# WEEKLY SESSION 6 – TERM END PROJECT

## Sun Dish, Inc.

Sun Dish, Inc. is a well-established company in the business of cable and dish TV. Headquartered at Indianapolis, the company was started in 1989 as a small cable company that served households in the states of Indiana, Wisconsin, Michigan, Ohio, and Kentucky. As business grew over the years, the company extended its business to other states such as Illinois, Minnesota, Kansas, and Colorado. Over the sixteen years of its existence, the company has grown into a major competitor in the cable TV business, competing with companies such as Cablevision and Comcast.

Rich Field has just joined Sun Dish, as a manager reporting to Vice President (VP) (Planning), Rudy Eberle. Rudy is a seasoned veteran in the industry, having worked in the industry for the past 20 years, of which the last 10 years have been at Sun Dish. Rudy played a key role in the expansion at Sun Dish and was primarily responsible for the extension of Sun Dish's services to Kansas and Colorado.

Rich has just finished his MBA from a premier institution in the Midwest after a stint of 10 years in the pharmaceutical and chemical industries. He has a graduate degree in Chemical Science and pursued the MBA because he wanted to switch over from a technical role to a managerial role. When the opportunity came with Sun Dish, he gladly accepted the position because not only would he get experience in a new industry but would also work with an expert like Rudy.

While interviewing Rich for the job, Rudy discussed an expansion project that the company was planning in the satellite dish business. Ironically, despite the name of the company, Sun Dish was not involved in the satellite dish business earlier. The company's founder, Ray Sun, thought the technology was too new and the business was not mature enough to take the risk. However, since then the satellite dish business has grown by leaps and bounds, and the managers at Sun Dish think that now is a good time to get into this business.

This being Rich's first project, Rudy will actively mentor Rich to make sure everything is on track. However, because Rudy is actively managing multiple projects, Rich will be responsible for most of the detailed work and analysis for the project. Specifically, Rich is expected to analyze decisions related to media selection, an investment portfolio, a product mix, a decision tree, and a simulation.

In the next few frames, you will see how Rich gathers the information regarding each of the required areas by interacting with:

- Rudy Eberle, Vice President (VP) (Planning)
- Sarah Johnson, Marketing Manager

▨Ron Floyd, Financial Manager

▨Vick Shaw, VP (Operations)

## Rich and Rudy in a Management Meeting

During a management meeting, Rudy talks to Rich about the possible areas Rich would need to analyze so that the company managers can make an intelligent decision about the venture into the satellite dish market. Here are some excerpts from the conversation.

Rich: "Rudy, this is a big project that you are handing me as my first task."

Rudy: "Yes, that was the plan ever since we decided to hire you. You can apply the knowledge you gained in your MBA program. Of course, I will be mentoring you and making sure you are on track. We do have a strict deadline for the project, but we need to first understand some issues."

Rich: "Can you give me a quick rundown on the details of this project?"

Rudy: "Yes. As with any other project in which we look at a new service or a new market for an existing service, we have to look at two major aspects: forecasting the demand and media selection. We don't normally use only one or two specific media outlets but five or six of them. The decision, then, is determining the optimal mix of each outlet to use so that customer exposure is maximized."

Rich: "I can understand why forecasting is important to look at because you have to know the demand before you venture into a new market, but why media selection?"

Rudy: "Rich, you will soon learn that in this business, advertising is everything. If you can catch the cable viewers' attention with a catchy slogan and put yourself in the limelight by a clever mix of different media outlets, it will make a big difference in whether you succeed or not."

Rich: "OK, I understand that these are two of the decisions. Are there any other aspects to be considered?"

Rudy: "We have to look at three additional aspects. The first is how we will build capacity for the new equipment that we will need for the venture. Second, we need to decide on the product mix of two main products: receivers and satellite dishes. The third is an investment decision. We have a fixed sum of money sanctioned for this venture. However, because we will not use all the money in the first week or month of the project, we have to invest it for the period so that the returns are maximized."

Rich: "OK... that makes five decisions in all – media selection, demand forecasting, capacity planning, product mix, and investment portfolio. Are there any more?"

Rudy: "Yes, there are a few more, but why don't you analyze these five decisions first and create a report? Then, we'll talk of the remaining areas."

Rich: "OK, I'll do that. Why don't I get back to you in a week with the results of the analysis?"

Rudy: "That would be great, Rich. I will look forward to reading the report."

## Rich's Meeting with Sarah

Rich thinks it is a good idea to address each of five problems that Rudy talked about one at a time. He decides to look at the media selection issue first. To get data on this, Rich approaches Sarah, the marketing manager. The following are excerpts from Rich's conversation with Sarah.

