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TiVo: A Case Study in Market Segmentation using Data Analytics

An analysis of a marketing case created by Moran Cerf and the Northwestern Kellogg School of Management using python.

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1.0 Summary

This is a marketing report addressing the case written by Northwestern Kellogg School of Management. The case is set in 1998, prior to the release of the product TiVo, and uses data analytic techniques on survey data to segment the potential market. The audience is the executives of ThinkAlike, a marketing consulting firm that TiVo has hired to perform market research. Therefore this report serves as an internal document to semi-knowledgeable executives who are working on a marketing plan for their client.

The introduction will give a brief history of the stakeholders, and contextualise the purpose of this report

The Marketing Questions section will frame the analysis in a marketing context. It will answer the questions of why segmentation is necessary, and what can be done with the information.

The Insights and Recommendations section will detail the most immediate, impactful information, with accommodating recommendations. The recommendations are actionable steps that TiVo should consider implementing moving forward.

The Findings section will consist of quantitative figures, charts, and graphs of the analysed data.

The Methodology section details the thought process and steps behind the statistical techniques

The conclusion will summarise the report, set the scope and contextualise the project, and provide steps for the future.

2.0 Introduction

TiVo is an American electronic device produced in the late 1990's. It was an accessory for television that allowed a myriad of features including recording and playback, commercial skipping, increased access to programs, and search filter capabilities. They partnered with Sony and Philips for production, and aimed to release lower end models for less than \$500.

ThinkAlike is a marketing consulting firm hired by TiVo to conduct preliminary market research prior to TiVo's launch. They conducted a survey of 1000 Americans on their demographic, purchasing behaviour, attitude, and television practices. The full list of questions is on page 8 and 9

This report is an analysis of the results of that survey. Based on the marketing questions and needs derived from the case document, the data is analysed and recommendations are given to TiVo. There is a key emphasis on not simply showing statistical information, but rather answering the question of "why does this matter?".

3.0 Marketing Questions

The surface level objective of this case is to segment the market, that much is apparent in the title of the case document alone. However segmentation and research is time consuming and expensive, so there must be an appropriate motivation to do so. In this instance, it is to gauge attitudes and tolerance for television. TiVo is the first product in the DVR market, an accessory product of television. Being the first technology and essentially spawning a new market comes with marketing difficulties. This survey and report are meant to quell some of those difficulties, or at the very least provide guidance of direction. TiVo usage is a function of television usage, so understanding how people interact with their television is paramount for TiVo. Therefore this report will attempt to answer how people interact with television, specifically watch time, willingness to buy new related products, and the different types of people. This initial segmentation should give a crude but necessary snapshot of the type of potential consumers that exist, who can later be refined and targeted specifically.

4.0 Insights and Recommendations

4.1 Cluster Analysis

Cluster analysis is a machine learning algorithm that groups data points based on similarities. In this case, the criteria for similarity were how close the survey answers were. From this, three distinct clusters emerged. They are listed below along with their characteristics, quantitative info are found on page 14.

Cluster 2: Watching Willy

Willy's defining traits are that they watch significantly more TV than the average person, at 4.5 hours a day.

They are younger than the population median, with a median age of 35.

Their median income and electronic spending is 40% more than the population median.

They purchase electronics slightly less frequently than the population median.

They are educated professionals, who purchase exclusively at mass-consumer electronics stores.

They care about programming/interactive features and saving favourite shows to watch as a family.

Cluster 1: Below average Betty

Betty's defining trait is they are lagging behind population trends.

They earn slightly less and spend less on electronics than the population median, as well as purchase electronics less frequently.

Bettys are a few years older than the population mean

They watch TV an average amount

Betty's are married, uneducated, and half of them are professionals

They exclusively at retail and discount stores

Betty's care equally about schedule control, time shifting and cool gadget

Cluster 0: Spending Spencer

Spencer's defining feature is their expensive spending habits. They earn, spend, and purchase 60% more than population median

Spencers are educated, married males, half of which live in the north east

They watch an average amount of TV

They shop exclusively at specialty stores

They care equally about schedule control, time shifting and cool gadget

Recommendation

Spencer's and Willy's are the two clusters that should be targeted by TiVo, each with their unique strategy.

Analysis

Spencer's are wealthier professionals who have the disposable income to purchase electronics, and the desire to do so. They appear to not be overly interested in the television in particular (as seen by the average watch time, but perhaps this is because of time constraints), however they desire luxury goods. A hypothesis that would require further research, is they purchase out of status and convenience. Regardless, Spencer should be targeted because they are shown to be willing to purchase expensive (as TiVo) electronics frequently.

