

Courtyard by Marriott

Case Simulation

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Abstract – In the early 1980’s Marriott Corporation used a statistical survey to design a new chain of hotels. The result was the Courtyard by Marriott. This Case Simulation provides a case study of Marriott’s research, and a software simulated model of the hotel market. The case study includes a high-level overview of conjoint analysis. Students then use the simulated model to design Marriott’s new chain of hotels.

Keywords – Agent-Based Models, AI, Artificial Intelligence, Business, Economics, Microeconomics, MBA, Teaching, Case Simulations, Case Study, Market Simulation, Modeling, Conjoint Analysis, New Product Development, Attributes, Features, Benefits, Part-Worth Value, Consumer Surplus, Willingness To Pay, WTP

Learning Goals – Students will learn:

1. How marketers use statistical survey tools like conjoint analysis,
2. How to develop new products from the part-worth values of their features and benefits, and
3. How to simulate the behavior of customers.

Prerequisites:

- Introductory statistics (including regression and correlation)
- Introductory economics (including consumer surplus)

1 ABOUT CASE SIMULATIONS

1.1 Overview

Case Simulations are a combination of Case Studies and Market Simulations.

$$\textit{Case Simulation} = \textit{Case Study} + \textit{Market Simulation}$$

Case Simulations extend business and economics case studies by reproducing key market dynamics in a software simulation. Students can actively explore this simulated environment to analyze the problems presented in the case. Data analytic tools are provided alongside the simulation to answer specific questions. Student solutions can be tested in software before recommendations are made.

1.2 Market Simulation Details

The software simulation runs an Agent-Based Model (ABM) built upon Mainstream Economics. Consumer Agents make Rational Decisions based upon their Willingness To Pay (WTP) and Consumer Surplus for goods and services. Vendor Agents can follow the rules of Game Theory to maximize profitability.

The simulation runs within a free Data Analytics platform called KNIME. This platform, along with the Market Simulation extension, must first be installed by students before the Market Simulation workflow can be explored and analyzed.

2 CASE STUDY

Small Marriott hotels seemed to be the answer. Marriott was running out of suitable locations for its big, premium hotels and needed a new engine for growth. But was there room in the market for a new hotel chain?

2.1 Background

Marriott Corporation had been enjoying a long run of high growth. But by the early 1980's management was getting worried. There were too few locations to place more of Marriott's premium hotels to maintain the growth investors had come to expect.

Management wondered if Marriott could tap into new sources of growth by penetrating sub-premium markets. Two potential segments were identified:

1. Business travelers who travel at least six times per year, or
2. Pleasure travelers who travel at least twice a year.

But what type of hotel should Marriott develop to attract these travelers?

It was essential the new chain offer good value-for-money and establish a competitive advantage over existing rivals. At first, management wanted to simply offer a smaller version of the existing Marriott. But it was also essential that the new chain not cannibalize Marriott's existing hotel offerings.

A research team with professors from The Wharton School of Business¹ was engaged to evaluate the unmet needs of travelers. They were asked to identify those facilities and services which offered the best competitive position, and assess whether demand was great enough to support Marriott's growth goals.

The team used surveys to evaluate 167 hotel features and services categorized into the following seven *facets*:

1. **Rooms** (room size, decor, suite configuration, TV, video rental, etc.)
2. **Food** (restaurant, room service, vending machines, etc.)
3. **Lounge** (private lounge, public bar, lively entertainment, etc.)

¹ Professors Jerry Wind and Paul Green, with Douglas Shifflet and Marsha Scarborough

4. **Services** (bellman, airport limo, etc.)
5. **Leisure** (sauna, gym, children's playroom, etc.)
6. **External Factors** (pool, landscaping, building shape, etc.), and
7. **Security** (guards, location of sprinklers, etc.).

Within each of these broad facets the researchers identified hotel *attributes*. And within each attribute were several *levels*. For example:

- **Facet:** Rooms
 - **Attribute:** Room Size
 - Levels:**
 - Small (standard)
 - Slightly Larger (1-foot)
 - Much Larger (2.5 feet)
 - Small Suite (2 rooms)
 - Large Suite (2 rooms)

To ensure the new hotel was competitive, the survey asked travelers about their preference for existing offerings. The question on room décor, for instance, asked travelers to rate:

- Days Inn and other budget motels
- Older Holiday Inn, Ramada, and Rodeway hotels
- Newer and better Holiday Inns
- Existing Marriott and Hilton hotels
- Hyatt Regency and Westin Plaza hotels

In total, Marriott studied 50 attributes each ranging from 2 to 8 levels. Results of the analysis recommended which traveler segment to target, what layout to build, which services to offer, and what price to charge.

