simulation knowledge can easily create a simulated manufacturing environment. These simulation software can also be used for programming the Cobots and their functionalities are studied in this thesis to see the effectiveness and challenges faced upon utilizing these technologies.