

MORAN CERF

TiVo Segmentation Analytics

John McCambridge, recent business school graduate and newly hired analyst at ThinkAlike, a boutique marketing consulting firm, was feeling stressed about his first project. It was October 24, 1998, and four days earlier, Leslie Pantelle, head of marketing for TiVo, had visited the firm's offices unexpectedly.

"We're about to launch a new product—a groundbreaking device like nothing you've seen before," she said. "We're going to revolutionize the way people interact with their TVs. It's going to be huge! The market is ready, our investors are excited, and the product is phenomenal." Pantelle continued, "Our biggest challenge at this point is segmenting the market. We've come up with some ideas internally but we want an outside point of view."

The partner in charge had agreed to take on the project even though TiVo set an aggressive deadline of one week. Since Pantelle's visit, ThinkAlike had gathered some robust data for TiVo. The presentation was scheduled in three days, and it was McCambridge's task to analyze the survey and draft segmentation recommendations for the partner managing the project.

Television Viewing in the United States

Americans had a love/hate relationship with television viewing. Of the country's 100 million households, 98 million owned at least one TV. The average household had 2.4 TVs and spent seven hours and fifteen minutes per day watching television. Traditional broadcast channels were supplemented by other services: in 1999, 78 million households spent \$34.4 billion on cable TV service, and another 14.5 million households paid for satellite TV service.

Although Americans spent a great deal of time in front of their televisions, they were far from satisfied with the experience. Viewers frequently complained that their favorite programs were not on when they had time to watch TV, and the watching they did was often interrupted by phone

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calls and family demands. The VCR, which might have been used to address these problems by recording shows to watch later, was difficult for many viewers to program.

TiVo's Origins

In August 1997, Jim Barton and Mike Ramsay founded TiVo in San Jose, California, with the goal of increasing consumers' control over their television viewing. They envisioned a system, which they named TiVo, that would enable a user to search a complete guide of television programs and digitally record and store selected programs in a set-top box that was referred to as a personal video recorder (PVR) or a digital video recorder (DVR). TiVo offered its customers numerous unique features, including:

- Pause, slow motion, and instant replay for live television programs
- Simultaneous playback and record
- Option to skip commercials
- Direct (nonlinear) access to all recorded programs
- Search for and record shows based on a favorite actor, director, genre, or show
- Automatically record a favorite program every time it aired, regardless of time
- Recommendations based on viewer preferences (similar to Amazon recommendations)

TiVo planned to charge a monthly fee of \$9.95 for the subscription service that would enable users to view special programming, receive personalized viewing suggestions, and control live television. Alternatively, users could purchase a lifetime subscription for \$199. Initially the subscription fee would be the company's primary source of revenue, but once a critical mass of consumers adopted TiVo, the detailed data regarding viewer behavior and preferences captured by the subscription service was anticipated to be a major revenue source. This data could be used to sell targeted access to advertisers and programmers, as well as to create interactive television.

Barton and Ramsay recognized that they lacked the resources to manufacture the hardware and build a PVR/DVR brand, so they partnered with consumer electronics leaders Sony and Philips. The companies agreed to manufacture the set-top boxes, which carried the Sony or Philips brand along with the TiVo name. TiVo subsidized production costs to ensure the price for lower-end models was under \$500.

Barton and Ramsay's business model was very appealing to investors and they quickly attracted significant financial backing from prominent venture capitalists. AOL/Time Warner, a major cable television company, also invested more than \$240 million.

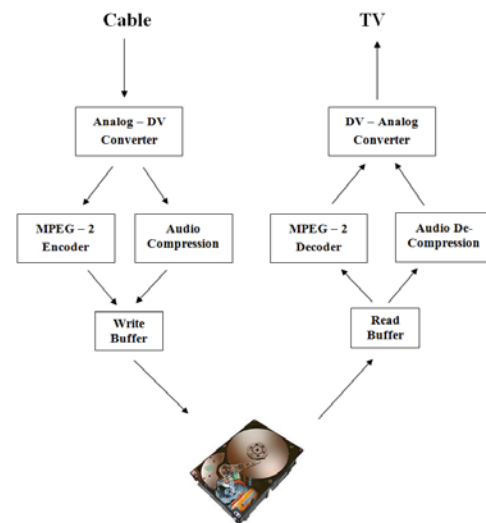
How TiVo Worked

When TiVo recorded a television program, the incoming analog video was converted to digital video and then encoded and compressed (see **Figure 1**). The compressed recordings were stored on the hard drive as separate files in order to allow random, or nonlinear, access to individual programs.