“The research allowed management to focus on the items customers wanted,” said A. B. Bryan, Jr., Executive Vice President and General Manager of Courtyard by Marriott. “We avoided focusing on things important to management, but not important to the consumer.”

2.2 Data Collection

A consumer study of 600 travelers from Atlanta, Dallas, San Francisco, and Chicago was undertaken. Mid-level and high-level business travelers, as well as non-business travelers, were screened and invited to participate.

According to Bryan, "In the design stage, the focus was on creating a small hotel, with a great room, and excellent security, while being a home away from home."

In the first phase of questioning, respondents were asked to *rank* the importance of each attribute (e.g., room size is / is not more important than room entertainment), then *rate* their preference for each of the attribute-levels (e.g., sink in separate area outside bathroom is acceptable / unacceptable).

All questions related to one of the broad facets were collected into a response card. Travelers were then asked to fill-out seven cards – each one relating to each different facet. Pictures were sometimes used to show, for example, what the swimming pool might look like. If additional costs to the traveler were involved these would be included in the questions. For example, respondents might rate:

- Color TV with free in-room movies (choice of 3)
- Color TV with movies 9 months ahead of HBO (\$5 each)

In the second phase of questioning, 5 complete hotel offerings were shown. These offerings were computer-selected from a pool of 50 hotels as most likely to appeal to the respondent based upon their earlier answers. Respondents were asked to indicate their likelihood of staying in each of the 5 complete hotels.

2.3 Conjoint Analysis

Conjoint analysis was the researchers' primary tool. The tool uses surveys and statistics to quantify the trade-offs consumers make among product attributes.

Conjoint analysis has been used to design:

- AT&T's first cellular phone,
- The new logo for the Baltimore Ravens football team,
- The E-ZPass electronic toll in the northeast U.S.,
- FedEx's tracking system for delayed and lost packages,

- Ford Fairlane's feature downsize,
- Mastercard's travel and entertainment features,
- Polaroid's instant camera, and
- The U.S. Navy's reenlistment benefits package.

Survey respondents are shown a stream of products made up of different combinations of attributes. Respondents are then asked to rank their likelihood to pay for each product combination. As the survey continues, it becomes possible to calculate the "worth" each individual attribute offers each respondent.

These are called "part-worth" values because the attributes need to be combined before the value of the whole product can be determined. By cross-referencing the part-worth values with a trade-off price, it becomes possible to determine the "Willingness To Pay" (WTP) customers have for the attributes and the products.

2.4 Results

Marriott settled on targeting pleasure travelers by offering an "informal, quiet, relaxing hotel with charm and personality". The name "Courtyard by Marriott" most appealed to these travelers.

The results not only highlighted those features travelers wanted, but also those that travelers did not want to pay for. This helped the design team retain desired features while meeting their price per-night goals.

Traditional features suggested by management, but not supported by the data, were dropped from the new design. These included an upscale restaurant, room service, an energetic lounge, and more meeting space.

With the new Courtyard by Marriott hotel, Marriott Corporation could continue its rapid expansion by placing hotels in lower demand areas and smaller markets where their big hotels would not be profitable.

Starting from the three test hotels built in 1983, Courtyard by Marriott surpassed 1,000 properties before 2018 with sales exceeding \$3 billion.

3 DISCUSSION QUESTIONS

These questions can be prepared by students after reading the case and before an instructor-led class discussion.

