Use of Bayesian Decision Analysis to Assess if Conducting Marketing Research is Worthwhile

(Click icon for audio)

Dr. Michael R. Hyman
The problems and complexity of precisely measuring the value of marketing research frequently lead to reactions that erroneously dismiss potential benefits as meaningless. The inability to calculate a dollar value before the research is conducted is a problem of measurement, not worth. (B.C. by permission of Johnny Hart and Field Enterprises, Inc.)
Decision Analysis

EXPECTED VALUE OF INFORMATION

Consider the situation where a brand manager is faced with deciding whether to roll out a new brand nationally. Past evidence indicates that a brand in this product category (1) will cost the company an estimated $3 million if it achieves less than a 2 percent share of market, (2) will return about $1 million if it achieves a share of market between 2 and 2.25 percent, and (3) will return about $2 million if it achieves a share of market greater than 2.25 percent. Suppose you were given the problem of choosing whether or not to introduce this brand. Perhaps you would first ask: What are the chances of realizing a share of market less than 2 percent, or a share of market between 2 and 2.25 percent, or a share of market greater than 2.25 percent? In other words, you would like to know the probabilities associated with each possible outcome.

If the probability of any one of the possible market share outcomes happens to be equal to one (the other two must therefore be equal to zero), then there is no uncertainty surrounding the decision. However, rarely will an outcome be known with certainty. The brand manager must make the decision to roll out the new product with uncertainty, because the probabilities for any of the three possible share outcomes will ordinarily not be zero or one.

How can the brand manager deal with uncertain outcomes? One strategy would be to somehow "guess" the likelihood of each possible outcome. We can frequently rely on past evidence in establishing the likelihood of some event or outcome. For example, the brand manager may know that historically 35 percent of new products launched in this category achieved a share of market less than 2 percent; 50 percent of new products achieved a market share between 2 and 2.25 percent; and the remaining 15 percent of new products achieved a market share greater than 2.25 percent. Using past evidence and the rewards and losses associated with the various market share outcomes, we can calculate the expected value of introducing the brand. The expected value (EV) is found by summing the product of the payoff (or loss) of a particular outcome times the probability of that outcome.

\[
EV = \sum_{\text{all outcomes}} \text{payoff for outcome} \times \text{probability of outcome}
\]
Expected value of introducing the brand (prior probabilities)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Payoff (millions)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2% share</td>
<td>-3</td>
<td>.35</td>
</tr>
<tr>
<td>2–2.25% share</td>
<td>+1</td>
<td>.50</td>
</tr>
<tr>
<td>&gt;2.25% share</td>
<td>+2</td>
<td>.15</td>
</tr>
<tr>
<td><strong>EV (Introducing)</strong></td>
<td><strong>(-3)(.35) + (1)(.50) + (2)(.15)</strong></td>
<td><strong>- .25, or -$250,000</strong></td>
</tr>
</tbody>
</table>

The calculations for the expected value of introducing the brand are shown in Table 2A–1. Because, in this case, the expected value of introducing the brand is negative, the brand manager would probably decide not to go to national rollout.

As we indicated earlier, one purpose of marketing research is to reduce the uncertainty under which marketing executives must operate. The remainder of this appendix explicates a method for calculating the value of the additional information provided by a marketing research study. The method to be described uses an approach called Bayesian analysis. Probabilities associated with the particular outcomes without the additional information that market research provides are called prior probabilities. The essence of Bayesian analysis is to use new information to revise the prior probabilities. The method relies on Bayes’s Theorem and the basic laws of probability. Your basic statistics course probably covered probability theory. If you have forgotten this material we suggest that you review it before proceeding.

We now demonstrate how these revised probabilities are utilized to calculate the value of additional information.

**VALUE OF ADDITIONAL INFORMATION**

Before we can begin our calculations, we need certain estimates from management. Specifically, we need (1) the payoff (or loss) associated with each particular outcome, (2) the prior probabilities associated with each outcome, and (3) the conditional probabilities of a particular research result, given that a specific outcome was realized. The conditional probabilities warrant further discussion.

