Problem Statement Worksheet (Hypothesis Formation)

How can Nordic Sensing Company reduce component failure rates for InSense sensor packages to less than 5% while maintaining sufficient production volume to meet existing orders for these systems?

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1 Context

Nordic Sensing Company (NSC) is a well-situated entity in the IoT sensor space that focuses on energy consumption and production. InSense is an energy tracking sensor offered by NSC to the residential energy usage space. The VP of InSense received reports from a team in Singapore of a major spike in sensor failure rates for packages undergoing pre-ship testing. A 1-2% failure rate was considered normal during early-stage development testing. March summaries indicate a current failure rate of 15%. NSC has large orders for these systems, and failure rates need to be reduced to less than 5%.

The InSense system is a sensor package manufactured in Asia. There are four factories "refocused solely" on these systems. It is unclear whether additional facilities are involved. Each system is made of 7 parts. There are 26 suppliers for these parts.

2 Criteria for success

The sensor failure rate for systems must be less than 5%. Solutions must be implemented in time to meet existing orders. The deadline for solution implementation is dependent on the cause of the increased failure rate.

3 Scope of solution space

The solution space is limited to the InSense system. It is time-bound by orders placed for these systems.

Unless advised otherwise, the manufacturing analytics team will proceed in this order until a relationship is established between increased failure rates and some other variable or combination of variables:
Analysis of testing data. Inquiry about and analysis of any changes made immediately preceding the spike in failures, especially those related to supplying, manufacturing, testing, storage, shipping, and handling. Analysis of testing equipment and procedures. Analysis of early-stage development for potential design flaws. Investigation of alternative manufacturing techniques. Projected cost analysis of increasing production capacity to offset increased failure rate (provided 'sensor failure rate'' refers to percentage of systems that do not work, and not a condition in which all sensors fail 15% of the time).

4 Constraints within solution space

NSC has large orders for InSense systems. An unspecified production volume must be maintained in order to meet existing commitments. This volume imposes time constraints on potential solutions.

Solutions may also be limited by the quality of record keeping and data provided for analysis, existing design considerations, specifications provided to companies that placed orders, existing component inventories, lead times on components in need of replacement, and the availability, cost, and production capacity of alternative manufacturing facilities.

5 Stakeholders to provide key insight

Manufacturing Analytics
Vince Maccano - Head of Data Science
Jane Smith - Data Scientist

Engineering and Manufacturing
Shane Buchholz - Head Engineer
Gary Neumont - Head of Manufacturing
Jessica Jones - QA/QC Engineer

InSense Leadership
Otto Evans - InSense President
Tony Abaraham - InSense VP

NSC Executive Management
Bernard Ong - CTO
James Hansk - CEO

6 Key data sources

A thorough definition of what 'sensor failure' means. The complete InSense testing data is needed. A 20,000 row subset of the data has been made available as an excel file. The early-stage development testing data and parts/manufacturing details for sensors used in these tests would be useful in ruling out inherent design flaws.

The engineering and manufacturing stakeholders listed above may be able to provide further information on manufacturing processes, component vendors, and logistics.

If analysis does not suggest any apparent causal relationship for increased failure rates from specific components, suppliers, or facilities, it may be useful to examine storage, shipping, handling, and testing procedures for assembled systems. Examining the test equipment itself would be a simple first step. Information on alternative manufacturing facilities may also be required.

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