PRODUCT COMPONENT GENEALOGY MODELING 
AND FIELD-FAILURE PREDICTION

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ABSTRACT

Many industrial products consist of multiple components that are necessary for system operation. There is an abundance of literature on modeling the lifetime of such components through competing risks models. During the life-cycle of a product, it is common for there to be incremental design changes to improve reliability, to reduce costs, or due to changes in availability of certain part numbers. These changes can affect product reliability, but are often ignored in system lifetime modeling. By incorporating this information about changes in part numbers over time (information that is readily available in most product production databases), better accuracy can be achieved in predicting time to failure, thus yielding more accurate field-failure predictions. This paper presents methods for estimating parameters and predictions for this generational model and a comparison with existing methods through the use of simulation. Our results indicate that the generational model has important practical advantages and outperforms the existing methods in predicting field failures.