Identifying Bottlenecks in High Capacity Automated Manufacturing through Consistency

**BUSINESS PROBLEM**

Assembly lines can only produce parts as fast as their slowest process (the bottleneck). The bottleneck will govern the speed of production and implicitly set the maximum capacity of what can be produced in a given time period. Without making improvements to the bottleneck, production will never increase. In large complex automated manufacturing, it can often become difficult to determine which process is the bottleneck as there are thousands of processes happening simultaneously and random real-world events that also affect production rates. In order to improve production, operators require a quick and effective way to find the bottleneck.

**DATA SOURCES**

Timestamps of data strips, self reported by robots

**Data Types and Format**

Excel, Continuous, Histograms, Probability Density Diagrams, PowerBI

**APPROACH**

By selecting a single point in the process of a robot making a part, and timing until the exact same process is performed in the next part produced, you can break down the system to find the bottleneck. When comparing robots in series to one another, all robots will operate at the bottleneck's production rate but the bottleneck will operate at this time more consistently than any other robot.

**Finding the Bottleneck**

bottlenecks are consistent since they control the flow most of the time

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Enabling the finding of bottlenecks in a complex system, has drastically reduced the time required to find the bottleneck. Previous practice required several industrial engineers, with stopwatches, to go out and manually measure every robotic process in the plant. This took several days to perform and often did not lead to the actual bottleneck being found. Most of this inaccuracy was due to issues with manual timing of machinery. This new approach produced a dashboard that was updated automatically every hour, to identify issues in the plant. The new process takes less than 2 minutes by a single person once an issue is determined. An active decision was made not to fully automate the bottleneck finding process. Using this technique takes some finesse and understanding of what was going on in the overall system. This tool was designed to be an aid to human operators to streamline the time to find a bottleneck, verify issues found are the issue, and allow for additional time/resources to be applied to improving the bottleneck. This process found bottlenecks that were improved to increase daily production by 20 vehicles per day (4% increase).