Willy's should be targeted due to their excessive viewing habits, and sheer volume. Essentially these are consumers that spend lots of time watching TV, as well as making up half of the population. There is a split in Willy's income levels, half hovers around \$45,000/year, and the other approximately at \$28,000. Despite this split, they are united in their watch time, with 83% watching at or more than the population average (adjusted for outliers). Willy's therefore can be categorised as involved consumers who are (probably) price and value sensitive.

Betty's does not provide any additional advantage over Spencer's or Willy's. Betty buys less than Spencer, watches less than Willy, and there are more Willy's than Betty's. One note of interest however is they shop exclusively at retail and discount stores, therefore if this cluster is to be targeted in the future by perhaps a budget model, they are reachable through defined and known channels.

Implementation

The TiVo marketing mix can be tailored to cater to this segment by:

Price:

The two strategies recommended are value pricing and price skimming.

Spencer's budget on average is \$720 a year on electronics and purchases once every 10 months, whereas Willy budgets \$420 and purchases once every 2.5 years. To match these figures, the price should be set to match these breakoff points. For example the premium product that is targeting Spencer's, could be set at \$650, with a 50% discount on the first year of a \$100 subscription totalling \$700 for the initial purchase. Within this consumer purchasing cycle, advertisements for a lifetime subscription of \$155 could be displayed close to time of renewal. Spencer's who value convenience and have the means, would be more likely to be purchasing a permanent subscription.

Conversely, Willy's are more price sensitive, they spend less and do so far more infrequently. Therefore in order to convince them that TiVo should be the one major electronic they purchase for 2-3 years, aggressive price skimming strategies should be employed. Similarly to Spencer, the price of the product for them should be set at the breakoff points. In the case document, the authors mention TiVo wants to set their budget model at \$500. This model would allow Willy's to purchase with just over a year's budget, well within their purchasing behaviour. The subscription pricing should match the upper limit of what Willy's are willing to pay for (note that loss aversion may come into play, if they've already spent a significant amount on a product they won't want it to go to waste). Trial runs of different subscription pricing strategies and the change in profits should be performed, in order to determine this upper limit. As the user base increases and brand loyalty strengthens, pricing across all clusters can increase.

Due to lack of internal information on production costs, budgets, company goals/strategies, the two pricing strategies recommended must work with these confines. Of course they are subject to 180 degree changes or complete negation with the addition of more information

Product:

Spencer's thinks that TiVo is a cool gadget, therefore the premium product targeting them should match this cool, sleek expectation. Market research should be performed to determine what features and aesthetics align with this expectation. Beyond ensuring the promoted features are functioning properly, the premium model should have higher storage capacity, and use SSD with faster read speeds. This will increase the amount of media saved, and the speed at which it can be replayed. The higher cost and elevated status of the premium product needs to match its design

Willy's spends a large amount of time watching TV, so if one area is not to be skimmed out on in search of the lowest production cost, it is storage. Additionally they report interest in the saving shows to watch with family features, therefore tailoring features such as child lock on R rated media might interest them.

Promotion:

Willy's already spend time and attention on TV, the product TiVo is an accessory too, as well as a promotional channel. This gives a tidy solution, perform market research into which channel's Willy's watch, and run advertisements espousing the benefits and value gained from the product. If the channels watched are too diversified, use a buckshot approach and simply advertise on the most watched networks (as much as the budget allows)

Advertisements targeting Spencer should highlight the exclusivity and prestige of owning the premium TiVo model. They should be promoted in high-end lifestyle magazines, as well as in mass electronic and specialty stores. Posters, cutouts, and mail in-rebates should be offered in these stores flyers and physical location.

At the time of this case, the data shows that only Spencer's use ecommerce channels. However as history tells, eventually these spaces become dominated by younger shoppers. Therefore specialty online deals could be created to capture tech-savvy Willy's, who are generally younger.

Place:

Spencers shop 60% of the time (for electronics) at mass electronic stores, and Willy's shop 100% of the time at specialty stores. Obviously these stores should be the location in which the respective TiVo models should be sold at. However together these channels make up less than half of the total purchasing done. Therefore TiVo should not neglect selling through other channels. Examples of mass electronic stores would be Best-Buy and Future Shop, and specialty stores would be circuit city.

4.2 Segmentation by behaviour

This segmentation method sorts the population by a category, e.g Time spent watching TV, then splits it into four parts, each 25%. Each of these four parts are then analysed to answer questions such as "what is the behaviour of someone that watches lots of TV?"