Again let us consider the questions of launching a new product with three possible outcomes (outlined in Table 2A–1). Assume that the brand manager could commission a test market in order to help make the decision. Although the test market can help, the brand manager will still be operating under uncertainty because there is no guarantee that the test market results will be perfectly...
reliable. In other words, sometimes the test market will indicate that the brand will achieve a relative “poor” share, when in fact it achieves an “average” or “above average” share after national rollout. Letting $R_i$ denote a particular test result and $O_i$ denote a specific outcome, then $P(R_i|O_i)$ is the probability that the test market will show a particular brand share, given that the product actually achieved that outcome after national rollout. The probabilities $P(R_i|O_i)$ are usually based on companies’ past records, such as the association between test market results and actual results for category brands test-marketed in the past.

Table 2A–2 contains the estimates of these probabilities based on past records of test market projections ($R_i$) and actual results when the product was introduced ($O_i$). Notice that it is the columns that must sum to one, not the rows. Reading the table, we see that—in the past—85 percent of the time when the actual, after national rollout, brand share was less than 2 percent, the test market projected share was less than 2 percent, whereas in 10 percent of the cases the actual share was 2 to 2.25 percent when the test market projected share was less than 2 percent, and so on.

Our objective is to revise the probabilities of actual share for each of the possible test market projections. It is known from probability relationships that

$$P(O_i|R_i) = P(O_i) \cdot P(R_i|O_i)/P(R_i)$$

(2A–1)

The $P(O_i)$ are the prior probabilities found in Table 2A–1. The conditional probabilities $P(R_i|O_i)$ are found in Table 2A–2. Consequently, we only need $P(R_i)$ to calculate the revised probabilities. The $P(R_i)$ can be calculated as follows:

$$P(R_i) = \sum_{i=1}^{m} [P(O_i) \cdot P(R_i|O_i)]$$

(2A–2)

The calculations necessary to revise the prior probabilities for each possible test market result are provided in Table 2A–3, A, B, and C.

The next step in the procedure is to determine the expected value if the brand is introduced for each of the possible test market results. However, now instead of using the prior probabilities $[P(O_i)]$ to weight the outcome we use the revised probabilities $[P(O_i|R_i)]$. The expected value calculations are demonstrated in Table 2A–4. Remember that for each of the expected value calculations there is always the alternative of not introducing the brand that we will assume has an expected value of zero.

### Table 2A–2

Estimated probabilities (conditional probabilities)

<table>
<thead>
<tr>
<th>Test market results ($R_i$)</th>
<th>&lt;2%</th>
<th>2–2.25%</th>
<th>&gt;2.25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2%</td>
<td>.85</td>
<td>.10</td>
<td>.05</td>
</tr>
<tr>
<td>2–2.25%</td>
<td>.10</td>
<td>.80</td>
<td>.20</td>
</tr>
<tr>
<td>&gt;2.25%</td>
<td>.05</td>
<td>.10</td>
<td>.75</td>
</tr>
</tbody>
</table>
Revised probabilities

| Outcome (share) | $P(O)$ | $P(R_i|O)$ | $[P(O) \cdot P(R_i|O)]$ | $\sum[P(O) \cdot P(R_i|O)]$ | $P(O|R_i)$ |
|----------------|--------|------------|-------------------------|---------------------------|-----------|
| <2%            | .35    | .85        | .2975                   | .355                      | .838      |
| 2-2.25%        | .50    | .10        | .0500                   | .355                      | .141      |
| >2.25%         | .15    | .05        | .0075                   | .355                      | .021      |