1. How do you think Marriott first identified mid-level business and leisure travelers as potential target segments?
2. Marriott could have targeted business travelers with their new hotel chain. Instead they selected to focus on pleasure travelers. What kind of metrics would management need to make that decision?
3. How did Marriott find the mid-level business travelers, high-level business travelers, and non-business travelers surveyed by the researchers? Would it make sense to survey Marriott's existing customers?
4. The first phase of the research was described by the team as "univariate self-explicated evaluation" because respondents were not forced to make a trade-off between multiple options. Do you think respondents can be trusted to accurately quantify their own preferences?
5. Marriott's surveys took respondents about an hour to complete, for which they were paid \$35. Is it reasonable to ask respondents to spend so long completing a survey? How does paying the respondent change the quality of the results? Can you think of another way to get the results Marriott would need?
6. Marriott surveyed 600 respondents. How many respondents is enough to generate actionable insights?
7. What factors do you need to consider when designing a survey for deep statistical analysis? How do you think conjoint analysis is able to integrate results from the first phase of questioning (individual attribute analysis) with the results from the second phase (comparison of complete hotel offerings)?
8. About how many different combinations of hotels could be made from the attributes and levels being studied? How might you pare these combinations back to a more manageable set of possibilities?
9. How should Marriott use the calculated part-worth values for each hotel attribute to design a new hotel chain? Should it simply design the hotel most customers would prefer and are willing to pay for? What other factors should you consider?

10. Using the part-worth values, why not just build the cheapest hotel you can that most respondents would accept?
11. How would you verify the design proposal coming from the survey recommendations?
12. Why do you think Marriott's management ignored the researcher's recommendation to install complete exercise rooms?
13. Before the research started, management wanted to develop a "Small Marriott". The final Courtyard by Marriott is a smaller hotel that is also a Marriott. Was the research necessary? When do you think it is acceptable for a company to forego research?
14. What would you expect competitors to do once the success of Courtyard by Marriott became clear?

4 SIMULATION QUESTIONS

A Market Simulation has been prepared that mimics the market for hotel rooms in a mid-sized city. The simulation is an Agent-Based Model (ABM) comprising of many traveler agents (called “customers” in the simulation) interested in staying a single night at one of the hotels being modeled over a 10-day period.

Surveys were *not* used to generate part-worth values. Instead, Willingness To Pay (WTP) values for each hotel attribute have already been estimated, along with the opportunity cost to provide these attributes. These estimates were generated for the purposes of simulation only and do *not* claim to be faithful. Adjustments to other input parameters have also been made to simplify the model.

The mid-sized city being modeled currently offers these legacy hotels:

- Marriott
- Radisson
- Holiday Inn
- Best Western
- Hampton Inn
- Red Roof

Students are asked to use the simulation to design a new “Courtyard” hotel to compete with these legacy hotels. To do so, students must specify attribute-levels for the following features:

- Location
- Decor
- Facilities
- Food & Beverage
- Room Size
- TV & Entertainment
- Building Configuration
- Miscellaneous Services

The selectable attribute-levels for each feature are as follow:

Location:

- Downtown
- Attraction
- Suburban
- Airport

Décor:

- Level 4 = Luxury
- Level 3 = Upscale
- Level 2 = Mid-Range
- Level 1 = Economy
- Level 0 = Budget

Facilities:

- Level 3 = Spa + Level 2
- Level 2 = Swimming Pool + Level 1
- Level 1 = Weight Room
- Level 0 = None

Food & Beverage:

- Level 3 = Room Service + Level 2
- Level 2 = Restaurant + Level 1
- Level 1 = Lounge
- Level 0 = Vending Machines

Room Size:

- Level 3 = Suite
- Level 2 = Large
- Level 1 = Medium
- Level 0 = Small

TV & Entertainment:

- Level 3 = HBO movie channel
- Level 2 = 30 channel cable
- Level 1 = \$5 movies
- Level 0 = Color TV

Building:

- Level 3 = Architectural
- Level 2 = Enclosed Central Skylight
- Level 1 = Outdoor Courtyard
- Level 0 = Simple

Miscellaneous:

- Internet
- Business Center
- Meeting Rooms
- Concierge
- Laundry

Using the simulation and the data analytics tools provided, answer the following questions. Some of this analysis can be performed in a spreadsheet but most needs to be performed in the simulated environment. Your instructor may demonstrate how to get started.

Create a spreadsheet to collect your answers.

