**QUM2 Task 2: Decision Tree Analysis**

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**QUM2 Task 2: Decision Tree Analysis**

1. **A Business Question**

Task 2 a Decision Tree Analysis for a Major Pharmaceutical Company (MPC) to identify the best decision alternative using the given information about the uncertain events and the possible payoffs of selections. The business question for the MPC asking the question what the best payoff for drug line development is in considering the three alternatives of (1) develop a new drug exploration, (2) focusing on modifications to existing drug, or (3) making no changes to current drug line.

1. **Identify relevant data values**

(See Decision Tree Analysis Excel WS for the following):

* Probabilities
* Payoffs
* Profits
* Demand

1. **Report analyzed data**
2. (See Decision Tree Analysis diagram on Excel WS for the following):

* State-of-nature nodes
* Calculated payoffs
* Expected values

1. ***Justification for Decision Tree Analysis?***

In this scenario decision tree analysis was used for analysis based on budget planning for the best alternative decision on the payoffs of developing a new drug line or modification of an existing drug for future profits. The decision tree analysis included quantitative data such as annual market demands based upon high favorable or low unfavorable market probability based on calculating the profit per unit to create an effective tree. The data was appropriate for calculating the expected value for the alternatives which resulted in alternative (1) developing new drug exploration with the highest payoff.

D. **Summary of Implications**

***(1). What was the role of probability and demand for each branch of the decision tree analysis?***

The **role** of demand is a product’s demand indicating the volume of a product that buyers

are willing to buy at a specific price. The following are key determinants of demand for products such as individual income, price, expectation and preferences, customer base, and economic conditions. In the Decision Tree the role of demand is to get payoffs which are computed by multiplying the demand by the unit profit. On the other hand, the **role** of probability in the Decision Tree which probabilities are assigned to events and values are determined for each outcome with goal of the analysis is to determine the best decision. In the role of calculating probability outcomes which multiply the probability values of the connected branches; therefore, calculating the probability of multiple outcomes by adding the probabilities together. Therefore, the key role of probability for improving decision making in face of uncertainties.

To determine success in the market the first branch in the tree (1) develop new drug line in market research it was determined that a 71% likelihood of success with an annual demand of 4341 units per month as high favorable versus its counterpart of 29% likelihood of 1205 units per month as low favorable market. The second branch in the tree (2) existing drug in market research determined that a 63% likelihood of success with an annual demand of 5475 units per month as high favorable versus its counterpart of 37% likelihood of 1807 units per month as low favorable market. The third branch of the decision tree (3) making no changes determined that an 81% likelihood of success with an annual demand of 730 units per month as high favorable market versus 19% likelihood of 241 units per month as low favorable market.

***(2). How was the expected value of each mode of the branches of decision tree determined based on payoffs?***

The calculations were based on the probability high favorable multiplying the high favorable demand multiplied by profit per unit adding the probability low favorable multiplying the low favorable demand of units per month multiplied by the profit per unit. The calculations are as follows:

* (1) new drug line 🡪(.71) ($2734.83) + (.29) ($759.15) = $2161.88 expected value \*
* (2) Existing drug 🡪(.63) ($2628.00) + (.37) ($867.36) = $1976.56 expected value \*
* (3) no changes 🡪(.81) ($613.20) + (.19) ($202.44) = $ 535.15 expected value \*
* The alternative with the greatest expected value payoff is the option chosen. \*

(See Excel WS – Decision Tree Analysis) \*

***(3). What are the limitations of the data elements and the decision tree analysis?***

The decision tree analysis a quantitative analysis approach design to establish logical sequence of decisions, decision alternatives, and evaluate what the result produces; yet the limitation that the decision tree analysis could occur a maximum loss which could have a huge effect; likewise, can become complex with too many decisions. The limitation of data elements in a decision tree can be unstable if there is constant change to data; likewise, the transparency of data can be compromised at certain stages of reporting.

**€. Recommended Course of Action**

What is the recommended course of action addressing the business question in Part A and based on the results of Decision Tree Analysis? The Expected Value results indicated alternative (1) developing new drug exploration with the highest payoff then (2) alternative existing drug modification. Alternative (3) making no changes are encountered by low market demands but had high profit per unit.