B. Full test market predicts average share (2-2.25%) [$P(R_2)$]

| Outcome (share) | $P(O)$ | $P(R_2|O)$ | $[P(O) \cdot P(R_2|O)]$ | $\sum[P(O) \cdot P(R_2|O)]$ | $P(O|R_2)$ |
|----------------|--------|------------|-------------------------|---------------------------|-----------|
| <2%            | .35    | .10        | .035                    | .465                      | .075      |
| 2-2.25%        | .50    | .80        | .400                    | .465                      | .065      |
| >2.25%         | .15    | .20        | .030                    | .465                      | .065      |

C. Full test market predicts good share (> 2.25%) [$P(R_3)$]

| Outcome (share) | $P(O)$ | $P(R_3|O)$ | $[P(O) \cdot P(R_3|O)]$ | $\sum[P(O) \cdot P(R_3|O)]$ | $P(O|R_3)$ |
|----------------|--------|------------|-------------------------|---------------------------|-----------|
| <2%            | .35    | .05        | .018                    | .180                      | .100      |
| 2-2.25%        | .50    | .10        | .050                    | .180                      | .278      |
| >2.25%         | .15    | .75        | .112                    | .180                      | .622      |

Revised expected value calculations

<table>
<thead>
<tr>
<th>Decision</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Test market projection &lt; 2% share</td>
<td>$EV = (-3)(.838) + (1)(.141) + (2)(.021) = -2,331,000$</td>
<td>Not introduce</td>
</tr>
<tr>
<td>B. Test market projection 2-2.25% share</td>
<td>$EV = (-3)(.075) + (1)(.860) + (2)(.065) = 765,000$</td>
<td>Introduce</td>
</tr>
<tr>
<td>C. Test market projection &gt; 2-2.25% share</td>
<td>$EV = (-3)(1) + (1)(.278) + (2)(.622) = 1,222,000$</td>
<td>Introduce</td>
</tr>
</tbody>
</table>

The expected value of additional information, that is, what you would be willing to pay for research, is found by subtracting the expected value without additional information from the expected value given additional information. From Table 2A-1 we already have the expected value without information, which is zero (not introduce). The expected value given additional information is calculated by taking the optimal alternative (introduce versus not introduce) for each test market condition from Table 2A-4 and weighting it by the probability [$P(R_i)$] of each test market projection. Hence, the expected value (EV) given additional information (AI) is
\[ EV|AI = (0)(.355) + (765,000)(.465) + (1,222,000)(.180) = 575,685 \]

Now the most that we would be willing to pay for the research is
\[ $575,685 - $0 = $575,685. \]

At first glance it may seem foolish to want to spend hundreds of thousands of dollars on a project that has an expected value of zero. However, notice that two of the alternatives (2 to 2.25 percent share and >2.25 percent share) have positive consequences. The research, then, aids management in rejecting an alternative with negative consequences or, on the other hand, selecting an alternative having positive consequences.

**Decision Trees**

A decision tree is frequently formed when Bayesian analysis is used. A decision tree is a network of decision nodes and branches. The branches represent alternatives. At each node nonoptimal branches are pruned (usually by using a double line). Figure 2A–1 is a decision tree representation of the brand introduction problem we have been working with.
Decision Tree