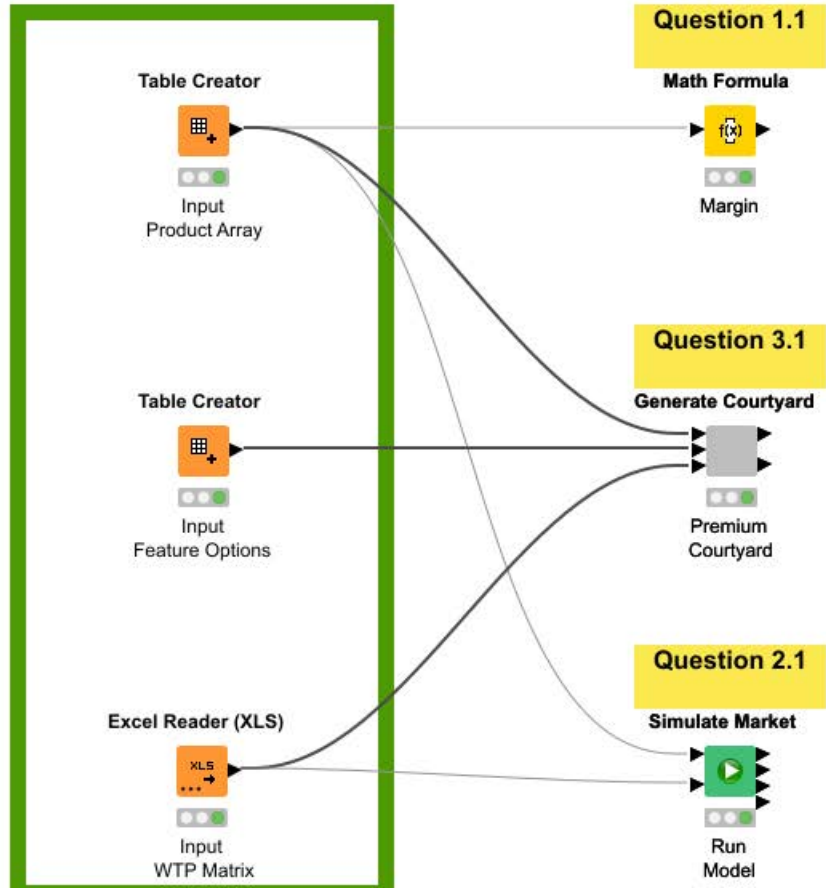
Note: do not be surprised if your recommendations for the new Courtyard vary from the facts provided in the case.

Education (ED-221) - Courtyard by Marriott

Marriott Corporation designed a brand-new chain of hotels from customer surveys and data analytics. The result was the Courtyard by Marriott. This Case Simulation provides both a case study of Marriott's research, and a software simulated model of the hotel market. Students are asked to use the model to design an optimal hotel.

Simulation Input Data

This is the input data used by the Market Simulation. The data includes legacy hotel Willingness To Pay (WTP) as well as the part-worth WTP values of individual Features.



Section 1: Exploring the Data

This section requires you to conduct basic statistical analysis of the data used by the market simulation.

Section 3: New Product Development

In this section, you need to define the Features that make up the new "Courtyard by Marriott". Price and Cost will be defined automatically from your selections. Test the new hotel in the market.

Section 2: Running the Simulation

This section requires you to run the original Market Simulation and analyze the number of travelers (customers) who stay at each hotel (product).

4.1 Exploring the Data

This section requires you to conduct basic statistical analysis of the data used by the market simulation. Some of the provided data refers to the part-worth Willingness To Pay (WTP) customers have for individual features. Other data refers to the total WTP customers have for the legacy hotels.

1. Find the list of legacy hotels in the Input Product Array table in the Market Simulation. Note the Location of each hotel. Calculate the Profit Margin and Margin Percentage of each based upon the room Price per night and opportunity Cost. Fill in the following table.

Hotel	Location	Price	Cost	Margin
Marriott				
Radisson				
Holiday Inn				
Best Western				
Hampton Inn				
Red Roof				

2. Find the Input Feature Options table. Verify the list of attributes-levels from the case and note the abbreviations used (for example, “Food” is used to mean “Food & Beverage”). The “Cost” column lists Marriott’s opportunity cost to offer this feature as part of the new Courtyard hotel chain. The “Price” column lists the incremental price Courtyard can charge by offering the feature.