Rich: "Sarah, you have been the marketing manager of the company for the last five years. I need some information from you regarding how the company approached the media selection issue in the past for services in new markets. Can you help me with that?"

Sarah: "Sure, is this for the satellite dish venture?"

Rich: "You've got it. So, I understand from Rudy that your department has already identified some preliminary requirements related to how we are going to approach the media selection issue for this project?"

Sarah: "Yes, let me share that information with you."

## Media Selection Data

The marketing department's plan for the advertisement campaign has a budget of $100,000. Previous experience has shown that the exposure to potential customers as a result of the advertising effort will be, as follows:

- For every sign placed by the roadside, 10 additional customers will sign up for the service.

- For every newspaper insert, 30 additional customers will sign up for the service.

- For every hundred weekend flyers in supermarkets, 10 additional customers will sign up for the service.

- For every hundred personal mailings to potential customers, 40 additional customers will sign up for the service.

- For every TV advertisement placed daily in the last month before the service is launched, 490 additional customers will sign up for the service.

The costs for each of these advertising measures, along with the practical minimum and maximum number that should be planned for each, are shown in the following table:

| Advertising device | Cost | Minimum | Maximum |
|---|---|---|---|
| Roadside sign | 25 | 100 | 500 |
| Newspaper insert | 60 | 50 | 300 |
| Weekend flyers (hundreds) | 30 | 40 | 100 |
| Personal mailings (hundreds) | 82 | 500 | 800 |
| Daily TV ads | 1000 | 3 | 12 |

Notes:

- The data presented here are only for the month preceding the launch of the service.
- This is a critical time to register new customers; therefore, the initial analysis needs to focus only on this month.
- The cost data in the table are the $ cost per insert for each type.
- The practical maximum and minimum numbers in the table are the maximum and minimum number of inserts possible for each media type.

It is important to note that in real-life situations, it takes significant effort to collect data by examining various documents and interviewing different people, to develop assumptions for simplifying analysis, and to present the data in an understandable form.

Rich: "So, this data is from your experience and shows the number of potential customers that we can get from each media option, correct?"

Sarah: "Yes. In addition, we have estimated the costs and the maximum and minimum number of units that we can feasibly show on each media outlet."

Rich: "OK, I think I can model this media selection data as a mathematical programming model. That will give us a combination of media outlets that will maximize the number of customers we reach."

Sarah: "Great! That will be a good start."

## Rich's Meeting with Ron Floyd

After getting the data for the media selection decision, Rich goes to Ron, the company's financial manager, to understand the details of the investment situation Rudy had talked about.

Rich: "Ron, I'm here about the satellite dish project, and I need some information regarding the finances for this project."

Ron: "Sure, what do you need to know?"

Rich: "Well, to start with, Rudy indicated that there is a sum of money earmarked for this project?"

Ron: "Yeah, call it a pot of gold because it is almost $2 million dollars that we are talking about here."

Rich: "Really? That's why Rudy mentioned that we needed to look at ways to invest this money in alternative investments before we use it for the project."

Ron: "Yes, that is sensible because you won't need the entire amount right away."

Rich: "So are there any rules that we traditionally follow when we decide on such investments?"

Ron: "Yes, there are. Let me tell you some of these guiding principles as we discuss the investment options data."

Investment Options Data

The company has traditionally hedged its investments across a variety of investment options. The options available to the company with their expected annual returns are shown in the following table. In addition, the table shows the levels of liquidity and risk for each of the six types of investments.

| Investment type | Expected annual rate of return (%) | Liquidity level | Risk level |
|---|---|---|---|
| Money market funds | 12.25 | High | High |
| Stocks | 11.50 | High | High |
| School bonds | 4.00 | Low | Low |
| Certificates of deposit | 3.00 | Low | Low |
| Tax-free municipal bonds | 6.50 | Low | Low |
| Treasury bills | 7.50 | High | Low |

In addition, the company has the following corporate principles for investing:

1.  The company will not invest more than 30 percent of the money in either of the first two investments because these are too risky.

2.  For the same reason, not more than 50 percent of the total money will be put in the first two investments together.

3.  The company will need the money whenever required for the satellite dish venture. Therefore, not more than 30 percent of the total money will be invested in investments with low liquidity, that is, school bonds, certificates of deposit, and tax-free municipal bonds.

4.  The company considers treasury bills issued by the Federal Reserve as less risky and having high liquidity. Therefore, the company wants at least 15 percent of the total money to be invested in treasury bills.