Expected value of additional information

Test results indicate good

$E(V|A) = 575,985$

$P(R_3) = .180$

Test results indicate poor

$E(V|A) = 575,985$

$P(R_1) = .355$

Not introduce

$E(V) = 0$

Introduce

$E(V) = -250,000$

$P(O_1) = .35$

$P(O_2) = .50$

$P(O_3) = .15$

Introduce

$E(V) = -2,331,000$

$P(O_1|R_1) = .838$

$P(O_2|R_1) = .141$

$P(O_3|R_1) = .021$

Introduce

$E(V) = 765,000$

$P(O_1|R_2) = .075$

$P(O_2|R_2) = .860$

$P(O_3|R_2) = .065$

Introduce

$E(V) = 1,222,000$

$P(O_1|R_3) = .100$

$P(O_2|R_3) = .278$

$P(O_3|R_3) = .622$

Not introduce

$E(V) = 0$

Not introduce

$E(V) = 0$

Not introduce

$E(V) = 0$
## Payoff Table for Pricing Decision

**Prior probabilities**

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>Light Demand</th>
<th>Moderate Demand</th>
<th>Heavy Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(S_j) )</td>
<td>0.6</td>
<td>0.3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative</th>
<th>( S_1 )</th>
<th>( S_2 )</th>
<th>( S_3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skimming Price</strong>—( A_1 )</td>
<td>100</td>
<td>50</td>
<td>-50</td>
</tr>
<tr>
<td><strong>Intermediate Price</strong>—( A_2 )</td>
<td>50</td>
<td>100</td>
<td>-25</td>
</tr>
<tr>
<td><strong>Penetration Price</strong>—( A_3 )</td>
<td>-50</td>
<td>0</td>
<td>80</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
EV(A_1) &= (0.6)(100) + (0.3)(50) + (0.1)(-50) = 70.0 \\
EV(A_2) &= (0.6)(50) + (0.3)(100) + (0.1)(-25) = 57.5 \\
EV(A_3) &= (0.6)(-50) + (0.3)(0) + (0.1)(80) = -22.0 \\
\end{align*}
\]

**Optimal choice without additional research information**

Table contains alternatives, states of nature, and consequences
Conditional Probability of Getting Each Test Market Result Given Each State of Nature

Read by Row ($Z_k$) within Column ($S_j$)

<table>
<thead>
<tr>
<th>Test Market Result</th>
<th>Light Demand</th>
<th>Moderate Demand</th>
<th>Heavy Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disappointing or only slightly successful -- $Z_1$</td>
<td>.7</td>
<td>.2</td>
<td>.1</td>
</tr>
<tr>
<td>Moderately successful -- $Z_2$</td>
<td>.2</td>
<td>.6</td>
<td>.3</td>
</tr>
<tr>
<td>Highly successful -- $Z_3$</td>
<td>.1</td>
<td>.2</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Revision of Prior Probabilities in Light of Possible Test Market Results

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>$S_j$</td>
<td>$P(S_j)$</td>
<td>$P(Z_k</td>
<td>S_j)$</td>
</tr>
<tr>
<td>(1)</td>
<td>Light demand—$S_1$</td>
<td>.6</td>
<td>.7</td>
<td>.42</td>
</tr>
<tr>
<td>(2)</td>
<td>Moderate demand—$S_2$</td>
<td>.3</td>
<td>.2</td>
<td>.06</td>
</tr>
<tr>
<td>(3)</td>
<td>Heavy demand—$S_3$</td>
<td>.1</td>
<td>.1</td>
<td>.01</td>
</tr>
</tbody>
</table>

$Z_1$—DISAPPOINTING OR ONLY SLIGHTLY SUCCESSFUL TEST MARKET.

$Z_2$—MORADERATELY SUCCESSFUL TEST MARKET.

$Z_3$—HIGHLY SUCCESSFUL TEST MARKET.

$S_j$ = State of Nature; $Z_k$ = Level of Success in Test

Notice difference in revised (post-research) distribution of demand probabilities

$\Sigma=1.0$
Expected Value of Each Alternative Given Each Research Outcome

\[ EV_i = \sum_{j=1}^{N} P_j V_{ij} \]

\( Z_1 \) -- Disappointing or only slightly successful test market.

Revised probabilities: \( P(S_1) = .858; P(S_2) = .122; P(S_3) = .020 \)

\[
\begin{align*}
EV(A_1) &= 100(.858) + 50(.122) + (-50)(.020) = 90.9 \\
EV(A_2) &= 50(.858) + 100(.122) + (-25)(.020) = 54.6 \\
EV(A_3) &= (-50)(.858) + 0(.122) + (80)(.020) = -41.3
\end{align*}
\]

Optimal choice if test market result is \( Z_1 \)

\( Z_2 \) -- Moderately successful test market.

