Carnegie Mellon University
Tepper School of Business

Industrial Scientific Customer Insights

MS in Business Analytics Capstone Project

The Team:

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ABSTRACT

The sponsor company has noticed an opportunity to improves upsell and cross-sell activity by using historical data to identify which sites are using less product than they need. The Tepper MSBA team met with members of the marketing, sales, field services, and IT teams to understand the business and data context. These interviews identified the key problem of understanding how account characteristics and behavior impact downsells and upsells.

Using product data, Salesforce account information, and contract amendment data, the Tepper team prototyped multiple machine learning models to predict product utilization rates, contract changes, and equipment volume. Ultimately the team refined a customer segmentation model, which used k-means clustering on the principal components of an 80 feature dataset.

The customer segmentation model output 3 clusters: low risk of downsells, moderate risk of downsells, and high growth opportunities. Key insights of these models include strong correlation between customer activity and upsells, the importance of product choice in predicting contract amendments, and the observable predictive value of the company's own customer health metric.

INTRODUCTION

Industrial Scientific (ISC) designs and manufactures gas detection products that protect workers from hazardous conditions around the globe, with a vision to eliminate death on the job by 2050. While its competitors focus on protecting workers through PPE, Industrial Scientific is focused on isolating workers from hazards through scalable sensor-to-cloud technology platforms. Most notably, it is known for its flagship offering, iNet Exchange, and among the first in the industry to offer this as-a-service program. ISC's Mission is "to preserve human life on, above, and below earth. [They] deliver high quality customer service in every transaction, every time."[1] This really highlights how important each account is to them and the actions taken throughout the duration of a customer.

Following the sponsor kick-off meeting and learning more about their company through discussion with various subject matter experts within their business, a problem statement was constructed, which could, ultimately, lead to their desire to fill the "white space" of current customer orders that are undersized and, on the other hand, gaining an understanding of what factors affect orders to be oversized and why downsell has occurred.

Problem Statement: Focus on truly understanding ISC's customers and the relationships affecting upsell/downsell and utilization rate in order to continue delivering the highest quality customer service for current and future customers.

METHODS AND MATERIALS

The sponsor company provided disparate sources of data consisting of customer characteristics from Salesforce (i.e. industry, employee headcount, and region), product information (i.e. onsite equipment volume), and customer behaviors (i.e. contract amendments, product returns).

The data was cleaned and merged into one table, consisting of 413 observations and over 80 features. This table was used as the input for machine learning model prototypes. The team attempted a combination of categorical and continuous variable prediction techniques including logistic and linear regression, decision trees, and random forests. Due to high variance in the predictions of these models, an unsupervised clustering algorithm was implemented.

PCA was used to reduce the dimensionality of the data, and a K-means algorithm was run using the principal components to cluster accounts into three categories.
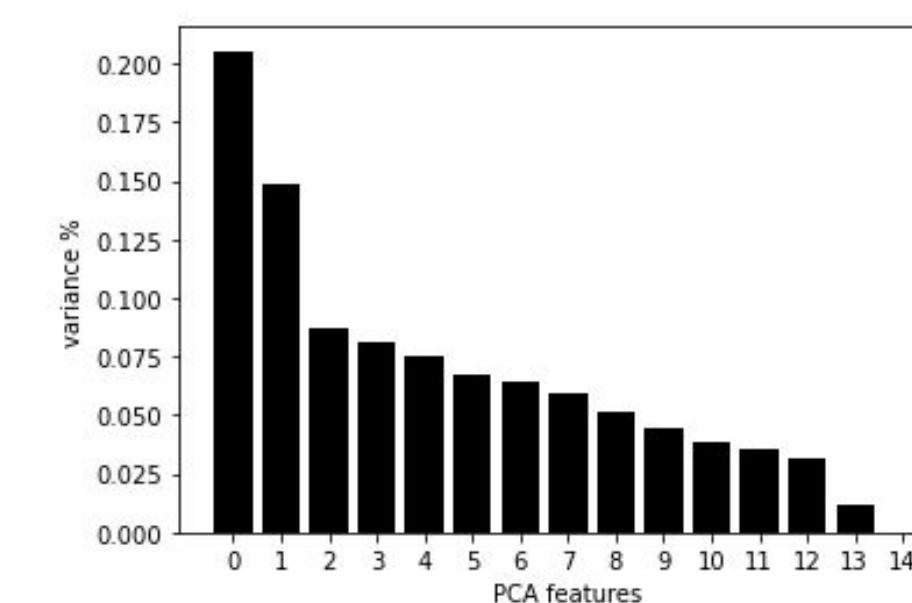
RESULTS