To diversify across the investment types, there is a corporate policy limit on each of the six types of investment. These are listed in the following table:

| Investment type | Maximum % of total money that can be invested |
|---|---|
| Money market funds | 30 |
| Stocks | 30 |
| School bonds | 20 |
| Certificates of deposit | 25 |
| Tax-free municipal bonds | 40 |
| Treasury bills | 25 |

5. For the same reason of diversification, a minimum of 10 percent of the total money will be invested in each of the funds.

Notes:
1. In the company, investments with a high liquidity level are known as "liquid" investments and those with a low liquidity level are known as "non-liquid" investments.
2. Similarly, investments with a high risk level are known as "risky" investments and those with a low risk level are known as "less-risky" investments.

It is important to note that in real-life situations, it takes significant effort to collect data by examining various documents and interviewing different people, to develop assumptions for simplifying analysis, and to present the data in an understandable form.

Rich's Meeting with VP (Operations), Vick Shaw

Having received data for two decisions, Rich wants to gather data for the remaining three decisions before analyzing any data. Next on his list are issues related to product mix and capacity planning. For both of these, Rich decides to approach Vick Shaw, the long-time VP (Operations) at Sun Dish. Rich remembers from his Operations Management course in the MBA program that the product mix issue is related to costs, and capacity planning is related to future planning of how production requirements will be achieved. He, therefore, thinks that the VP (Operations) is the right person to approach. Here are some excerpts from Rich's conversation with Vick.

Rich: "Hi Vick, I hope you remember me. You came with Rudy to interview me?"

Vick: "Oh yes, you are Rich, right? So, we finally got you here, eh?"

Rich: "You sure did. I am working on this satellite dish project with Rudy, and I need some help from you."

Vick: "Sure. This will be an important venture for our company, so I'll be glad to help in any way I can."

Rich: "Well, there are two issues on which you can probably give me some information. One is the aggregate production plan for the new equipment; the other is the capacity planning issue. Rudy mentioned that we don't have sufficient current capacity to handle production of the new equipment."

Vick: "Yes, that's right. But first, let me give you some idea about production planning."

Rich: "OK."

## Aggregate Production Plan Data

The Sun Dish satellite system requires manufacture of three products: a High Definition (HD) receiver, a digital receiver, and a satellite dish. The initial production plan is for the first six months after launch of service. The production capacity cannot be changed quickly. Consequently, the production plan would be a level plan in which the production levels for the first six months stay the same. The company wishes to make at least as many units of each of the three products as the number of customers who can be reached, as predicted by the media selection analysis. In other words, the company wishes to produce at least 50,000 units of each of the three products if the media selection analysis shows that a total of 50,000 customers will be reached through the various media outlets. In addition, because fewer customers will need HD receivers compared to digital receivers, the company has to ensure that the number of HD receivers produced is not more than 50 percent of the number of digital receivers produced.

The other details related to each of the products are listed in the following two tables.

|  | Fabrication time (hrs) | Assembly time (hrs) | Inspection and testing time (hrs) | Packing time (hrs) |
|---|---|---|---|---|
| HD receivers | 0.1 | .15 | .10 | .05 |
| Digital receivers | 0.15 | .12 | .12 | .05 |
| Satellite dishes | 0.2 | .18 | .15 | .05 |

|  | Fabrication | Assembly | Inspection and testing | Packing |
|---|---|---|---|---|
| Workforce cost/hr ($) | 7.00 | 9.00 | 8.5 | 7.25 |
| Available time (hrs): | 30,000 | 30,000 | 30,000 | 10,000 |

It is important to note that in real-life situations, it takes significant effort to collect data by examining various documents and interviewing different people, to develop assumptions for simplifying analysis, and to present the data in an understandable form.

## Capacity Planning Data

The company needs to plan for the capacity required to produce the new equipment for the satellite dish venture because the existing capacity is insufficient. There are several options to add capacity; however, the selection depends on the market for the new service.

The basic decision is to do one of the following to increase capacity:
1. Build a new plant in Wisconsin.
2. Buy an existing plant in Indiana from a smaller company.
3. Subcontract the required capacity from available vendors.
4. Buy new equipment to boost the capacity of existing plants.

If the company undertakes the second option, it can engage the services of a survey company to narrow the search for a potential plant that can be bought. Of course, the decision depends on how the market for the new service turns out in the future. The company managers think the market can be predicted to turn in one of three ways: favorable, average, or unfavorable. The data related to the four options available for increasing capacity and the expected payoffs with the market events are shown in the following table:

| Option | Cost of the option ($) | | Payoffs with market conditions ($) | | |
|---|---|---|---|---|---|
| | | | Favorable | Average | Unfavorable |
| Build a new plant in Wisconsin | 300,000 | | 1,100,000 | 750,000 | 400,000 |
| Buy an existing plant in Indiana from a smaller company | 100,000 | With the survey company option | 1,000,000 | 500,000 | 300,000 |
| | | Without the survey company option | 600,000 | 300,000 | 100,000 |
| Subcontract the required capacity from available vendors | 10,000 | | 800,000 | 400,000 | 200,000 |
| Buy new equipment to boost capacity in existing plants | 30,000 | | 300,000 | 200,000 | 150,000 |

Notes:

- The cost of the services from the survey company is $15,000.