Revised probabilities: \( P(S_1) = .364; P(S_2) = .545; P(S_3) = .091 \)

\[
\begin{align*}
EV(A_1) &= 100(.364) + 50(.545) + (-50)(.091) = 59.1 \\
EV(A_2) &= 50(.364) + 100(.545) + (-25)(.091) = 70.4 \\
EV(A_3) &= (-50)(.364) + 0(.545) + (80)(.091) = -10.9
\end{align*}
\]

Optimal choice if test market result is \( Z_2 \)

\( Z_3 \) -- Highly successful test market.

Revised probabilities: \( P(S_1) = .333; P(S_2) = .333; P(S_3) = .333 \)

\[
\begin{align*}
EV(A_1) &= 100(.333) + 50(.333) + (-50)(.333) = 53.3 \\
EV(A_2) &= 50(.333) + 100(.333) + (-25)(.333) = 41.6 \\
EV(A_3) &= (-50)(.333) + 0(.333) + (80)(.333) = 10.0
\end{align*}
\]

Optimal choice if test market result is \( Z_3 \)
The Williams Company

The Williams Company is a regional manufacturer of soft drinks in flavors such as grape, cherry, and orange. Top management has recently become concerned about the erosion of its competitive position and is now considering plans for a summer promotional campaign. The special promotion would cost $100,000, and corporate management is concerned about whether it should contract for an expenditure of this magnitude since it has little past experience against which to gauge the possible success of these efforts. If consumer reaction is extremely favorable (over a 10-percent increase in market share), the company stands to make an incremental profit of $400,000; if it is favorable (5- to 10-percent increase in market share), the projected profits are $100,000, while if it is unfavorable (no appreciable change in market share), the company stands to incur an incremental loss of $100,000 reflecting the cost of the campaign. The marketing manager’s best estimates of the likelihood of these occurrences are, respectively,

- $S_1$: extremely favorable consumer reaction  \( \text{probability} = 0.3 \)
- $S_2$: favorable consumer reaction  \( \text{probability} = 0.4 \)
- $S_3$: unfavorable consumer reaction  \( \text{probability} = 0.3 \)

The Williams Company is considering contracting for a marketing research study to assess the potential effectiveness of the planned promotion campaign. The research study would cost $25,000 and would include some laboratory copy tests to measure attention-getting power and some field studies to assess consumer attitudes toward the advertisements. On the basis of its past experience, the Surveys Unlimited research company has suggested the following relationship between its assessments of an ad’s effectiveness and the ultimate success of the advertisement.
<table>
<thead>
<tr>
<th>Surveys Unlimited's Experience</th>
<th>Consumer Reaction</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Favorable</td>
<td>Favorable</td>
<td>Unfavorable</td>
<td></td>
</tr>
<tr>
<td>Strongly positive</td>
<td>0.7</td>
<td>0.2</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Moderately positive</td>
<td>0.3</td>
<td>0.6</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Slightly positive</td>
<td>0.0</td>
<td>0.2</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

The table is read row within column. Thus, for example, the entry in the first row, first column indicates that 70 percent of those advertisements that created an extremely favorable customer reaction also elicited a strongly positive reaction in the research.

Problems and Questions

1. Should the decision on the special promotion be made without the research, or should the proposed research be conducted?