Answer the following questions:

- a. What “Feature” corresponds to a medium-sized room? Hint: the answer should be in the form “Attribute.Level”.
 - b. What “Feature” corresponds to providing the HBO movie channel?
 - c. What is the opportunity “Cost” in providing only vending machines?
 - d. What is the incremental “Price” the Courtyard hotel can charge if it offers upscale décor?
 - e. Which Location will most increase Margin?
3. Average the Cost of the Features within each Attribute. What are the top 5 most expensive Attributes it costs the hotel to provide? Fill in the table.

Hint: The GroupBy node can be used to average the Cost column.

Rank	Attribute	Average Cost
#1 costly		
#2		
#3		
#4		
#5		

4. If the new Courtyard hotel were to select the costliest Feature level within each Attribute, and offered all the optional Miscellaneous Features, what would be the total cost per room? What price would it charge?

5. Find the Input WTP Matrix table. Verify the number of customers included in the model? Verify the number of legacy hotels (called “products” in the simulation)? Filter out the legacy hotel columns and the Demographic column, then count the remaining Feature columns containing part-worth WTP values for the individual attribute-levels.

How many Customers in the WTP Matrix?	
How many Attribute-Levels in the WTP Matrix?	

6. Consider the first customer C00001. Using the first row of the Input WTP Matrix, and looking only at the attribute-level columns, answer the following questions:
 - a. What Feature is this customer willing to pay the most for?
 - b. How much more would this customer pay for a Suite than a Large Room?
 - c. How much would this customer pay for a Spa vs just a Pool?
 - d. Which miscellaneous service does this customer value the most?
 - e. Which location is *least* attractive to this customer?

7. Considering again *all* the customers, compare the WTP for HBO (TV.Level3) versus the WTP for free cable (TV.Level2). Do any customers think free cable is better than HBO? Fill in the following table.

Hint: Subtract the WTP for TV.Level3 from TV.Level2.

TV	Count Customers
Prefer HBO	
Prefer Free Cable	

8. Generate a Correlation Matrix using all the customer Willingness-To-Pay (WTP) values in the Input WTP Matrix. Comparing just the legacy hotels, determine which is the best substitute to each hotel. Fill in the table.

Hotel	Best Substitute Hotel
Marriott	
Radisson	
Holiday Inn	
Best Western	
Hampton Inn	
Red Roof	

9. Continue using the Correlation Matrix generated above but now focus on the correlation between the legacy hotels and the feature columns. The correlations can indicate which features each hotel is likely to offer. For example, the WTP for the legacy Marriott hotel is highly correlated with the feature WTP for suite-sized rooms and room service.

Determine the set of features offered by the legacy Marriott hotel by looking at the most correlated *level* within each *attribute*. Fill in the table.

Hint: the Marriott can offer more than one Miscellaneous service.

Marriott	Level	Level Description
Location		
Building		
Room		
Food		
Facilities		
Décor		
TV		
Miscellaneous		

10. Repeat the exercise above and determine the set of Features offered by the Hampton Inn. Fill in the following table.

Hint: The Hampton Inn only offers one Miscellaneous service.

Hampton Inn	Level	Level Description
Location		
Building		
Room		
Food		
Facilities		
Décor		
TV		
Miscellaneous		

11. Determine whether it is true that customers who prefer a given level of luxury for one attribute are also more likely to prefer the same level of luxury for other attributes. Do this by selecting all the correlation values between the “Décor” levels and the “Room” levels. Plot them in a heatmap of 3D column chart and explain your findings.

4.2 Running the Simulation

This section requires you to run the original Market Simulation and analyze the number of travelers (customers) who stay at each legacy hotel (product). Totals represent activity over a 10-day period.

Connect the Input Product Array and the Input WTP Matrix to a “Simulate Market” node and run it. Find the “Output Product Array” and answer the following questions.

1. What is the total quantity of customers staying at each legacy hotel? What is the revenue and profit of each hotel? Fill in the following table.

Hotel	Quantity	Revenue	Profit
Marriott			
Radisson			
Holiday Inn			
Best Western			
Hampton Inn			
Red Roof			

2. What was the total revenue and profit earned by all hotels over the period? You can compare these totals to the new totals after adding the Courtyard by Marriott hotel. Hint: do not forget to exclude the ‘No Sale’ product.