Monthly Electronic Spending

- educated individuals spend much more, uneducated individuals spend much less
- People that enjoy the features of "saving favourite shows to watch as family" and "programming/interactive features" spend much more
- males spend slightly more
- single people tend to spend more
- People who shop in mass consumer electronics, specialty stores, and ecommerce spend more
- late adopters spend slightly more
- professionals spent much more

Electronic spending as % of income

-follow the same trends as electronic spending, with slight fluctuations in intensity and distribution

TV Viewing hours

- The less education individuals have, the less they tend to watch
- People that enjoy the features of “saving favourite shows to watch as family” and “programming/interactive features” watch much more
- Females tend to watch slightly more TV
- Individuals in the North East watch slightly less
- Married individuals watch less
- Those who shop at mass consumer electronics stores watch much more
- late adopters watch much more

The difference in segmenting by behaviour versus cluster analysis

The usefulness of the cluster analysis is contingent on there being a high enough intra-cluster distance, and low enough inter-cluster distance. This level can change with more data, whether the population surveyed increases or through more rigorous collection methods. Regardless, it is a safer bet to study trends based on a single variable (i.e segmentation by behaviour), rather than relying on clusters. Therefore the cluster analysis is a strong preliminary attempt at segmentation, that gives rich, insightful, and deep information. However it's existence is not as solid, as simply looking at linear trends in data. These trends don't give as insightful information, but should remain true, even in light of more data. It is harder to make actionable information on it alone, but it will generally always remain true that people who watch more TV will tend to shop at mass consumer electronic stores. These are useful nuggets of insight that will aid in whichever route TiVo decides to go.

5.0 Methodology

A simple random survey of 1000 Americans was conducted via 30 minute phone interviews.

Questions surveyed:

Question	Possible Answers
<i>Gender</i>	Male, Female
<i>Marital Status</i>	Single, Married

<i>Work Status</i>	None, Professional
<i>Education</i>	None, BA, MA, PhD
<i>Annual Income (x1000 \$)</i>	Continuous Variable
<i>Age</i>	Continuous Variable
<i>Location</i>	By U.S State
<i>Purchasing Decision-maker</i>	Single, Family
<i>Purchasing Location</i>	'mass-consumer electronics', 'specialty stores', 'Retail' discount', 'web (ebay)
<i>Monthly Electronics Spend</i>	Continuous Variable
<i>Monthly Household Spend</i>	Continuous Variable
<i>Purchasing Frequency (every x months)</i>	Continuous Variable
<i>Technology Adoption</i>	Early, Late
<i>TV Viewing (hours/day)</i>	Continuous Variable
<i>Favorite feature</i>	'saving favorite shows to watch as a family', 'time shifting', 'cool gadget', 'schedule control', 'programming/interactive features'

The data was collected into a .CSV file, and along with the case document constitutes the entirety of the given case.

The primary tool to analyse and visualise the data is Python using Jupyter Notebooks, with the occasional supplementary help of excel.

Cleaning and Preparing Data

Using Jupyter Notebook, the data is opened, cleaned, and prepared. This includes converting column data types to floats, removing blank rows, and converting discrete columns into dummy variables. Dummy variables are a method of codifying string variables, e.g Male and Female are converted into 0 and 1. Location is also converted from state into region (South,

North East, West, and Midwest). Several other columns are created such as: Annual Spending on Electronics, Electronic spending as % of income, and Spending as % of income.

Basic Analysis

Using dataframe manipulation, column information such as: averages and distribution are found. Correlation is calculated via a heatmap between all non-dummy variables. These variables would not yield meaningful results when correlated. Their impact is seen and discussed in the regression section.

Cluster Analysis

To prepare for k cluster analysis, continuous variables are standardised, an elbow test is run to determine optimal k value. Dummy variables are added back into the dataframe, then a Cluster Analysis is run to find statistical segments. A 3D PCA test is run to determine strength of segmentation (i.e intra-cluster distance). The results are de-standardised for comprehension of numbers.

Behavioural Segmentation

Segmenting by behaviour entails sorting the data by a given metric, three of which are shown in the link below. Each metric is broken into four quadrants, each representing 25% of the frequency values. For example if the metric had an n=40, and each value was unique (i.e 1-40), then quadrant 1 = 1-10 (bottom 25% of values), and quadrant 4 = 31-40 (top 25% of values). For the KPI relating to behaviour, this shows the profiles of individuals who are on either ends of the spectrum. For example, it illustrates the type of people that tend to watch lots of television. Due to the skewness of the data, TV hour only has 3 segments.