- The payoff values are different for each option because of the different capacity available for each option. For instance, if a new plant is built, the payoffs are greater because the company would have greater capacity to handle the demand.

- The probabilities of the market conditions are:

- Favorable: 20%

- Average: 50%

- Unfavorable: 30%

It is important to note that in real-life situations, it takes significant effort to collect data by examining various documents and interviewing different people, to develop assumptions for simplifying analysis, and to present the data in an understandable form.

Lastly, Rich wants to see whether he can estimate the demand for the new service. As with any new venture, the success of the project will depend on how the new service is perceived by customers. Rich thinks he should get some historical data concerning the demand for Sun Dish's other services when they were introduced for the first time. He then plans to use a simulation model to determine the level of demand the company can expect for the satellite dish service.

Demand Forecasting Data

Historical Demand Distribution for New Services

| Monthly demand (Number of new customer sign-ups) | Percentage of time a demand level occurs |
|---|---|
| 1,000 | 5 |
| 2,000 | 15 |
| 3,500 | 20 |
| 5,000 | 30 |
| 7,000 | 25 |
| 9,000 | 5 |

In addition to the historical demand, the company knows that the selling price per customer is a random value between $50 and $80. The selling price is the monthly bill for a customer, and the variability in the selling price is due to the different packages ordered by different customers. The random value of the selling price has been traditionally determined within Sun Dish by a discrete uniform distribution.

Notes:

- The monthly demand data shown is an average of the demand from the first six months after the new service is introduced.
- The data about the percentage of time a specific demand level occurs is based on historical data over a number of observations.
- The simulated monthly demand multiplied by the simulated selling price gives the monthly revenue.
- Normally, the company runs 200 replications in simulation models such as this one. The 200 replications are used to determine the average revenue and the standard deviation of revenue that is expected from a new service offering.

It is important to note that in real-life situations, it takes a significant amount of effort to collect data by examining various documents and interviewing different people, to develop assumptions for simplifying analysis, and to present the data in an understandable form.

**Assume that you are Rich and your job during the week is to work on the five decisions assigned to you by Rudy. As requested by Rudy, prepare a detailed analysis of each of the five decision areas and provide a summary memo to describe what you have done.**

## Project Deliverables and Guidelines

There are six deliverables in this project. A breakdown of the deliverables and some guidelines are specified in the following table because this is your first project. Please remember that in real-life situations, you might not be given guidelines.

| Deliverable | Grade weight |
|---|---|
| **Deliverable #1:**<br>Prepare a memo to send to Rudy that provides a two-page summary of what you have done. The first paragraph should contain general comments relating to your experience over the week. The other five paragraphs should summarize your conclusions about each of the tasks. Attach five exhibits showing your detailed work. The details of each exhibit are shown in the remaining deliverables listed here. | 5% |
| **Deliverable #2:**<br>Exhibit 1 – Media Selection<br>Model the media selection problem as a mathematical programming model to determine the optimal combination of media outlets and the number of units in each that would maximize the number of potential customers reached. Use Microsoft Excel's QM to solve the problem. | 4% |
| **Deliverable #3:**<br>Exhibit 2 – Investment Options<br>Model the investment options problem as a mathematical programming model to maximize the returns for the money invested by the company. Use Microsoft Excel's QM to solve the problem. | 4% |
| **Deliverable #4:**<br>Exhibit 3 – Aggregate Production Planning<br>Model the aggregate production-planning problem as a product-mix problem to determine the optimal mix of products to be manufactured, given the constraints. Use Microsoft Excel's QM to solve the problem. | 4% |
| **Deliverable #5:**<br>Exhibit 4 – Capacity Analysis<br>Prepare a decision tree for the specified decisions and market events. Determine the best decision for the company based on the expected payoff from the possible alternatives. Use TreePlan to solve the problem. | 4% |
| **Deliverable #6:**<br>Exhibit 5 – Demand Forecast<br>Use the specified historical demand data to simulate the demand for the new service. Use the Monte Carlo method to determine the expected average monthly demand over the first six months of the service. Conduct 200 replications of the simulation model to determine your results. | 4% |