2. Construct a payoff table for the promotion decision option without the research.

3. Diagram the total decision, including the research option, in the form of a decision tree.

4. Evaluate the value of perfect research information. Evaluate the value of the research information to be provided by Surveys Unlimited.
THE WILLIAMS COMPANY

DEFINITION:

- **A₁** — Decision not to promote
- **A₂** — Decision to conduct special promo
- **S₁** — State of nature reflecting extremely favorable response
- **S₂** — State of nature reflecting favorable response
- **S₃** — State of nature reflecting unfavorable response

**Payoff Table for Promotional Decision Without Research**

<table>
<thead>
<tr>
<th></th>
<th>S₁</th>
<th>S₂</th>
<th>S₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A₂</td>
<td>100,000</td>
<td>100,000</td>
<td>-100,000</td>
</tr>
</tbody>
</table>

Prior Probabilities:

- **P(A₁)** = 0.3
- **P(A₂)** = 0.4
- **P(S₁)** = 0.3

Solution to Example #2
Revision of Prior Probabilities in Light of Research Information that Surveys Unlimited Might Provide

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$Z_1$-Strongly Positive</td>
<td>$S_1$</td>
<td>.3</td>
<td>.7</td>
<td>.21</td>
<td>.724</td>
</tr>
<tr>
<td></td>
<td>$S_2$</td>
<td>.4</td>
<td>.2</td>
<td>.08</td>
<td>.276</td>
</tr>
<tr>
<td></td>
<td>$S_3$</td>
<td>.3</td>
<td>.0</td>
<td>.00</td>
<td>.000</td>
</tr>
<tr>
<td>$Z_2$-Moderately Positive</td>
<td>$S_1$</td>
<td>.3</td>
<td>.3</td>
<td>.09</td>
<td>.231</td>
</tr>
<tr>
<td></td>
<td>$S_2$</td>
<td>.4</td>
<td>.6</td>
<td>.24</td>
<td>.615</td>
</tr>
<tr>
<td></td>
<td>$S_3$</td>
<td>.3</td>
<td>.2</td>
<td>.06</td>
<td>.154</td>
</tr>
<tr>
<td>$Z_3$-Slightly Positive</td>
<td>$S_1$</td>
<td>.3</td>
<td>.0</td>
<td>.00</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>$S_2$</td>
<td>.4</td>
<td>.2</td>
<td>.08</td>
<td>.250</td>
</tr>
<tr>
<td></td>
<td>$S_3$</td>
<td>.3</td>
<td>.8</td>
<td>.24</td>
<td>.750</td>
</tr>
</tbody>
</table>
- **Value of Optimal Act w/out Research**
  
  \[
  EV(A_1) = 0
  \]

  \[
  EV(A_2) = \$400,000 \cdot 0.3 + \$100,000 \cdot 0.4
  \]

  \[
  - \$100,000 \cdot 0.3 = \$130,170
  \]

- **Value Under Certainty of State of Nature to Be**

  - Will choose optimal alternative

  \[
  EV(C) = \$400,000 \cdot 0.3 + \$100,000 \cdot 0.4
  \]

  \[
  + \$0 \cdot 0.3 = \$160,000
  \]

- **Value of Perfect Information**

  \[
  EV(PI) = EV(C) - EV(A_2)
  \]

  \[
  = \$160,000 - \$130,170 = \$30,170
  \]

Since research costs \$25,000, it may be worthwhile. It depends upon how much uncertainty is reduced - how close it is to perfect information.
With revised probabilities, determine value of optimal decision given each research outcome.

1. Z₁ - Positive (Extremely)
   
   \[ EV(A₁) = 0 \]
   
   \[ EV(A₂) = 0.724(400,000) + 0.276(100,000) + 0.000(-100,000) = \$317,200 \]

2. Z₂ - Positive (Moderately)
   
   \[ EV(A₁) = 0 \]
   
   \[ EV(A₂) = 0.231(400,000) + 0.154(100,000) + 0.615(-100,000) = \$138,500 \]

3. Z₃ - Positive (Slightly)
   
   \[ EV(A₁) = 0 \]
   
   \[ EV(A₂) = 0.75(400,000) + 0.250(100,000) + 0.200(-100,000) = \$52,000 \]
**Question:** How likely is each research result and therefore alternate chosen — and the gain from doing research?