Results

6.1 Survey Data

Gender		Percentage
	Male	53.5
	Female	46.5
Marital Status		
	Single	72.0
	Married	28.0
Work Status		

	None	65.0
	Professional	35.0
Education		
	None	50.6
	BA	26.0
	MA	12.4
	PhD	11.0
Location		
	North East	34.5
	West	33.1
	South	23.7
	Midwest	8.7
Purchasing Location		
	Retail	29.4
	Discount	29.3
	mass-consumer electronics	20.0
	specialty stores	17.0
	web (ebay)	4.3
Favourite Feature		
	Cool Gadget	22.8
	Time Shifting	22.1
	Schedule Control	22.1

	saving favorite shows to watch as a family	20.0
	programming/interactive features	13.0
Technology Adoption		
	Early	80.0
	Late	20.0
Purchasing Decision-maker		
	Single	56.0
	Family	44.0

	Monthly Household Spend	Purchasing Frequency (every x months)	TV Viewing (hours/day)
count	1000.000000	1000.000000	1000.000000
mean	94.241000	22.986000	2.370000
std	67.173128	13.878776	2.910252
min	10.000000	1.000000	0.000000
25%	47.000000	11.000000	1.000000
50%	73.000000	22.000000	1.000000
75%	124.000000	35.000000	2.000000
max	390.000000	48.000000	14.000000

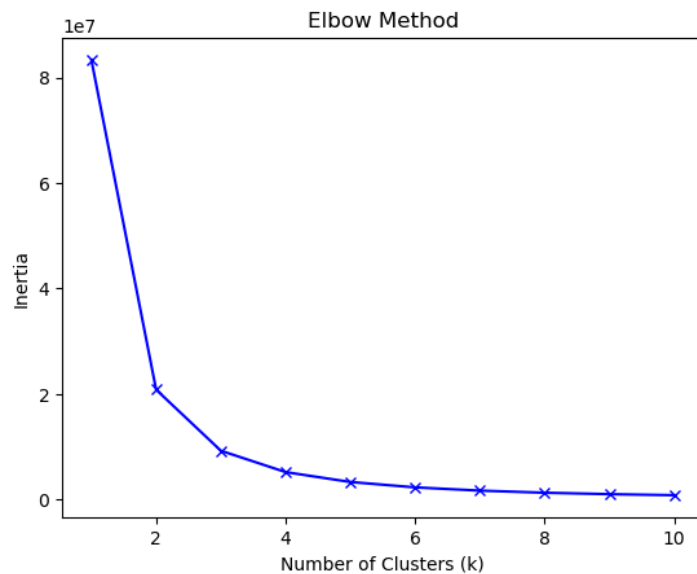
	Annual Income (x1000 \$)	Age	Monthly Electronics Spend
count	1000.000000	1000.000000	1000.000000
mean	39.007000	48.344000	30.962000
std	30.985627	17.865409	17.049787
min	21.000000	18.000000	7.000000
25%	29.000000	32.000000	17.000000
50%	33.000000	49.000000	25.500000
75%	48.250000	63.000000	42.000000
max	730.000000	80.000000	88.000000

[Histograms of above chart values](#)

The demographic data aligns with the national census at the time, with no irregularities. One point of concern is in adoption. 80% of individuals self-reported as “early” adopters. The data is not currently available on this right now, however it may speak to a psychological fallacy of self importance regularly seen in self report surveys.

6.2 Cluster Analysis and Correlation

[Correlation Heatmap](#)



The elbow of the chart flattens on at 3, so a $k=3$ is used.

The cluster analysis has now assigned each row (respondent) into one of 3 groups. To display the characteristics of each group, the data is sorted by cluster, then each demographic is shown, alongside the total population.

Violin Plots of Clusters

Cluster	Values	Cluster 0	Cluster 1	Cluster 2	Total
Count		161	324	515	1000
Gender	female	26%	49%	53%	54%
	male	74%	51%	47%	47%
Marital Status	married	78%	80%	56%	72%
	single	22%	20%	44%	28%
Work Status	none	1%	50%	29%	35%
	professional	99%	50%	71%	65%
Education	none	15%	79%	23%	51%
	BA	60%	15%	26%	26%
	MA	14%	3%	26%	12%
	PhD	11%	3%	25%	11%
Location	Midwest	5%	9%	10%	9%
	Northeast	47%	36%	26%	35%
	South	22%	22%	27%	24%
	West	26%	33%	36%	33%