We conducted customer segmentation with K-Means Clustering, and determined significant features with Decision Tree analysis (predicting utilization rate) and PCA which both shared similar results. The 3 key iNet customer segments and distribution of accounts are as follows:

1) Low Risk (30%) - no historical contract changes, average customer health ratings and account activity levels

2) Moderate Risk (50%) - high concentration of downsell accounts, below average customer health ratings, more SMB accounts ("small medium businesses")

3) High Growth (20%) - low concentration of downsell accounts, high multi-gas instrument counts, highly active accounts, high customer health ratings
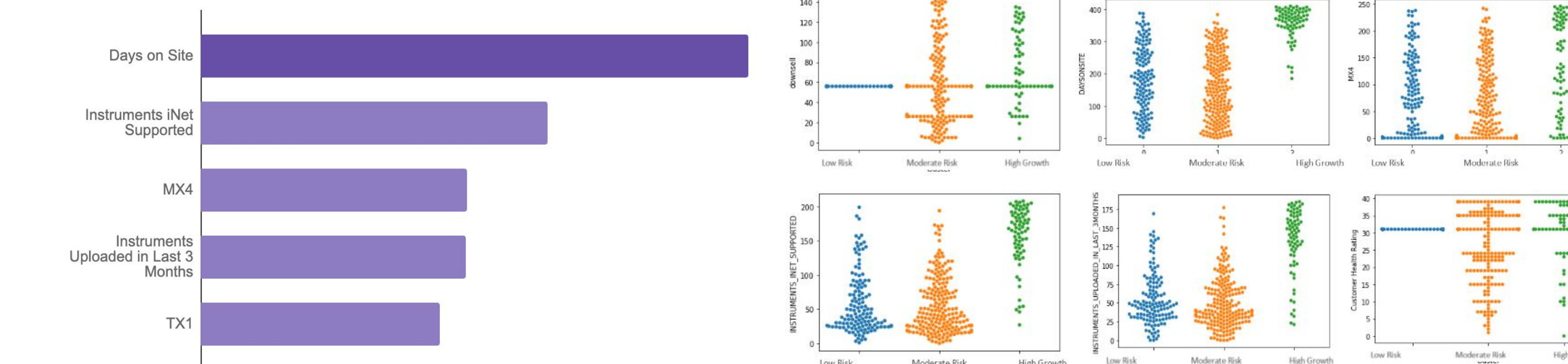
Key iNet Customer Segments
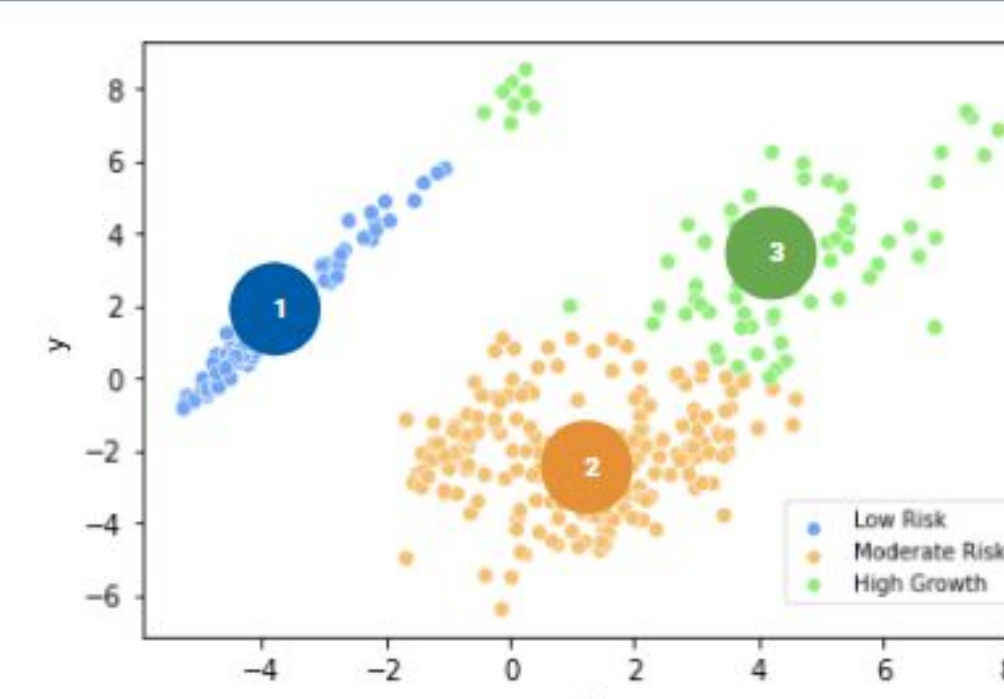
Number of iNet Accounts in Each Segment
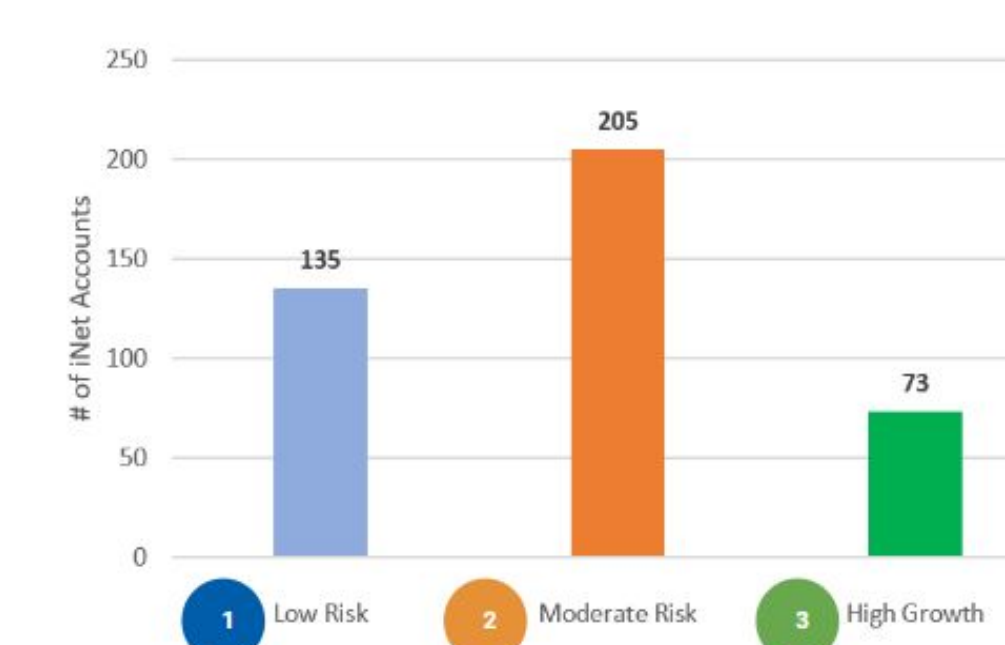
Additionally, top features for predicting utilization rate (as well as for PCA) included: Days on Site, certain multi-gas instruments, instrument upload activity, and certain single-gas instruments.

