

ANTICIPATING HIGH DEMAND CLASS IX ITEMS



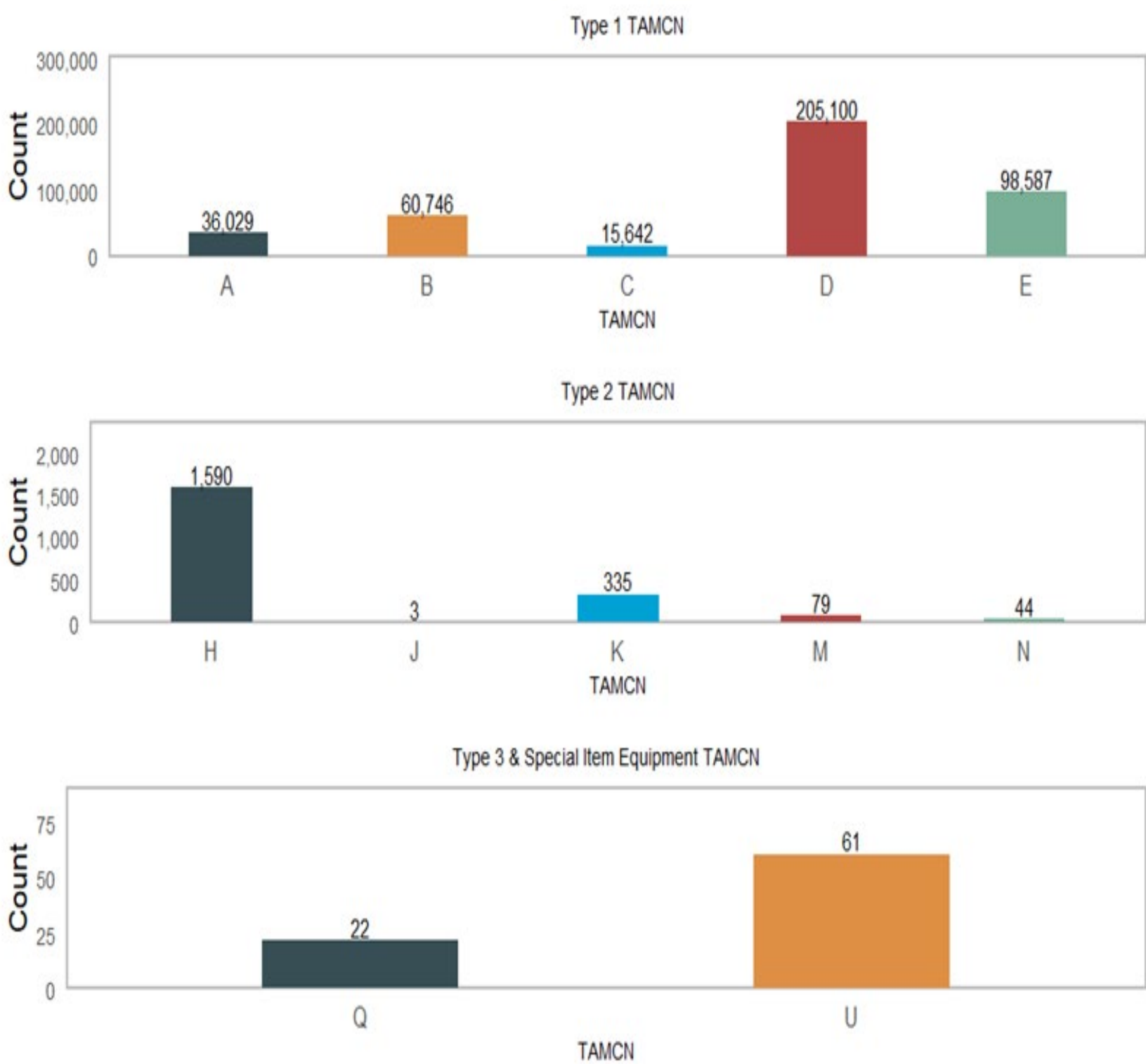
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Abstract

The thesis focuses on predicting high-demand class IX items for MARFORPAC by analyzing maintenance and requisition data over multiple fiscal years. We apply a Markov chain model to examine failure patterns across subassembly systems of a specific assets; this model will provide a descriptive analysis to examine the maintenance history by identifying the primary defects that have caused failures within a given TAMCN. We will then apply this model to help us understand the probabilities of one failure in a subassembly can lead to failures in another, allowing us to predict future breakdowns based on historical data. By identifying these failure sequences, we aim to provide a framework for MARFORPAC units to leverage predictive analytics in distributed and contested environments.

Methods

- We analyzed 553,945 requisitions linked within 183,654 tasks, across 127,190 service requests spanning four fiscal years.
- Data is reconstructed into a time-based format, enabling the calculation of maintenance events relative to procurement dates.
- Maintenance histories are analyzed to identify defect occurrences and calculate defect failure rates.
- Transition matrices are generated to quantify the likelihood of transition from one defect state to another based on requisition events.



Results & Their Impact

- The Markov chain analysis identifies defect progression patterns, showing how issues in one subcomponent can lead to failures in another subcomponent; this supports a proactive approach to maintenance and demand planning.
- Transition probabilities highlight components with high self-transition rates that are prone to recurring failures. These insights provide actionable data to prioritize requisitions and optimize demand planning for high-demand items.
- This framework can be applied to all major end items with sufficient requisition records tied to subcomponent issues, enabling improved supply chain strategies across a broader range of assets.