TiVo's most important feature was its hard drive. For cost and compatibility reasons, it used the same hard drives that were used in desktop computers. The set-top boxes were sold in configurations that stored 20, 30, or 60 hours of basic-quality video, but users could set the devices to record at higher-quality levels, which reduced the advertised storage by up to two-thirds. The 20-hour model was priced at \$299, and the 60-hour model was priced at \$699 (MSRP).

The TiVo set-top box used an existing telephone landline to download updated programming information and unique content every day, usually very early in the morning. Software upgrades and enhancements also were automatically delivered via the phone line, but TiVo was designed not to interrupt incoming or outgoing calls.

Figure 1: TiVo Video Processing



Source: Alice M. Tybout and Julie Hennessy, "TiVo," Case #5-104-024 (Kellogg School of Management, revised September 14, 2011).

Survey

After Pantelle's visit, ThinkAlike immediately designed and implemented a survey to gather its own data about potential users of TiVo. One thousand participants from across the United States were surveyed by phone for thirty minutes each. The survey asked participants about their purchasing behavior and their attitude toward the TiVo concept. The sample included a wide range of ages, locations in the United States, and interests and attitudes toward the product. The survey respondents were quizzed on fourteen attributes, which are summarized in **Exhibit 1**.

Analytics and Segmentation

Segmentation is an art, but it relies on rigorous mathematics known as principal component analysis (or "factor analysis," a simplified version of it). The essence of principal component analysis is identifying attributes in the data that are correlated with others, and then removing them so that the remaining attributes separate the population into homogeneous segments.

ThinkAlike created a table listing all fourteen attributes in the rows and columns to record the correlation of attributes—cells were filled with the correlation of each attribute with every other attribute (see sample table in **Exhibit 2**). The value of every cell on the diagonal was 1 because every attribute was perfectly correlated with itself.

Attributes with non-numeric responses needed to be coded by assigning a number to each response; for example, Gender could be coded by assigning the value 1 to every male, and 2 to every female. Once all non-numeric responses were coded the attributes could be correlated.

If Gender and Marital Status had a correlation (or r^2) of 0.92, as shown in the sample in Exhibit 2, then Gender provided a high indication of Marital Status. This strong correlation could occur

if nearly all male respondents were single and nearly all female respondents were married, for example. Because it was highly correlated with another attribute, Gender could be ignored for purposes of segmentation.

Running a correlation between all pairs of attributes would identify which of them were highly correlated and which were not. (A correlation or r^2 above 0.45 is regarded as high.) In the example in Exhibit 2, Location and Annual Income were highly correlated with at least one other attribute, so they also could be ignored for segmentation purposes. The remaining three attributes, which were not highly correlated with anything but themselves—Marital Status, Education, and Age—would be the basis for three distinct segments.

Analyzing the Survey Data

McCambridge assumed TiVo's target segment would have similar attitudes toward the product, but that would not be enough to define a useful segment. What if people who liked the product could not afford it or were unable to use it in a way that satisfied them? What if they were interested but were not early adopters?

For now, he had to start working with the data.

Assignment

Use the provided Excel workbook to record your answers to the following questions.

1. In the Survey Data worksheet, insert one row above the column labels and categorize each data field by its segmentation parameter type: "Demographic," "Purchasing," "Behavioral," "Attitude," or "Other."
2. In the Survey Data worksheet, do the following:
 - a. Insert a column labeled "Annual spending on electronics" that calculates the average annual spending on electronics.
 - b. Insert another column labeled "Spending as % of income" that calculates annual spending on electronics as a percentage of annual income.
3. On the Question 3 worksheet, create a table for each attribute (e.g., education) and record the percentage of responses for each answer (e.g., % of respondents answering "none," % with "BA," % with "MA," % with "PhD").
4. Answer the following questions on the Question 4 worksheet. In Excel you may sort, filter, or use pivot tables, or you may use another method and record your answers in the worksheet.
 - a. How many married men who are early adopters have monthly electronics spend high enough that they can afford to purchase a TiVo for \$499 and still be able to spend more on electronics in the next two years?
 - b. How many women with an education level of 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?
 - c. How many early adopters purchase electronics at least once every year, and do so in stores that specialize in electronics?
 - d. How many seniors (over the age of 65) spend more than six hours a day watching TV? What is their income range? What is their average annual income?
5. Correlate Annual Income with Age and record the answer in the Question 5 worksheet. What is the correlation (r^2)? Both the CORREL function and the Analysis Toolpak add-in in Excel return r , which will need to be squared. You may also use any other method to calculate the correlation (r^2).