Variable Importance

DISCUSSION

We identified six key takeaways from our analysis:

1. The Moderate Risk segment is heavily associated with downsells. Since the company wanted to reduce downsell accounts, we recommended the company to discourage Moderate Risk customer behavior and to encourage High Growth behavior

2. The Moderate Risk segment contains more accounts of a certain customer type

3. Accounts with utilization rate <10% belonged to the Low Risk or Moderate Risk segments

4. Accounts with 100+ instruments returned belonged to the High Growth segment

5. Accounts with Customer Health Score below 30 belonged to the Moderate Risk segment

6. Certain gas monitor products were associated with the High Growth segment

CONCLUSIONS

After conducting thorough research and analysis, we have identified several recommendations and next steps the company can take to achieve even greater success and customer satisfaction in the future.

Our first recommendation is to target significant variables to move accounts from moderate risk to high growth.

Our second recommendation is to have sales representatives observe "quiet" low activity accounts to gain valuable insights and potential growth opportunities.

Our third recommendation is to understand customer behavior and preferences towards specific products, as it can provide valuable insights on what drives customer purchasing decisions.

Lastly, we recommend creating a central, trusted hub to track significant variables and criteria.

By implementing these recommendations, ISC can increase up sell opportunities and bring value to the company.

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REFERENCES

1. https://www.indsci.com/en/about