Purchasing -Decision Maker	family	78%	51%	53%	56%
	single	22%	49%	47%	44%
Purchasing Location	discount	0%	49%	13%	29%
	mass-consumer electronics	1%	2%	59%	20%
	retail	0%	49%	14%	29%
	specialty stores	99%	1%	1%	17%
	web (ebay)	0%	0%	13%	4%
Adoption	early	99%	98%	41%	80%
	late	1%	2%	59%	20%
Favourite Feature	cool gadget	34%	33%	1%	23%
	programming/interactive features	0%	0%	40%	13%
	saving favourite shows to watch as a family	1%	2%	59%	20%
	schedule control	31%	33%	0%	22%
	time shifting	34%	32%	0%	22%

[A 3D PCA test](#) is used to determine differences between clusters. The distinct visual separation between the three clusters indicates that the cluster groupings are non-arbitrarily; they are statistically motivated. The cluster analysis is therefore giving meaningful results.

6.3 Segmentation by behaviour

The three [Segmentation Methods](#) are:

Segmenting by Electronic spending as % of income,
 Monthly Electronics Spend
 Segmenting by TV Viewing (hours/day)

These were selected as they are the types of behaviour of most value to TiVo. They represent those who spend the most money or time on TiVo-adjacent products.

The charts above are simply the raw percentage of people who belong to each category per segment. However This is only meaningful when compared to the population average. The link below shows the same information as the chart above, but subtracted from the population values. Therefore one can determine how normative the results, and whether or not there is a significant change in population based on different behaviours.

[By difference to population average](#)

6.4 Questions asked of the case

These are the questions asked in the case document that have not previously been answered by other analysis.

a. How many married men who are early adopters can afford to purchase a TiVo for \$499 and on average have enough money to purchase another electronic gadget in the next two years ?

I interpreted this criteria as married men who can afford to purchase 2 electronic gadgets, both worth \$499, in 3 years. This would mean their average monthly electronic spending budget would have to exceed \$1000 over 3 years time.

The amount of married early adopter males who can afford is: 106

Percentage of married early adopter males who can afford is: 34.0%

This is compared to the total population, out of which this percent can afford the criteria: 49.0%

b. How many women with an MA or PhD are making purchasing decisions for electronics without discussing them with a spouse, either because they are single, or because they are making purchasing decisions without the involvement of their spouses?

The amount of educated women that are making the decisions is: 56

The percentage of educated women that are making the decisions is: 23.0%

C. Among early adopters, how many purchase electronics at least once every year and do so in stores that specialise in electronics?

The percentage of early adopters that buy in specialised stores, that purchase at least once per year is: 78.0%

The amount of early adopters that buy in specialised stores, that purchase at least once per year is: 132

d. How many seniors (above the age of 65) spend more than six hours a day watching TV? What is their income range? What is their average annual income?

Seniors have average income, and do not generally watch excessive amounts of TV.

7.0 Conclusion

This marketing report was written for the executive of a marketing agency prior to the launch of TiVo. Survey data conducted on potential customers is run through a cluster analysis. Two clusters were identified as viable targets, they can be roughly categorised as people who like to purchase electronics, and people who like to watch TV. These two categories of people are assumed to be those most likely to purchase TiVo, and therefore of the most interest. A secondary analysis of changes in behaviour based on changes in demographic is conducted.

This report should not be the final step in TiVo's marketing plan, it is merely a guiding stepping stone for further research. They should investigate specifically on the clusters mentioned, determine their validity, then gather more information about them. Only through a comprehensive understanding of their target market's wants, needs, and behaviour, can TiVo enter a new market and hit the ground running.

References

Cerf, M. (2016). Tivo segmentation analysis. *Kellogg School of Management*

A brief note:

This case was originally accessed from Harvard Business Publishing Education, which I had access to via my enrollment in the University of Manitoba course MKT 4010: Marketing Analytics. In this class, this assignment was taught to be completed in excel. The assignment in question was specifically answering 9 questions laid out at the end of the case document, and seemed removed from the original purpose as a marketing report. Being a prospective marketer, I intended to re-complete the assignment as a means to practice a new program (Python), but primarily as a means to practice being a marketer. I sought answers from this case not to answer arbitrary questions, to get a good grade in a class, to get a piece of paper saying I can answer arbitrary questions. Rather I approached this case by playing a character. The character is a marketing employee for Xperi (the creator of TiVo), who is tasked with analyzing this data and presenting actionable insights to CMO, or board of managers and executives. I don't want to complete it for the sake of completing it (whether for marks or learning Python), but first and foremost providing value to a company.

