

## **SIX SIGMA APPLICATION; TO REDUCE THE CYCLE TIME OF THE SUB-ASSEMBLY LINE IN THE BICYCLE MANUFACTURING PROCESS**

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### **Abstract**

**Purpose:** Six Sigma is a project-driven approach to improving business performance error-free. This study is an applied and mixed-method study that focuses on applying the Six Sigma Methodology to improve the sub-assembly line of a bicycle manufacturing system. The main objective of the study is “To improve the assembly line production system by reducing the cycle time, applying Six Sigma Methodology in the bicycle production system in ABC Company”.

**Methodology:** This is Applied research in nature. A mixed research methodology was used in order to reach the study objectives. Primary data are collected from 30 sample units, related to Production line operations and five interviews are conducted. The direct observation method is used to collect data from the sample. Time is considered the main data source to reach the study objectives. The time of each operator in the sub-assembly line of “Handle line Operations” is collected. Time is measured in the measurement of seconds and it takes seconds to assemble the parts one batch of an hour is considered as a population. DMAIC methodology under Six Sigma is applied to analyze the data with its tools.

**Findings:** The current sub-assembly line is processing with a low Sigma level between 0.8 and 0.85. The Sigma level is increased from 0.8 – 8.5 level to 2.2 to 2.3 level through this study. Interview data revealed that few causes are effect to have a higher cycle time in the sub-assembly line. They identified the viewpoint of men, methods, materials, and machines. Poor operator efficiency, Lack of knowledge about the process, and Irresponsibility of the operators due to the lack of communication were identified under the mean category. Under the method category causes such as, time was not balanced and lack of space to keep the parts which are required to use in the system are identified. Under the material category, material delay and the availability of the defective materials are identified. Not utilizing the new tool, Less capacity of the available tools is the cause identified under the machine category. It is revealed that to make high cycle time of the process, lack of knowledge related to the process, lack of space facility, material delay to the process, use of fewer capacity tools with traditional tools, are caused.

**Research Limitations:** This study is limited only to the Sub-Assembly line in the Bicycle Manufacturing Process. It is considered in the bicycle handle line and not a total manufacturing process. Data access is limited to one batch it is satisfied under the Statistical background but the number of batches and the considered time is limited for the study.

**Implementations:** Following implementations are done in order to develop the process. To maintain and develop the labor skills, continuous training is provided to all the employees to sustain the total assembly line. Time study and work-study were conducted, and they were properly recorded for analysis purposes. More connections developed with the quality department in order to maintain the quality of the overall production. Introduced more updated modern technology to improve the processes. Therefore, It can be concluded that the Six Sigma methodology can be successfully applied to improve the sub-assembly line production system by reducing the cycle time of the bicycle manufacturing process of ABC Company.

**Keywords:** Six sigma, cycle time, bicycle manufacturing, sub-assembly line