

Harrison Kim (University of Illinois at Urbana-Champaign)

CMMI 0953021, 0953021

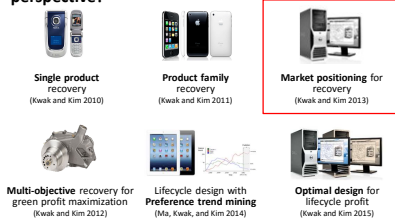
What is sustainable design and manufacturing?

"Creation of goods and services that respond to customers' needs and improve quality of life, while minimizing the adverse environmental impact over the lifecycle**"



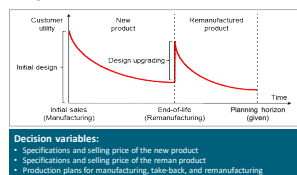
How can we maximize the profit from recovery?

Which product design is better from a recovery perspective?



Life cycle design

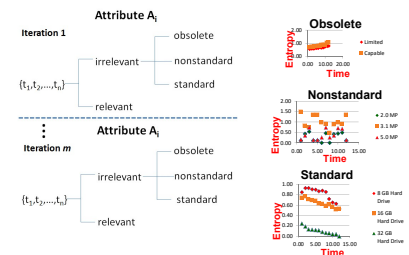
What is the optimal product design for maximizing the lifecycle profit, where the lifecycle profit is the sum of the profits from manufacturing and remanufacturing?



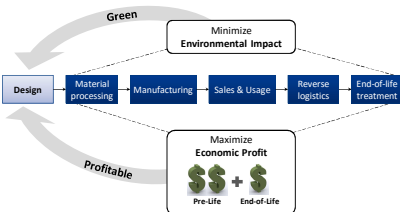
Decision variables:

- Specifications and selling price of the new product
- Specifications and selling price of the reman product
- Production plans for manufacturing, take-back, and remanufacturing

Irrelevant Attribute Classification



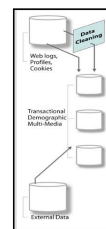
Green Profit Design: Making "green profit" through design



Example: market positioning for remanufacturing

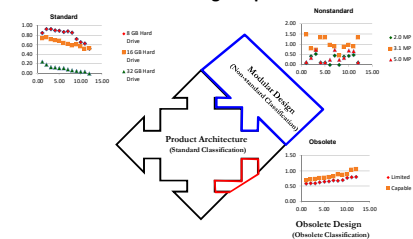


Proposed Trend Mining Algorithm

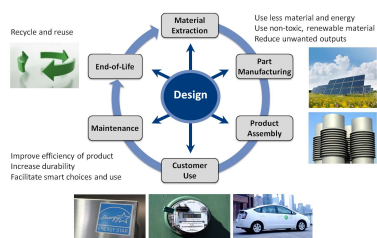


- Data is often collected over a long period
- Such data captures and reflects changing product characteristics over time
- The underlying hidden structure therefore evolves over time
- Most current demand modeling approaches assume stationary

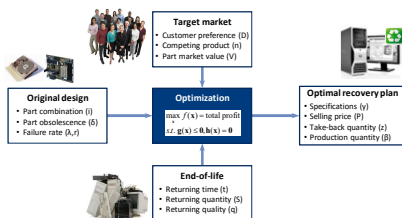
Product Design Implications



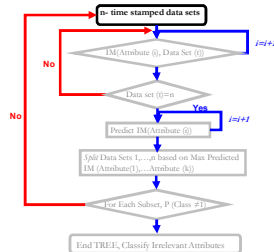
Design Effort for Green Profit



Market positioning with optimal part upgrading



Trend Mining Algorithm Flow

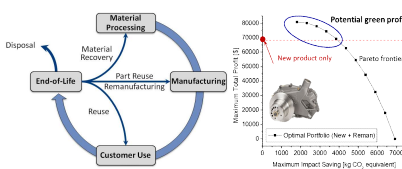


Opportunities for Future Research Expansion

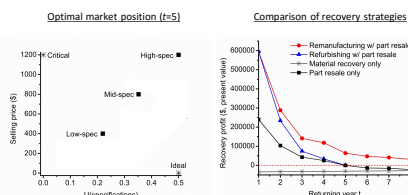
- Currently, the Trend Mining algorithm is bound by the initial product design attributes specified by designers. However, the attributes themselves may evolve in the market space, not just the attribute levels.
- There is a need to explore the correlations that exist between the price of a product and the attribute trends in the market

End-of-Life Recovery for Green Profit

Recovering end-of-life products after customer use can be a promising solution for green profit generation. This research aims to facilitate end-of-life recovery through well-designed products.



The positioning model identifies the optimal specs and the selling price of remanufactured products.



Trend Mining Algorithm Flow

Attributes	Time Series Gain Ratio												Predict				
	T	2	3	4	5	6	7	8	9	10	11	12					
Hard Drive	0.242	0.222	0.308	0.348	0.218	0.438	0.448	0.512	0.618	0.702	0.732	0.732	0.732	0.732	0.732	0.732	0.732
TalkTime	0.822	0.842	0.642	0.482	0.702	0.902	0.782	0.592	0.732	0.902	0.782	0.472	0.472	0.472	0.472	0.472	0.472
Camera	0.482	0.402	0.112	0.572	0.372	0.952	0.902	1.002	0.362	0.042	0.042	0.572	0.572	0.572	0.572	0.572	0.572
Headline	0.952	1.002	0.952	0.982	0.702	0.652	0.542	0.702	0.712	0.902	0.972	0.972	0.972	0.972	0.972	0.972	0.972
Connectivity	0.052	0.052	0.072	0.112	0.172	0.272	0.322	0.362	0.502	0.612	0.612	0.702	0.702	0.702	0.702	0.702	0.702
2-G Processor	0.912	0.872	0.842	0.802	0.712	0.732	0.672	0.632	0.612	0.572	0.512	0.512	0.512	0.512	0.512	0.512	0.512

Attribute Gain Ratio Plot Over Time