If you are unsure how correlation is calculated, the following simple definition is provided. More detail is online at: http://onlinestatbook.com/2/describing_bivariate_data/calculation.html.

When you are calculating the correlation of attributes X and Y, calculate the mean of each attribute and subtract it from each value of X and Y, respectively. This will result in x and y , known as *deviation scores*. The calculation of r is shown in the following formula:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

6. Record your answers to the following questions in the Question 6 worksheet:
- Code Gender as a number. What is the correlation (r^2) between it and Annual Income?
 - Explain why it makes no difference which numbers are used to code Gender or other non-numeric attributes.
7. Repeat the correlation analysis for the following four pairs of attributes and record their correlation (r^2) in the Question 7 worksheet.
- Age and Purchasing Frequency
 - Annual Income and TV Viewing
 - Education and Favorite Feature
 - Monthly Electronics Spend and Monthly Household Spend
- Of the four correlations, are any high enough to make one of the attributes redundant? In other words, can you describe any of the attributes simply by saying that “it behaves like attribute X?”
8. Select one or more attributes to use as the basis for generating two segmentation schemes with different numbers of segments. For example, you could choose Age as the basis for creating segments based on age ranges, or you could select two attributes that would help you to segment by willingness to buy and ability to pay.

As you generate segmentation schemes, use the data in the Survey Data worksheet to fill each cell in the tables shown below and in the Question 8 worksheet. Remember to try to create segments that are homogenous internally and heterogeneous across segments. Not all attributes will be used.

SEGMENTATION SCHEME A: SEVEN SEGMENTS OF TV-INVOLVED CUSTOMERS

Segment Name	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7
Market size (% of TV-involved households)							
Average annual income							
Description of segment							
Most appealing feature/benefit							
Stores shopped for electronics							
Average electronics purchase (\$)							

SEGMENTATION SCHEME B: FOUR SEGMENTS OF TV-INVOLVED CUSTOMERS

Segment Name	Segment 1	Segment 2	Segment 3	Segment 4
Market size (% of TV-involved households)				
Average annual income				
Description of segment				
Most appealing feature/benefit				
Stores shopped for electronics				
Average electronics purchase (\$)				

9. Choose the segmentation scheme from Question 8 that seems best to you (either Scheme A or Scheme B). In the Question 9 worksheet, write a 150-word summary of your selected scheme that explains how you arrived at it. Include descriptive names for your segments that would be understandable to the marketing manager at TiVo.

Exhibit 1: Survey Data Attributes

Field name	Description	Possible Responses
ID	Participant index number	Ranging from 1 to 1000
Gender	Participant gender	<ul style="list-style-type: none"> • Male • Female
Marital status	Participant marital status	<ul style="list-style-type: none"> • Single • Married
Work status	Participant employment status	<ul style="list-style-type: none"> • None • Professional
Education	Participant education level	<ul style="list-style-type: none"> • None • BA • MA • PhD
Annual income	Participant annual income (× \$1,000)	
Age	Participant age	
Location	Participant U.S. state	
Purchasing decision maker	Participant decides alone or decides in consultation with spouse (relevant only for married participants)	<ul style="list-style-type: none"> • Single • Family
Purchasing location	Where the participant purchases electronics	<ul style="list-style-type: none"> • Specialty stores • Retail • Web • Discount • Mass-consumer electronics
Monthly electronics spend	Average monthly spending on electronics	
Monthly household spend	Average monthly spending on all household purchases	
Purchasing frequency	Average number of months between electronics purchases	
Technology adoption	Participant's self-perception as an adopter of new technology	<ul style="list-style-type: none"> • Early • Late
TV viewing	Number of hours participant spends watching TV daily, on average	
Favorite feature	Feature in TiVo participant loves most	<ul style="list-style-type: none"> • Saving favorite shows to watch as a family • Time shifting • Schedule control • Cool gadget • Programming and interactive features

Source: Created by the author.

Exhibit 2: Sample Correlation Table

	Gender	Marital Status	Location	Education	Annual Income	Age
Gender	1	0.92	0.04	0.11	0.23	0.02
Marital Status		1	0.17	0.48	0.19	0.08
Location			1	0.03	0.80	0.34
Education				1	0.34	0.15
Annual Income					1	0.73
Age						1

Note: Values in bold show attributes with high correlation.

Source: Created by the author.