- Find the "Output WTP Matrix" from the "Simulate Market" node. Notice that this table contains both the customer "Demographic" column as well as the hotel the customer selected in the "Purchased" column. Use these two columns to count the total number of "Business" customers and "Pleasure" customers staying at each hotel. Fill in the following table.

Hint: The GroupBy node can count customer demographics by hotel. The Pivoting node can reform the results. Do not forget the totals.

Hotel	Business	Pleasure
Marriott		
Radisson		
Holiday Inn		
Best Western		
Hampton Inn		
Red Roof		
No Sale		
Total		

- The table above also includes counts for the 'No Sale' product. These are customers who decided against staying at any of the hotels. Why do you think there are so many more 'No Sale' Pleasure customers than Business customers when there are fewer total Pleasure travelers?

5. Continue using the “Output WTP Matrix” from the “Simulate Market” node. Sort all the customers by their preference to stay near the city’s Attraction (in descending order). Select the top 500 customers. In which hotel did these customers stay? Fill in the following table then sort it by popularity.

Hotel	Count Attraction Customers
Marriott	
Radisson	
Holiday Inn	
Best Western	
Hampton Inn	
Red Roof	

6. If the Best Western were to close for renovations, which hotel would pick up most of its customers? Fill in the following table. You may assume none of the hotels have limitations on the number of rooms.

Hint: Setting the price of the Best Western to \$9,999 is equivalent to closing the hotel. Make a copy of the Input Product Array before changing the price.

Hotel	Quantity Change
Marriott	
Radisson	
Holiday Inn	
Best Western	
Hampton Inn	
Red Roof	

4.3 New Product Development

In this section, you need to select the features that will make up the new “Courtyard by Marriott” hotel. Then test the success of the new hotel in the market.

Open the Input Feature Options table and notice the “Include” column. You can manually change these values to either *true* or *false* for each attribute levels. The features you choose to include will be those that define the new Courtyard hotel.

A special “Generate Courtyard” node has been provided to generate the new Courtyard hotel and add it to the market. The WTP of the Courtyard is the sum of all the selected feature columns included by the user. The final Cost is the sum of individual costs associated with each feature. The final Price is the sum of the selected incremental prices.

The “Generate Courtyard” node will ensure that one-and-only-one level within each attribute is selected. Students cannot, for example, select two room types or no location. Miscellaneous services need not be included.

1. Open the Input Feature Options table and select to include all the best Features and all the Miscellaneous services (in fact, this has already been done for you). Generate the new Courtyard using the provided “Generate Courtyard” node. Connect the output Product Array and WTP Matrix to a “Simulate Market” node and run it. Fill in the following table.

Hotel	Quantity	Revenue	Profit
Marriott			
Radisson			
Holiday Inn			
Best Western			
Hampton Inn			
Red Roof			
Courtyard			

2. Was the launch above successful? What do you think happened? Compare the sales of the hotels before and after the launch of the Courtyard. How many customers did the new Courtyard hotel “cannibalize” from the legacy Marriott hotel?
3. Correlate the WTP of the Courtyard with those of the legacy hotels. Which hotel is most like the Courtyard? Does this explain the results of the launch above?

- Now select to include the worst location and all the worst features, and exclude all the miscellaneous services. Generate the new Courtyard and test it in the market as before. Fill in the following table. Was this product launch more successful? Why?

Hotel	Quantity	Revenue	Profit
Marriott			
Radisson			
Holiday Inn			
Best Western			
Hampton Inn			
Red Roof			
Courtyard			

- Design a discount hotel located Downtown that targets business travelers? Justify your design choices. Run the simulation. Sum the *total* quantity, revenue, and profitability of the Marriott Corporation (including both the legacy Marriott and the new Courtyard). Do you think Marriott Corporation would be happy with the results? Explain.
- Describe, in words, how to design the most profitable hotel chain possible using just the feature WTP data.
- Design the best hotel you can that maximizes Marriott Corporation's total profitability using trial-and-error or any other way. Boasting rights will be awarded to the student or team that can generate the most profit.
- (optional – experts only) Increase the profitability of the Courtyard hotel you just designed by finding its profit-maximizing price. You may assume none of the legacy hotels will change their price in response.

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