\[
\text{EU (Research)} = Pr(Z_1) \text{EV (Optimal Act/} Z_1) \\
+ Pr(Z_2) \text{EV (Optimal Act/} Z_2) \\
+ Pr(Z_3) \text{EV (Optimal Act/} Z_3)
\]

\[
= 0.29(317,200) \\
+ 0.39(138,500) \\
+ 0.32(0)
\]

\[
= 146,000
\]

\[
\text{EV (No Research)} = 130,100
\]

**Difference** = $16,100

\[\therefore \text{Don't do $25,100 Research}\]
CASE 3: TOYS FOR ALL

Example #3—You Solve

Toys for All, a manufacturer of children’s toys, was interested in entering the educational toy market. To this end they established a new brand group whose responsibility was to develop and launch a new educational toy aimed at children under five years of age. Six months later, in direct response to this change, the brand group developed a new puzzle that they believed was both enjoyable and educational.

A sample of 100 households with at least one child under the age of five was given the new puzzle and asked to evaluate it. The results were quite favorable, and, in general, the product appeared to live up to its claims.

Based upon these results and past company records, the brand group determined that there was a 30 percent chance that the toy would capture less than 2 percent of the market, a 50 percent chance that the toy would capture 2 to 5 percent of the market, and only a 20 percent chance that the toy could exceed 5 percent of the market. The financial analysis indicated that if the new puzzle could get 2 to 5 percent of the market, the projected profit would be approximately $1.2 million; a share of market of less than 2 percent would translate into a loss of $1 million; and a share greater than 5 percent would likely return $1.9 million. The brand group was excited because they had a 70 percent chance of not losing any money on their first launch. However, they also were well aware that company records were solely for the general toy market, and the consumer testing was conducted on a small sample of households. Consequently, they decided to initiate a concept test with more representative sample.
TABLE 1
Records of actual and predicted market share

<table>
<thead>
<tr>
<th>Predicted market share based on</th>
<th>Actual market share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 2%</td>
</tr>
<tr>
<td>In-home concept test</td>
<td></td>
</tr>
<tr>
<td>&lt; 2%</td>
<td>.70</td>
</tr>
<tr>
<td>2-5%</td>
<td>.20</td>
</tr>
<tr>
<td>&gt; 5%</td>
<td>.10</td>
</tr>
<tr>
<td>Mall intercept concept test</td>
<td></td>
</tr>
<tr>
<td>&lt; 2%</td>
<td>.65</td>
</tr>
<tr>
<td>2-5%</td>
<td>.25</td>
</tr>
<tr>
<td>&gt; 5%</td>
<td>.10</td>
</tr>
</tbody>
</table>

Bradford, Inc., a research supplier specializing in concept testing of children's products was invited to submit a proposal to concept test the new puzzle. An account executive from Bradford, Inc., presented its basic methodology of concept testing toys. The brand group was presented with the choice between an in-home concept test at $95,000 and a mall-intercept concept test at $50,000. A member of the brand group asked how reliable the results were. The account executive indicated that it depends on the type of concept test selected (in-home or mall-intercept); in addition, he indicated that the company did keep records of share predictions and the actual shares realized by the products tested and that these records should help the brand group decide which type of concept test to choose.

In three days, the brand group received records from Bradford, Inc., showing the percentage of actual and predicted market shares for each of the two types of concept tests (Table 1):
Study Questions (not on exam)

The expected value of the optimal act with no additional research is:
   a. $450,000
   b. $620,000
   c. $680,000
   d. $740,000

The most it would make sense to spend on the in-home concept test is:
   a. $111,270
   b. $130,870
   c. $146,240
   d. none of the above

The most it would make sense to spend on the mall-intercept concept test is:
   a. $24,640
   b. $26,440
   c. $32,780
   d. $36,860

Based on a Bayesian analysis, the Toys for All Company should:
   a. only do the in-home concept test
   b. only do the mall-intercept concept test
   c. do both the in-home and mall-intercept concept tests
   d. do neither the in-home nor mall-intercept concept test